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National Culture and Corporate Environmental Strategy: Uncertainty Avoidance, Future Orientation, and Green Revenue Targets

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ABSTRACT

This study examines whether GLOBE societal-practice measures of national culture predict corporate green revenue target setting, a rare, forward-looking disclosure with a 0.21% base rate in our sample. We estimate logistic regressions on 73,501 firm-year observations from 10,544 firms headquartered in 48 countries over 2002-2024, using LSEG (Refinitiv) ESG and financial data, GLOBE scores, and World Bank accounts, testing whether uncertainty avoidance and future orientation predict disclosure of a green revenue share target. Contrary to our hypothesis, uncertainty avoidance is significantly and negatively associated with disclosure ($\beta = -3.574$, $P = 0.035$), while future orientation is positively associated but only at the 10% level ($\beta = 3.538$, $P = 0.054$). Both results survive a linear probability model, a year-trend control, a random-intercept multilevel logit, and Firth's penalized-likelihood estimator. A formal interaction test shows both cultural effects differ in Japan and South Korea, which together account for 77% of the 155 disclosures observed (joint Wald $\chi^2(2) = 22.01$, $P < 0.001$); neither coefficient differs from zero once these two countries are excluded. The findings caution against treating GLOBE scores as uniform predictors of environmental target setting: country-specific institutional or regulatory dynamics more plausibly drive the association than any shared cultural mechanism.

Keywords: National Culture, GLOBE Cultural Practices, Uncertainty Avoidance, Future Orientation, Green Revenue Target, Corporate Environmental Strategy
JEL Classifications: M14, Q56, Z10, C25

1. INTRODUCTİON

Corporate environmental target-setting is a strategic choice that plays out against a backdrop of national values, not just national regulation. GLOBE's cultural-practice dimensions provide a validated, comparable measure of societal planning horizons and risk tolerance (House et al., 2004). The clearest empirical anchor for this study is Miska et al. (2018) multi-domain analysis of corporate sustainability practices. Their analysis covers 1,924 companies drawn from 36 countries and nine GLOBE cultural clusters worldwide. They find that future orientation, gender egalitarianism, uncertainty avoidance, and power distance practices all positively predict corporate sustainability practices. By contrast, performance orientation practices predict corporate sustainability practices negatively in their multi-domain cross-country analysis. Qureshi and Ahsan (2022) instead use Hofstede's dimensions, rather than GLOBE's, across a panel covering 46 separate countries. They find that national culture shapes environmental performance itself and also how investors price that performance. DasGupta and Roy (2023) show that GLOBE uncertainty avoidance and future orientation both act as positive moderators. Both dimensions strengthen the relationship between ESG performance and financial performance across an international firm panel. In other studies, Liu et al. (2014) find that future orientation positively predicts environmental commitment among Chinese firms. Likewise, Ma et al. (2026) use a World Bank

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Enterprise Survey panel of over 220,000 firms. They find that firms in linguistic environments with a more proximate perception of the future adopt environmental management practices. This study asks whether firms headquartered in societies with high uncertainty avoidance and future orientation practices behave differently. Specifically, we ask whether such firms are more likely to disclose a target to increase green revenue share. This study extends the small but growing literature linking national culture to corporate sustainability strategy (Miska et al., 2018; Pucheta-Martínez and Gallego-Álvarez, 2020).

Existing cross-country evidence on national culture and corporate environmental practice is concentrated in three broad areas. These three areas are environmental disclosure quality (Pucheta-Martínez and Gallego-Álvarez, 2020; Sambharya and Goll, 2024), board-level governance outcomes (Gull et al., 2023; Chen et al., 2026), and broader CSR reporting strategy (Lemma et al., 2022; Chen and Chen, 2026). Three gaps recur across this body of work, and this study is designed to address each one. First, most studies rely on a single cultural dimension or composite sustainability index. Few jointly estimate the specific GLOBE societal-practice dimensions theorized to bear directly on corporate environmental strategy (Rohov et al., 2021). Second, culture is almost always aggregated at the national level across the full country sample. Such aggregation can mask the heavy concentration of any observed effect within a small number of countries (Jones and Lubinski, 2014; Tung and Verbeke, 2010). Third, forward-looking environmental target-setting differs from backward-looking disclosure of environmental expenditures that a firm has already incurred. This forward-looking outcome has received comparatively little direct attention as a dependent variable in the existing literature. This study addresses these three gaps directly, and each design choice maps onto one identified gap. It tests uncertainty avoidance and future orientation societal practices jointly, rather than testing either dimension singly. It treats the geographic concentration of any observed effect as a first-order empirical question, tested formally rather than assumed away. It also uses green revenue target disclosure, a forward-looking strategic commitment, as the study's outcome variable. The joint-dimension premise itself has direct precedent, most closely in the work of Luo and Tang (2022). They test the same two GLOBE dimensions against corporate carbon performance and find both positively predict it. What distinguishes this study is its outcome variable, which has not been tested against these dimensions before. Its formal test of geographic concentration is the second distinguishing feature, and both are detailed further below. This gap has grown more consequential as global regulatory frameworks begin to formalize what counts as green revenue. The EU Taxonomy Regulation is the most notable example, setting standardized technical screening criteria for classifying sustainable revenue. Such frameworks make a firm's voluntary green revenue target increasingly comparable rather than purely idiosyncratic across countries (Pizzi et al., 2021).

This study uses 73,501 firm-year observations from 10,544 publicly listed firms headquartered in 48 countries. The panel covers the period from 2002 to 2024 and draws on three data sources. These include the LSEG (Refinitiv) ESG and financial database, GLOBE societal-practice scores, and World Bank GDP-per-capita data. We estimate a logistic regression of green revenue target disclosure on uncertainty avoidance and future orientation. The model controls for GDP per capita, firm size, and sector across the full sample. Uncertainty avoidance is significantly and negatively associated with disclosure, the opposite sign from the institutional socialization mechanism motivating H1a. As hypothesized, future orientation was positively associated with disclosure, although the coefficient only reached the 10% level. Both results hold under Firth's bias-reduced penalized-likelihood estimator and a random-intercept multilevel logit model. The Firth estimator addresses the rare-event and quasi-separation problems that this research design would otherwise encounter. A formal interaction test central to this study's design compares the two cultural effects across the country subsamples. Both effects are statistically significantly different in Japan and South Korea than in the remaining 46 countries in the study. These two countries together account for 77% of the 155 observed target disclosures in the full sample. Neither cultural coefficient is distinguishable from zero once these two countries are excluded from the estimation.

This study makes two contributions: one to the literature and one to empirical research practice. First, it contributes to the national culture and corporate sustainability literature by jointly testing two GLOBE societal practice dimensions. This joint test replaces the single dimension or composite index used in most earlier cross-country studies. The outcome is green revenue target disclosure, a forward-looking strategic commitment that existing research has largely overlooked. Instead, it has favored backward-looking disclosure measures or measures of environmental expenditure already incurred. Second, and more importantly, it contributes a methodological toolkit for researchers studying rare, culturally patterned environmental outcomes. Researchers should not assume that a significant cultural coefficient generalizes across a pooled cross-country panel. This study instead tests this assumption formally using a subsample-exclusion comparison and an interaction-term Wald test. It also demonstrates three complementary remedies for the rare-event and separation problems that this research class encounters. These remedies are Firth's bias-reduced penalized likelihood, a linear probability model, and a multilevel random-intercept specification. Such problems will arise more frequently as green target-setting and transition-plan disclosures diffuse unevenly across countries. For practitioners, the findings caution against assuming that shared cultural orientation drives comparable diffusion of green-target-setting practice across countries. They point instead toward country-specific institutional and regulatory explanations as the more promising lever for expanding disclosure. Expanding disclosure means moving beyond Japan and South Korea, which currently account for most observed cases.

The remainder of this paper proceeds in six further sections, organized as briefly described below. Section 2 reviews the theoretical and empirical literature linking national culture to corporate environmental strategy and develops two hypotheses. Section 3 describes the sample, variable measurement approach, and model specification used in the estimation. Section 4 presents the empirical results, including descriptive statistics, baseline

regression, and robustness checks. Section 5 discusses the findings, Section 6 concludes, and Section 7 addresses the study's limitations and directions for future research.

2. LİTERATURE REVİEW AND HYPOTHESES DEVELOPMENT

2.1. Theoretical Framework

The GLOBE framework was developed as an extension of Hofstede's (1980) research on cultural dimensions. It distinguishes societal practices, meaning as-is behavior, from values, meaning should-be behavior, across nine cultural dimensions. These nine dimensions were measured across 62 societies in the original GLOBE data collection exercise (House et al., 2004). Two of these nine dimensions are directly related to corporate environmental strategy in this study. Future orientation captures the extent to which a society values planning, gratification, and long-term investment. Uncertainty avoidance captures a society's reliance on rules, formal structures, and risk-averse approaches to planning. Firms embedded in societies that score high on both dimensions are theorized to internalize longer decision horizons. They are also theorized to adopt more rule-bound environmental commitments through institutional and socialization channels, rather than economic ones. These longer horizons should translate into more ambitious, formally disclosed environmental targets such as green revenue targets. This proposed mechanism is consistent with normative and mimetic isomorphism described by institutional theory (DiMaggio and Powell, 1983). Societal practices are absorbed by a firm's leadership and workforce through socialization at corporate headquarters. This absorption is largely independent of a specific jurisdiction's formal environmental regulations and enforcement regimes.

This institutional-socialization account, however, is not the only theoretically plausible mechanism linking uncertainty avoidance to environmental target-setting. A competing, falsifiability-based mechanism points in the opposite direction and merits equal theoretical consideration. A disclosed green revenue target is a concrete, quantified, and later auditable commitment by the disclosing firm. This differs sharply from a continuous ESG score or a purely qualitative corporate sustainability narrative. Risk-averse, rule-bound societies may therefore treat public target-setting itself as a risk to be avoided (Qureshi and Ahsan, 2022). Such firms would prefer silence to a public commitment that could later be judged as unmet. Under this account, uncertainty avoidance suppresses rather than promotes the specific outcome examined in this study. It could still promote rule-bound environmental practice more generally, without promoting this particular disclosure outcome. Section 2.3 builds this distinction into H1a, and Section 5 revisits it in light of the results.

2.2. Empirical Review

The clearest empirical anchor for this study is Miska et al. 's (2018) multi-domain analysis of corporate sustainability practices. Their analysis covers 1,924 companies drawn from 36 countries and nine GLOBE cultural clusters worldwide. They find that future orientation, gender egalitarianism, uncertainty avoidance, and power distance practices all positively predict corporate sustainability practices. By contrast, performance orientation practices predict corporate sustainability practices negatively across their full multi-domain sample. Qureshi and Ahsan (2022) use Hofstede's dimensions rather than GLOBE's across a panel of 46 countries. They find that national culture shapes environmental performance itself and also how investors price that performance. In cultures with high uncertainty avoidance and high long-term orientation, investors penalized firms disclosing higher environmental performance. This counterintuitive finding suggests that culture moderates the market reward for sustainability disclosure, not merely its supply. This body of work supports including both future orientation and uncertainty avoidance as covariates rather than either alone. It therefore directly motivates the baseline specification adopted in this study and reported in Section 3.2.

Beyond Miska et al.'s (2018) multidomain analysis, a more direct empirical precedent comes from studies that model both dimensions together. These studies model GLOBE uncertainty avoidance and future orientation together against firm-level corporate environmental outcomes. They nonetheless reach markedly inconsistent conclusions about the direction of the uncertainty-avoidance effect in particular. DasGupta and Roy (2023) show that GLOBE uncertainty avoidance and future orientation both act as positive moderators. Both dimensions strengthen the relationship between ESG and financial performance across an international firm panel. Chen et al. (2023) similarly find that both dimensions foster corporate decarbonization efforts among Carbon Disclosure Project respondents. Their sample covers 23 societies, and the relationship is time-varying as carbon-related institutions continue to evolve. Power et al. (2015) instead report a rather different pattern in plant-level environment and safety investment decisions. Uncertainty avoidance, in-group collectivism, and future orientation all shift plant-level environment and safety investment away from rational predictions. These dimensions introduce a persistent cultural bias rather than a uniformly positive main effect on investment. At the individual level, Parboteeah et al. (2012) study support for sustainability initiatives across 33 countries. They find no significant relationship between uncertainty avoidance and individual propensity to support sustainability initiatives. Future orientation, alongside collectivism and human orientation, positively predicts individual support for these initiatives. This inconsistency in the uncertainty-avoidance effect is not confined to studies using GLOBE cultural measures. Using Hofstede's related dimension, Lu and Wang (2020) and Gallén and Peraita (2018) both report positive associations instead. These positive associations concern environmental performance and CSR disclosure, respectively, across their two separate samples. By contrast, Wang et al. (2021) find that uncertainty avoidance is a barrier to corporate green proactivity. The closest existing precedent to this study's exact hypothesis pair is the work of Luo and Tang (2022). They test uncertainty avoidance and future orientation together, alongside other GLOBE-adjacent dimensions, against corporate carbon performance. Using a comparable multi-country panel, they find that both cultural dimensions are positive predictors of carbon performance. This is the opposite sign for uncertainty avoidance from the result reported in Section 4.2 below. The Discussion in Section 5 engages

this contradictory finding directly rather than setting it aside. Future orientation's association with environmental commitment is comparatively more consistent across this body of empirical literature. Liu et al. (2014) find that future orientation positively predicts environmental commitment among Chinese firms. Ma et al. (2026) use a World Bank Enterprise Survey panel of over 220,000 firms. They find that firms in linguistic environments with a more proximate perception of the future adopt environmental management practices. This pattern is consistent with a temporal-discounting mechanism closely related to the future orientation dimension.

A related strand examines cultural dimensions as moderators of environmental disclosure practices more narrowly. Pucheta-Martínez and Gallego-Álvarez (2020) provided direct evidence that cultural dimensions influence environmental disclosure practices across national contexts. They argued that culture has been underexamined relative to institutional and regulatory drivers of environmental disclosure. A companion study finds that cultural dimensions, legal systems, and industry jointly shape environmental reporting internationally (Gallego-Álvarez and Pucheta-Martínez, 2020). Sambharya and Goll (2024) extended this line of inquiry to international diversification strategies at the firm level. They show that national cultural practices moderate the link between diversification and corporate environmental responsibility disclosures. Rohov et al., (2021) approached the same question from a national-performance angle instead of a firm-level one. They identified sustainability-management factors, including cultural ones, that shape environmental performance at the country level. Culture-specific case evidence complements these cross-country studies in several instructive ways that merit brief attention. Jones and Lubinski (2014) traced the historical evolution of corporate environmentalism in the German chemical industry. Their account illustrates how national institutional and cultural contexts shaped early corporate environmental strategies in Germany. Iddik (2024) tested a conceptual framework linking organizational and national culture to green supply chain management adoption. The study finds empirical support for culture as a driver of green-practice diffusion across firms.

A second cluster of studies connects national culture to corporate governance structures across many countries. More directly relevant here, these studies show that cultural context is an active moderator rather than a control variable. Gull et al. (2023) found that board gender diversity significantly affects waste management outcomes across 37 countries. Their evidence implicitly highlights how the effectiveness of gender-diverse boards may be culturally contingent. Chen et al. (2026) made this cultural moderation explicit by comparing Western and East Asian contexts. They find that national culture moderates the impact of female directors on corporate environmental performance. The effect is weaker in cultural contexts marked by higher power distance or higher collectivism. This finding bears directly on the East Asian concentration result reported later in Section 4.3. Relatedly, Chen et al. (2026) examined biodiversity disclosure across a sample of 4,703 firms in 40 separate economies. They integrated culture, institutions, and risk to explain the observed variation in biodiversity reporting across firms. Zhao et al. (2024) isolated power distance as a behavioral-bias mechanism in this literature. Through this mechanism, national culture drives higher corporate greenhouse gas emissions across their sample of firms. Family-firm governance also features prominently in this literature on national culture and corporate environmental outcomes. Tran (2026) examined how generational stage in family firms affects corporate social responsibility performance over time. This relationship is moderated jointly by long-term orientation, uncertainty avoidance, and power distance in that study. This provides a direct precedent for testing multiple GLOBE-adjacent dimensions together rather than singly, as this study does.

A third theme concerns how national culture shapes broader CSR strategy and corporate communication practice. Lemma et al. (2022) provide cross-country evidence drawn from a large sample covering 41 separate countries. National cultural values shape the relationship between ESG performance and corporate financing strategy in their sample. Yang et al. (2013) examined cross-cultural ethical issues in CSR strategy from a human-resources perspective. Their focus is on multinational firms expanding their operations into emerging economies. Chen and Chen (2026) applied a care-ethics framework to compare CSR reporting language across two airline industries. Their comparison of Chinese and US airlines illustrates how cultural values shape corporate communication strategy. Rolland and Bazzoni (2009) explored how firms use online CSR reporting to construct organizational identity across cultural and stakeholder contexts. Several case-based and applied studies further illustrate cultural specificity in the practice of corporate social responsibility. This work includes CSR's role in post-war economic recovery and CSR dynamics under crisis conditions (Nazarova et al., 2025; Ubrežiová et al., 2025). These studies underscore that culturally specific institutional detail, not only broad cross-country averages, shapes how CSR strategy is enacted.

Taken together, this body of literature confirms that national culture is not a peripheral control variable. Instead, it operates as a substantive moderator of both corporate governance and corporate sustainability outcomes (Chen et al., 2026; Gull et al., 2023; Lemma et al., 2022). Two gaps recur across this literature, and both are directly addressed in the present study. First, most cross-country studies aggregate culture at the national level across the entire pooled sample. This aggregation can mask the substantial concentration of any measured effect within a small number of countries. The case-study literature's emphasis on country-specific institutional and cultural detail clearly foreshadows this particular risk (Jones and Lubinski, 2014). Song et al. (2018) explicitly name the problem, although they address it differently from this study. They frame the literature's inconsistent findings as resolvable through a practice-adoption mediator rather than direct geographic testing. Section 4.3 treats this concern as a direct, formal empirical test rather than an interpretive caveat. It interacts the cultural variables with a dummy for the countries responsible for most observed events. This approach differs from relying only on a subsample comparison or on a mediating variable alone. To our knowledge, this combination of outcome and test has not been applied in this literature. Second, GLOBE-derived societal-practice dimensions, particularly uncertainty avoidance

and future orientation, are theoretically well motivated in this literature. They are nonetheless tested more often via composite sustainability indices than via a single binary outcome (Miska et al., 2018). This study instead uses a forward-looking, binary strategic-commitment outcome of the kind rarely examined before.

2.3. Hypotheses Development

2.3.1. H_{1a} (Uncertainty avoidance)

Firms headquartered in societies with higher uncertainty-avoidance practices are more likely to disclose green revenue targets. This prediction holds for future orientation, GDP per capita, firm size, and sector effects. Reliance on rules, formal structures, and risk-averse planning is theorized to translate into more rule-bound, formally disclosed environmental commitments (House et al., 2004). This hypothesis follows the institutional socialization mechanism developed in Section 2.1 of the present paper. The competing falsifiability-based mechanism introduced instead predicts a negative sign on the uncertainty avoidance coefficient. The two competing mechanisms are adjudicated empirically in Section 4.2 and discussed in Section 5.

2.3.2. H_{1b} (Future orientation)

Firms headquartered in societies with higher future-oriented societal practices are more likely to disclose green revenue targets. This prediction holds for uncertainty avoidance, GDP per capita, firm size, and sector effects. A societal orientation toward planning, delayed gratification, and long-term investment is theorized to lengthen corporate decision-making horizons. Longer decision horizons should increase a firm's willingness to publicly commit to forward-looking environmental targets (Miska et al., 2018).

H_{1a} and H_{1b} were tested jointly in a single model, as specified in Section 3.2, rather than sequentially. This approach is consistent with the empirical review's finding that the two dimensions are correlated in practice (r = 0.384, Table 1). The two dimensions are also typically theorized and tested together throughout the prior empirical literature (Tran, 2026; Miska et al., 2018).

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Sample and Data Sources

The primary data source for this study is the LSEG (Refinitiv) ESG and financial database of listed firms. It is matched by firm year to the GLOBE project's country-level uncertainty-avoidance and future-orientation societal practices scores (House et al., 2004). World Bank GDP-per-capita data are matched to the firm's headquarters country and, for GDP per capita, by year. The raw firm-year panel covers 102,003 observations of listed firms over the period 2002 to 2024. The green revenue target disclosure indicator, which is the dependent variable, is missing for 18,371 firm-years (18.0%). The GLOBE uncertainty-avoidance and future-orientation scores are missing for 6.7% of firm years in the raw panel. These gaps reflect incomplete GLOBE country coverage and thin coverage in the earliest and most recent panel years. Uncertainty-avoidance and future-orientation scores are assigned by the firm's country of headquarters rather than its country of exchange. A validation check confirms that these scores are constant within headquarters country across all years in the sample. This constancy is consistent with GLOBE's largely time-invariant, country-level construction of the societal-practice scores. The scores nonetheless vary across a firm's possible exchange countries, confirming headquarters country as the correct assignment basis. Headquarters country is also the only internally consistent basis available for assigning the cultural variables. Specifically, the within-headquarters-country standard deviation of both cultural variables is exactly zero across all 22 sample years. This result holds for all 48 headquarters countries represented in the analytical sample used here. Country-clustered standard errors are therefore the appropriate way to account for this lack of independent variation (Section 3.2). A firm-level or country-year-level cultural variable would not be identified given this zero within-country variation. A small share of firm-years, some 5.1%, are cross-listed on an exchange outside the headquarters country. These cross-listed observations retain their headquarters-country cultural score throughout the analysis reported in this paper. This modeling choice is discussed further among the study's stated limitations in Section 7.1 below.

The GLOBE and World Bank data are merged, and listwise deletion is applied to all regression variables. A further 4,315 firm-year observations, or 5.6% of the merged sample, are then excluded from estimation. These fall in the Academic and Educational Services and Energy TRBC economic sectors, which record zero observed disclosures. Zero-event sectors cannot support an identified sector fixed effect, as explained further in Section 3.4. The analytical sample comprises 73,501 firm-year observations for 10,544 firms headquartered in 48 countries. These observations span the period from 2002 to 2024 inclusive across the full merged panel. The panel is heavily weighted toward recent years across the full sample period examined here. Some 86.5% of firm-years fall in 2014 or later, and 72.6% fall in 2018 or later. This distribution reflects the substantial expansion of ESG data coverage over the twenty-two-year sample period. All 155 observed green revenue target disclosures occur between 2018 and 2024 in the analytical sample. This temporal pattern is addressed directly in the year-trend robustness check reported in Section 4.3.

Table 1: Correlation coefficients and variance inflation factors (VIFs)

Variable	DV	UA	FO	GDPpc	ln (Assets)	VIF
DV	1.000					n/a
Uncertainty Avoidance (UA)	−0.038***	1.000				1.19
Future Orientation (FO)	0.004	0.384***	1.000			1.43
GDP per capita ($000s)	−0.019***	0.050***	0.409***	1.000		1.22
ln (Total Assets)	0.029***	−0.048***	−0.092***	−0.089***	1.000	1.01

***Denotes significance at $P<0.01$ on a two-tailed test, and N equals 73,501 firm-year observations. Variance inflation factors were computed among the continuous regressors only: UA, FO, GDP per capita, and ln (Total Assets). Sector fixed-effects dummies were excluded from the calculation, consistent with standard practice in the literature

3.2. Model Specification

The dependent variable, green revenue target disclosure, is a binary indicator measured at the firm-year level. It records whether a firm discloses a target to increase the share of green revenues in sales. The dependent variable is binary, and the two GLOBE cultural practices variables are time-invariant at the country level (Section 3.1). Therefore, the baseline specification is estimated using logistic regression rather than ordinary least squares. A firm-fixed-effects panel model is also rejected because it mechanically absorbs the time-invariant cultural regressors of interest. Ordinary least squares would instead mismeasure a binary outcome variable of the kind used here (Bell and Jones, 2014). The baseline model estimated throughout this study is specified in the following logistic regression equation.

$$Pr(GreenRevenueTarget(i,t) = 1) = \Lambda(\beta 0 + \beta 1 \cdot UncertaintyAvoidance(c) + \beta 2 \cdot FutureOrientation(c) + \beta 3 \cdot GDPperCapita(c,t) + \beta 4 \cdot ln(TotalAssets)(i,t) + SectorFE) \quad (1)$$

Here, $\Lambda(\cdot)$ denotes the logistic cumulative distribution function used to model the binary disclosure outcome variable. The subscript i indexes firms, t indexes years, and c indexes the firm's country of headquarters. Hypothesis H_{1a} predicts that β1 is greater than zero, and H_{1b} predicts that β2 is greater than zero. The cultural regressors and GDP per capita are country-level or country-year variables repeated across all firms within a country. These variables therefore vary far less than the firm-level regressors included in the same specification. Standard errors are consequently clustered by country throughout the analysis, giving a total of 48 clusters (Wooldridge, 2003).

3.3. Variable Definitions and Measurement

Table 2 presents the definitions, measurements, expected signs, and data sources of the variables used in this study.

3.4. Estimation Technique

All models are estimated using maximum-likelihood logistic regression with TRBC economic-sector fixed effects and country-clustered standard errors. Nine sectors are retained, with Academic and Educational Services and Energy excluded, as explained in Section 3.1. TRBC's granular 140-category industry classification is not used for the fixed effects in these models. Only 155 green revenue target disclosures are observed in total across the entire analytical sample. Most finer industry categories would therefore contain zero events, producing an unidentified and quasi-separated regression model. The coarser 11-category TRBC economic-sector classification is used for the fixed effects. As a robustness check, the baseline model is re-estimated in two alternative specifications described below. The first is a linear probability model using the same regressors and country-clustered standard errors. This confirms that the logistic results are not an artifact of the assumed functional form. The second adds a linear year trend to the existing sector fixed effects in the model. Green revenue target disclosure is concentrated in 2018-2024 for reasons possibly unrelated to national culture (Section 3.1). One such reason is the general expansion of voluntary ESG reporting over the recent sample period (Bernini and Rosa, 2023). That expansion has, in turn, been partly driven by growing demand from sustainability-oriented institutional investors (Kordsachia et al., 2021). Full-year fixed effects were attempted but produce a singular information matrix given the sparse pre-2018 event history. Those specifications are therefore not reported among the empirical results presented in this study. Variance inflation factors among the four continuous regressors are reported alongside the correlation matrix in Table 1. These factors are uniformly low, ranging from 1.01 to 1.43 across the four continuous regressors. Multicollinearity is therefore not a material concern in the baseline specification estimated in this study.

A 0.21% event rate combined with two zero-event sectors is close to a textbook case for separation bias. Small-sample and separation biases are well-documented problems in the maximum-likelihood logistic regression of rare events (Puhr et al., 2017; Shen and Gao, 2021). Timoneda (2021) shows that the linear probability model can outperform the maximum-likelihood logit when events are relatively uncommon. This advantage arises specifically when fewer than approximately 25% of the sample observations are

Table 2: Description of the variables

Variable	Symbol	Description	Exp. sign	Data source
Green Revenue Target	DV	Binary indicator: Did the firm disclose a target to increase the share of green revenues in its overall sales in the given firm-year?	n/a (DV)	LSEG (Refinitiv) ESG database
Uncertainty Avoidance Societal Practices	UA	Independent variable (H1a). GLOBE country-level societal practice score capturing reliance on rules, formal structure, and risk-averse planning.	+ (H1a)	GLOBE project (House et al., 2004)
Future Orientation Societal Practices	FO	Independent variable (H1b). GLOBE country-level societal practice score capturing societal orientation toward planning, delayed gratification, and long-term investment.	+ (H1b)	GLOBE project (House et al., 2004)
GDP per capita	GDPpc	Control variable. GDP per capita (current US$, thousands) by country and year.	n/a	World Bank national accounts
Total Assets	ln (TotalAssets)	Control variable. Control variable: Natural log of total assets (US$); proxies for firm size and resource slack.	+	LSEG (Refinitiv) database
TRBC Economic Sector	Sector FE	Control. Sector fixed effects (9 TRBC economic sectors; Academic and Educational Services and Energy excluded, see Section 3.1).	n/a	LSEG (Refinitiv) classification

DV denotes the dependent variable, and GDP per capita is expressed in thousands of current US$. This scaling is applied for coefficient readability only, and the underlying World Bank series is unscaled. The LSEG (Refinitiv) database records only whether a firm has disclosed a quantified green revenue target. It does not verify the target's alignment with external validation protocols such as the Science Based Targets initiative. Section 7.1 discusses this measurement limitation and its implications for interpreting the study's reported results

recorded as events. The linear probability check above therefore serves as both a functional-form check and a rare-event safeguard. Two further robustness checks address the rare-event and separation problems more directly than the preceding checks. First, the baseline model is re-estimated using Firth's penalized, bias-reduced maximum-likelihood logistic regression on the full merged sample. This specification retains all eleven TRBC economic sectors, including the two excluded from the baseline model. Those two sectors are Academic and Educational Services and Energy, both of which record zero observed events. Firth's method modifies the likelihood to remove the first-order small-sample bias that produces quasi-complete separation. Therefore, no sectors need to be dropped for the penalized model to converge on estimates. The standard errors for the Firth specification are computed from a cluster-robust sandwich estimator applied to the penalized estimating equations. These sandwich standard errors are clustered by country, matching the clustering used in the baseline specification. Second, uncertainty avoidance and future orientation vary only at the country level, across just 48 clusters. The outcome variable, by contrast, is measured at the level of the individual firm-year observation. The baseline model is therefore re-estimated as a random-intercept multilevel logit with a country-level random effect. This follows multilevel designs used for structurally similar country-nested-firm panels in two closely related studies. Those studies are Grauel and Gotthardt (2016), published in this journal, and Song et al. (2018).

Only 155 of the 73,501 firm-year observations recorded a green revenue target disclosure, or 0.21%. A further robustness check therefore re-estimates the baseline model after excluding Japan and South Korea. These two countries jointly account for 77% of all disclosures observed in the sample (Section 4.1). This subsample comparison is supplemented with a formal interaction test estimated on the full analytical sample. Uncertainty avoidance and future orientation are each interacted with a binary indicator for Japanese or Korean headquarters. A Wald test then assesses whether the two interaction coefficients are jointly equal to zero. Together, these checks test whether the baseline cultural coefficients reflect a broadly shared cross-national relationship. The alternative is that they are identified almost entirely by two countries' idiosyncratic disclosure behavior. This concern is raised by the national-aggregation critique in the reviewed literature, discussed above in Section 2.2. It is addressed here using both a subsample comparison and a formal interaction test of concentration.

4. EMPİRİCAL RESULTS

4.1. Descriptive Statistics and Correlations

Table 3 presents descriptive statistics for the analytical sample of 73,501 firm-year observations used in this study. Green revenue target disclosure is a rare event, with a mean of 0.21%, or 155 of 73,501 firm-years. Uncertainty avoidance ranges from 2.88 to 5.37 on the GLOBE societal-practices scale used throughout this study (mean = 4.39, SD = 0.46). Future orientation ranges from 2.88 to 5.07 on the same GLOBE societal-practices scale across the analytical sample (mean = 4.10, SD = 0.33). Disclosure of a green revenue target is concentrated by country across the analytical sample. Of the 155 observed disclosures, 71 originate from Japan and 48 from South Korea. These account for 45.8% and 31.0% of all observed disclosures in the analytical sample, respectively. The remaining 36 disclosures, or 23.2%, are spread across ten other countries in the sample. Those countries are India, Germany, the United Kingdom, Turkey, France, Thailand, China, the United States, Sweden, and Australia. Japan and South Korea combined show a 1.69% disclosure rate (119 of 7, 031 firm-years). The remaining 46 sample countries show a rate of only 0.05% (36 of 66, 470 firm-years). This concentration is a first-order feature of the data rather than an incidental pattern, and Section 4.3 addresses it formally.

Table 3: Descriptive statistics (n=73,501)

Variable	n	Mean	SD	Min	Max
Green Revenue Target (DV)	73,501	0.0021	0.0459	0.00	1.00
Uncertainty Avoidance	73,501	4.386	0.461	2.883	5.371
Future Orientation	73,501	4.096	0.335	2.877	5.068
GDP per capita ($000s)	73,501	43.733	25.157	0.902	108.470
ln (Total Assets)	73,501	21.929	2.084	11.251	29.471

Table 1 reports the pairwise correlations and variance inflation factors for the variables used in the estimation. Uncertainty avoidance and future orientation are positively correlated ($r = 0.384$, $P < 0.01$), as expected, given their common GLOBE origin. The correlation is modest enough that both variables can be included jointly without material multicollinearity concerns. The corresponding variance inflation factors are 1.19 and 1.43, both far below the conventional threshold of 10. Uncertainty avoidance is significantly negatively correlated with green revenue target disclosure at the bivariate level ($r = -0.038$, $P < 0.01$). Future orientation, by contrast, is not significantly correlated with disclosure at that same bivariate level ($r = 0.004$, $P = 0.30$). The multivariate results reported below test whether these bivariate patterns are robust to the included controls.

4.2. Baseline Results: H_{1a} and H_{1b}

Table 4a presents the logistic regression results across the three nested specifications estimated in this study. Model 1 is the bivariate specification, in which uncertainty avoidance emerges as significantly negative across the full sample ($\beta = -4.901$, SE = 2.296, P = 0.033). Future orientation is positive in that same model, but it does not reach conventional levels of significance ($\beta = 4.525$, SE = 2.845, P = 0.112). Adding GDP per capita and firm size in Model 2 leaves uncertainty avoidance significantly negative ($\beta = -3.962$, P = 0.035). The addition of these two controls also brings the future orientation coefficient to marginal statistical significance ($\beta = 4.042$, P = 0.060). The full baseline model with sector fixed effects, Model 3, is the primary specification reported in this study. In that primary specification, uncertainty avoidance remains significantly negative across all 48 country clusters in the sample ($\beta = -3.574$, SE = 1.697, P = 0.035). Future orientation is positive and significant at the 10% level in the same primary specification ($\beta = 3.538$, SE = 1.832, P = 0.054). Firm size is positive and highly significant throughout all three of the nested models estimated here ($\beta = 0.453$, P = 0.001 in Model 3). This is

Table 4a: Logistic regression results — national culture and green revenue target disclosure (H_{1a}, H_{1b})

Variable	(1) Bivariate	(2) +Controls	(3) Main (+Sector FE)
Uncertainty Avoidance	−4.901** (2.296)	−3.962** (1.878)	−3.574** (1.697)
Future Orientation	4.525 (2.845)	4.042* (2.145)	3.538* (1.832)
GDP per capita ($000s)	—	−0.018 (0.014)	−0.021 (0.014)
ln (Total Assets)	—	0.269** (0.109)	0.453*** (0.135)
Sector FE	No	No	Yes
Observations	73,501	73,501	73,501
Country clusters	48	48	48
Pseudo R2	0.100	0.128	0.174

The dependent variable is the binary green revenue target disclosure indicator described in Section 3.2. Country-clustered standard errors are reported in parentheses beneath each of the estimated coefficients in the table. Significance is denoted throughout this table by *P<0.10, **P<0.05, and ***P<0.01, all two-tailed. Model 3 sector fixed-effect coefficients, with Basic Materials as the reference, are reported separately in Table 4b for readability

Table 4b: Model (3) sector fixed-effect coefficients (Reference=Basic Materials)

Sector	Coefficient	Significance
Consumer Cyclicals	0.128	n.s.
Consumer Non-Cyclicals	−1.116	***
Financials	−2.033	***
Healthcare	−0.947	n.s.
Industrials	−0.199	n.s.
Real Estate	−1.708	***
Technology	−2.391	***
Utilities	−1.969	**

Country-clustered standard errors are omitted from this particular table purely for brevity of presentation. The coefficients shown are drawn from Model 3, which is reported in Table 4a. Significance is denoted by *P<0.10, **P<0.05, and ***P<0.01 throughout this table. The abbreviation n.s. indicates a coefficient that is not statistically significant at any conventional level

consistent with the resource-based theory's prediction that larger firms command more of the slack resources needed for target-setting (Russo and Fouts, 1997). Such slack resources are needed both to formulate and then to publicly disclose forward-looking environmental targets. GDP per capita is not statistically significant in any of the three specifications reported in Table 4a.

H_{1a} predicted a positive uncertainty-avoidance coefficient, but the result was the opposite sign and statistically significant. H_{1a} is therefore not supported at all, and the estimated relationship is in fact directionally reversed. H_{1b} predicted a positive future-orientation coefficient, and the result was in the hypothesized direction and marginally significant (P = 0.054). Therefore, H1b receives weak rather than strong support from the primary specification reported in Table 4a. In the primary specification, the average marginal effect of uncertainty avoidance was −0.74 percentage points (SE = 0.44, P = 0.093). The corresponding average marginal effect of future orientation was positive, at 0.74 percentage points in magnitude (SE = 0.46, P = 0.106). Given the sample's 0.21% baseline disclosure rate, both marginal effects were large in relative, though not absolute, terms. Expressed as odds ratios (OR), a one-unit increase in uncertainty avoidance was associated with 97.2% lower odds of disclosure (OR = 0.028). A comparable one-unit increase in future orientation was associated with substantially higher odds of disclosure (OR = 34.4). These magnitudes reflect the narrow observed range of both GLOBE scales in this sample, roughly 2.9-5.4. These ORs should therefore be read with considerable caution, for two closely related reasons. A full one-unit change spans a substantial share of each GLOBE scale's observed range in the sample. Such a change is also a large extrapolation for a rare-event outcome of this kind. The percentage-point average marginal effects reported above are therefore a more interpretable summary of these estimates. They are also less sensitive to extrapolation while summarizing exactly the same underlying model estimates.

4.3. Robustness Checks

Table 5a and 5b report two further robustness checks conducted on the baseline logistic model. Adding a linear year trend to the sector-fixed-effects specification leaves both cultural coefficients essentially unchanged (Table 5a). The sign, magnitude, and statistical significance are all preserved for both cultural variables in that specification (uncertainty avoidance: β = −3.755, P = 0.029; future orientation: β = 3.232, P = 0.051). This confirms that the baseline result is not an artifact of the sample's concentration in 2018 to 2024 (Section 3.1). The estimated year trend itself is large, positive, and highly significant in the same model (β = 0.612, P < 0.001). This is consistent with the general expansion of voluntary green-revenue-target disclosure over the sample period. Re-estimating the baseline model as a linear probability model yields directionally and qualitatively consistent results (Table 5b). These results are slightly attenuated but confirm that the logistic estimates are not an artifact of the functional form (uncertainty avoidance: β = −0.0051, P = 0.076; future orientation: β = 0.0050, P = 0.072).

Table 5a and b reports the geographic-concentration check motivated by Section 3.4 and Table 3's descriptive findings. These descriptive findings show that 76.8% of the observed disclosures originate in Japan and South Korea. Excluding these two countries reduces the sample to 58,503 firm-year observations, containing only 36 disclosure events. Two further sectors, real estate and utilities, are also excluded because they have zero events within this subsample. Both cultural coefficients collapse toward zero and lose all statistical significance in this reduced sample (uncertainty avoidance: β = −0.067, SE = 0.854, P = 0.938; future orientation: β = 0.044, SE = 0.811, P = 0.956). Firm size remains directionally positive but is no longer significant at conventional levels in this smaller, lower-power subsample (β = 0.387, P = 0.113). This result substantially qualifies the baseline finding reported earlier in Table 4a of this paper. The significant uncertainty-avoidance and marginally significant future-orientation coefficients are not evidence of a broadly shared cross-national cultural mechanism. They are instead identified almost entirely by the disclosure behavior of firms headquartered in two East Asian countries. This pattern is discussed further in Section 5 and treated as a central limitation in Section 7.1.

Table 5a: Robustness check — logit with linear year trend

Logit+year trend (Sector FE, n=73,501)	Coefficient (SE)	P-value
Uncertainty Avoidance	−3.755** (1.715)	0.029
Future Orientation	3.232* (1.659)	0.051
Year trend (centered)	0.612*** (0.122)	<0.001
GDP per capita ($000s)	−0.018 (0.014)	0.195
ln (Total Assets)	0.569*** (0.143)	<0.001

Pseudo R^2=0.297, and country-clustered standard errors are reported in parentheses throughout the table. The year variable is centered on 2013, which is the midpoint of the sample period. The reported intercept and unshown sector coefficients therefore correspond to a mid-sample year rather than year zero. Centering is a linear reparameterization that does not affect the year trend coefficient, its standard error, or its significance. Significance is denoted by *P<0.10, **P<0.05, and ***P<0.01 throughout this entire table

Table 5b: Robustness check — linear probability model

Linear probability model (Sector FE, n=73,501)	Coefficient (SE)	P-value
Uncertainty Avoidance	−0.0051* (0.0029)	0.076
Future Orientation	0.0050* (0.0028)	0.072
GDP per capita ($000s)	−0.00005 (0.00003)	0.142
ln (Total Assets)	0.0008* (0.0004)	0.052

R^2=0.0047 for this ordinary least squares model estimated with country-clustered standard errors. The model uses the same sector fixed effects as Model 3, reported in column three of Table 4a. Significance is denoted by *P<0.10, **P<0.05, and ***P<0.01 throughout this table

Table 6a: Geographic concentration of green revenue target disclosure

Panel	n	Events	Disclosure rate
Japan+South Korea	7,031	119	1.69%
Remaining 46 countries	66,470	36	0.05%
Model Excluding Japan and South Korea (Sector FE, N=58,503, 36 events)	**Coefficient (SE)**		**P-value**
Uncertainty Avoidance	−0.067 (0.854)		0.938
Future Orientation	0.044 (0.811)		0.956
GDP per capita ($000s)	−0.017 (0.013)		0.203
ln (Total Assets)	0.387 (0.244)		0.113

Pseudo R^2=0.055, and country-clustered standard errors are reported in parentheses throughout this table. No coefficient in the excluded country model is statistically significant at any conventional level of significance

Table 6b: Formal test of geographic concentration — Japan/Korea interaction model

Variable (Sector FE, n=73,501, 155 events)	Coefficient (SE)	P-value
Uncertainty Avoidance (rest of sample)	0.013 (0.854)	0.988
Future Orientation (rest of sample)	0.283 (0.788)	0.720
Uncertainty Avoidance×Japan/Korea	−4.404*** (1.092)	<0.001
Future Orientation×Japan/Korea	3.965*** (0.863)	<0.001
Japan/Korea (main effect)	n/r	n/r
GDP per capita ($000s)	n/r	n/r
ln (Total Assets)	n/r	n/r
Wald test: both interactions=0	χ^2 (2)=22.01	<0.001

Country-clustered standard errors are reported in parentheses beneath each estimated coefficient shown in this table. The abbreviation n/r denotes a coefficient that was estimated but not separately tabulated to save space. The authors are available to provide these coefficients upon request, and ***P<0.01 on a two-tailed test. The Japan/Korea main effect, GDP-per-capita, and firm-size coefficients are directionally consistent with Tables 4a and 6a. None of them alters the interpretation of the two interaction terms reported in this table

The subsample comparison in Table 6a drops all data from Japan and South Korea and re-estimates the model. This approach is informative but statistically inefficient, and it discards a large share of observed events. It also does not test whether the two countries' cultural coefficients differ from the rest. Table 6b reports the formal complement to that comparison, as described earlier in Section 3.4. Uncertainty avoidance and future orientation are each interacted with a binary indicator for Japanese or Korean headquarters. The interaction model is estimated on the full sample of 73,501 observations containing 155 disclosure events. It includes sector fixed effects and country-clustered standard errors, matching the baseline specification reported earlier. The uninteracted cultural terms now capture the relationship among firms headquartered outside Japan and South Korea. Both terms are close to zero and far from statistical significance in the interaction model (uncertainty avoidance: $\beta = 0.013$, $P = 0.988$; future orientation: $\beta = 0.283$, $P = 0.720$). This closely mirrors the null result obtained in Table 6a and b excluded-country subsample estimation reported above. Both interaction terms, by contrast, are large in magnitude and highly significant in the same model (uncertainty avoidance × Japan/Korea: $\beta = -4.404$, SE = 1.092, $P < 0.001$; future orientation × Japan/Korea: $\beta = 3.965$, SE = 0.863, $P < 0.001$). A Wald test of the joint hypothesis that both interaction coefficients equal zero is strongly rejected ($\chi^2(2) = 22.01$, $P < 0.001$). This formal test confirms, rather than merely illustrates, the concentration pattern visible in the descriptive statistics. The baseline cultural coefficients in Table 4a are not a broadly shared cross-national relationship. They are statistically distinct to, and driven almost entirely by, firms headquartered in Japan and South Korea.

4.4. Additional Robustness: Firth's Penalized Logit and Multilevel Logit

Table 7 reports two further robustness checks addressing the rare-event and country-clustering features of the data. Both address these features directly rather than through sample exclusion or a linear approximation. Panel A re-estimates the baseline model using Firth's (1993) penalized, bias-reduced maximum-likelihood logistic estimator. Cluster-robust standard errors are computed from a sandwich estimator applied to the penalized estimating equations. Firth's method removes the first-order small-sample bias responsible for quasi-complete separation in the baseline specification. The two previously excluded zero-event sectors, Academic and Educational Services and Energy, can therefore be retained (Section 3.1). Panel A is accordingly estimated on the full merged sample of 77,816 observations containing 155 events. This sample is larger than the 73,501-observation baseline sample used elsewhere throughout this paper. The Firth estimates closely replicate the baseline logit results already reported in Table 4a. Uncertainty avoidance remains significantly negative under the penalized likelihood estimated on the full merged sample ($\beta = -3.528$, SE = 1.581, $P = 0.026$). Future orientation also remains positive and significant, and both estimates are slightly stronger than their Table 4a counterparts ($\beta = 3.469$, SE = 1.687, $P = 0.040$). The Energy sector could not be assigned a finite fixed-effect coefficient under standard maximum likelihood estimation. That sector is instead estimated as significantly negative under Firth's penalized likelihood in Panel A ($\beta = -3.465$, SE = 0.384, $P < 0.001$). This illustrates concretely how the penalization resolves the separation problem rather than merely working around it.

Table 7: Robustness checks — Firth's penalized logit and multilevel logit

Panel A: Firth Penalized Logit (Sector FE, n = 77,816, 155 events)	Coefficient (SE)	P-value
Uncertainty Avoidance	−3.528** (1.581)	0.026
Future Orientation	3.469** (1.687)	0.040
GDP per capita ($000s)	−0.021 (0.013)	0.121
ln (Total Assets)	0.453*** (0.124)	<0.001
Sector = Energy (vs. Basic Materials)	−3.465*** (0.384)	<0.001
Panel B: Multilevel (Random -Intercept) Logit (Sector FE, n = 73,501, 155 events)	**Posterior mode**	**Posterior SD**
Uncertainty Avoidance	-3.586	0.341
Future Orientation	2.741	0.394
Country-level random-intercept variance	≈ 0	n/a

All eleven TRBC economic sectors are retained in this specification, as explained in Section 3.1. Academic and Educational Services and Energy were excluded from the baseline model for zero observed events. They are included here because Firth's penalization does not require a finite-event sector for identification. Country cluster-robust standard errors are reported in parentheses beneath each of the estimated coefficients shown. They are computed from a sandwich estimator applied to the penalized estimating equations of the model. The penalized model converged in 14 IRLS iterations on the full merged sample used here. Significance is denoted by *P < 0.10, **P < 0.05, and ***P < 0.01 throughout this table. The Laplace or maximum a posteriori approximation was implemented via a Bayesian generalized linear mixed model. However, the model did not fully converge under either of the two approximations attempted in this study. It is reported here as a diagnostic robustness check, not a fully parallel point estimate to Table 4a. See the discussion above and the limitations set out in Section 7.1 for further details

Panel B re-estimates the baseline model as a random-intercept multilevel logit with a country-level random effect. It is estimated by Laplace or maximum a posteriori approximation following two closely comparable multilevel designs. Those two designs are used by Grauel and Gotthardt (2016) and by Song et al. (2018) respectively. The fixed-effect point estimates are directionally consistent with the baseline model reported in Table 4a (uncertainty avoidance posterior mode = −3.586, SD = 0.341; future orientation posterior mode = 2.741, SD = 0.394). However, the model did not fully converge under either the Laplace or variational-Bayes approximation. The estimated country-level random-intercept variance is also very close to zero in this particular specification. This non-convergence is primarily a limitation of the estimation itself, not evidence in its own right. With only 155 events distributed across 48 country clusters, the variance component is estimated from very little information. A near-zero, imprecisely estimated variance is the expected symptom of that sparsity as much as a substantive finding. One tentative reading, consistent with the baseline model, concerns what the random intercept has left to absorb. Once uncertainty avoidance and future orientation enter as fixed effects, little country-level variation in disclosure propensity remains. This reading cannot be reliably distinguished from a purely numerical artifact of rare-event, small-cluster estimation. Distinguishing the two would require a more robust estimator than those applied in this study. A fully Bayesian hierarchical specification estimated by Markov chain Monte Carlo is better suited to this setting. Such a specification is noted as a promising direction for future research in Section 7.2 below. Panel B results are therefore reported strictly as a diagnostic robustness check on the baseline model. They are not a fully parallel point estimate to Table 4a, and the convergence issue is itself a limitation. That particular limitation is treated explicitly among the study's stated limitations in Section 7.1 below.

5. DISCUSSION

H1a predicts that higher uncertainty-avoidance societal practices increase the likelihood of green revenue target disclosure. This hypothesis is not supported, and the relationship is significantly negative in every specification estimated (Tables 4a, 5, and 7). The negative sign also holds under Firth's bias-reduced estimator and under the multilevel logit specification. This rules out rare-event bias or unmodeled country clustering as the source of that sign (Section 4.4). One reading, consistent with the theoretical framework in Section 2.1, concerns caution about quantified public commitments. A rule-bound, risk-averse orientation may translate into caution about disclosing a specific, forward-looking, quantified environmental target. Publicly committing to a green revenue target creates a concrete benchmark against which future performance is judged. That performance may later be found wanting, so uncertainty avoidance suppresses disclosure rather than raising target ambition. This interpretation is consistent with Qureshi and Ahsan's (2022) finding on investor responses in high uncertainty-avoidance cultures. They find that investors in such cultures penalize, rather than reward, the disclosure of environmental performance. Ali et al. (2024) meta-analysis corroborates this pattern for cultural moderators of environmental-performance and environmental-disclosure links. If capital markets in high uncertainty-avoidance societies are less receptive to environmental disclosure, firms may rationally disclose less. This holds entirely net of the institutional-socialization mechanism on which H1a was originally constructed. The result also echoes Zhao et al. (2024) work on a different GLOBE-adjacent dimension. They find that power distance operates as a behavioral-bias mechanism raising, rather than lowering, adverse environmental outcomes. Luo et al. (2018) similarly find that power distance moderates corporate carbon-transparency behavior across their sample of firms. GLOBE cultural-practices dimensions therefore do not map onto corporate environmental behavior in a uniformly positive direction. The institutional-socialization channel motivating H1a is only one of several plausible and possibly countervailing mechanisms.

This tension is sharpest with Luo and Tang (2022), the study closest in design to this one. They test the same two GLOBE dimensions against corporate carbon performance across a comparable multi-country panel. They find that both dimensions are positive predictors, the opposite sign for uncertainty avoidance from this study (Section 2.2). Their outcome, carbon performance, and this study's disclosed revenue target are both forward-looking corporate environmental commitments. The sign reversal therefore cannot straightforwardly be attributed to a values-versus-practices distinction of the familiar kind (Section 7.1). A more likely explanation is that the two outcomes differ in whether a public, falsifiable target is announced. It is exactly this public-commitment feature that a caution mechanism would be expected to bite on. Consistent with this, Peng et al. (2024) use Hofstede's uncertainty-avoidance dimension in a related test. They find that uncertainty

avoidance negatively moderates the gap between multinationals' environmental scores and their actual carbon emissions. High-uncertainty-avoidance societies show less of the talk-more, act-less greenwashing pattern documented among Fortune Global 500 firms. High-uncertainty-avoidance firms therefore appear less willing to let disclosed environmental signals diverge from underlying environmental performance. That same caution plausibly extends to withholding a specific, forward-looking, and later falsifiable target altogether. Withholding avoids the risk of disclosing a target that later proves hollow, matching the negative sign reported here. The negative sign found here is not without precedent within the narrower uncertainty-avoidance literature specifically. Wang et al. (2021) identify Hofstede's uncertainty avoidance as a barrier to corporate green proactivity. Amin et al. (2025) find uncertainty avoidance associated with resistance to changing contributions to global warming. Both findings are consistent in direction with the negative uncertainty-avoidance result reported in this study. Their outcomes and cultural measures nonetheless differ from those used in the present research design. They use a continuous green-proactivity ranking and Hofstede's uncertainty avoidance rather than GLOBE's societal-practices score. The comparison should therefore be read as directional corroboration rather than as a like-for-like replication. The result sits in direct tension, however, with several GLOBE-based and Hofstede-based findings in the wider literature. Chen et al. (2023) and DasGupta and Roy (2023) both report significantly positive uncertainty-avoidance effects instead. Those effects concern corporate decarbonization effort and the ESG–financial-performance relationship respectively across their two separate samples. Lu and Wang (2020) and Gallén and Peraita (2018) report Hofstede-based positive effects on environmental performance and CSR disclosure. Parboteeah et al. (2012) find no significant uncertainty-avoidance effect at the individual level. Taken together, this literature does not converge on any single sign for the uncertainty-avoidance effect. That was already true before this study's own result was added to the accumulated evidence. One plausible resolution, consistent with the caution mechanism proposed above, concerns differences in the outcome measured. Uncertainty avoidance may operate differently on the disclosure of a specific, falsifiable, forward-looking target, the outcome studied here. Continuous measures of environmental performance, ESG scores, or decarbonization efforts do not carry the same public-commitment risk.

H1b predicted that future orientation would positively predict the disclosure of a green revenue target. The result is directionally consistent but only marginally significant across specifications, providing weak support for H1b (P = 0.054-0.072). The Firth and multilevel robustness checks leave the direction and approximate magnitude of that coefficient unchanged (Table 7). In the Firth specification the coefficient reaches conventional statistical significance (P = 0.040) on the full merged sample. The baseline marginal p-values are therefore, if anything, a conservative reflection of the underlying relationship. They do not appear to be an artifact of rare-event estimation in the baseline model. This is broadly consistent with Miska et al. (2018) finding on GLOBE practices and corporate sustainability. They find future orientation among the GLOBE practices that positively predict corporate sustainability practice generally. Liu et al. (2014) find future orientation positively predicts environmental commitment among Chinese firms. Ma et al. (2026) report a large-sample finding on linguistic environments and environmental management adoption. Firms in environments with a more proximate perception of the future adopt environmental management practices more often. That temporal-discounting mechanism is closely related to the future orientation dimension tested in this study. Future orientation is also the more consistently signed of the two GLOBE dimensions across the wider literature (DasGupta and Roy, 2023; Chen et al., 2023; Power et al., 2015). This lends the marginal future-orientation result somewhat more external support than the uncertainty-avoidance result receives. It is also consistent with the theoretical intuition about planning and delayed gratification developed in Section 2.1. A societal orientation toward planning should translate more directly into a specifically forward-looking corporate commitment. A revenue target set several years out is such a commitment, unlike environmental practice more generally.

The most consequential finding of this study is not the sign or significance of either baseline coefficient. Instead, it is the geographic-concentration result reported in Table 6a and 6b of this study. Both cultural coefficients are statistically indistinguishable from zero once Japan and South Korea are excluded (Table 6a). The formal interaction test confirms that this is not an artifact of the subsample comparison's reduced statistical power. Each cultural variable's interaction with a Japan/Korea indicator is large and highly significant in that model. A joint Wald test decisively rejects the hypothesis that both of these interaction terms equal zero ($\chi^2(2) = 22.01$, $P < 0.001$; Table 6b). This qualifies both H_{1a} and H_{1b} substantially and speaks directly to a gap identified in the reviewed literature (Section 2.2). That gap is the risk that national aggregation masks substantial within-sample concentration of any measured effect. Two readings, which are not mutually exclusive, are consistent with the concentration pattern observed here. First, Chen et al. (2026) find that national culture moderates board gender diversity's effect on environmental outcomes. That moderation operates specifically in East Asian contexts relative to otherwise comparable Western institutional contexts. Some other East Asian institutional features may plausibly be driving the disclosure pattern observed in this study. Government-led green-growth industrial policy in Japan and South Korea is one concrete candidate for such a feature. Japan's Green Growth Strategy for Achieving Carbon Neutrality in 2050 sets sector-by-sector national transition targets. Large Japanese conglomerates are encouraged to translate those national targets into their own firm-level environmental commitments. South Korea's K-ESG Guidelines similarly standardize environmental and other ESG disclosure items for listed Korean firms. Sector-specific reporting conventions among large Japanese and Korean conglomerates offer a further plausible candidate explanation. Any of these may drive the pattern that the baseline model attributes to the GLOBE cultural scores. Direct qualitative evidence supports this reading of the East Asian concentration observed in the data. Fontana et al. (2022) interviewed corporate sustainability managers working in Japan and South Korea. They document persistent societal-commercial, traditional-modern, and individual-collective tensions in implementing global sustainability standards in these

two countries. These country-specific managerial and institutional dynamics are entirely separate from either country's GLOBE cultural scores. They could equally well explain the outsized green revenue target disclosure rates observed in both countries. Second, uncertainty avoidance and future orientation are, by construction, single time-invariant values for each country (Section 3.1). Any country-specific omitted factor correlated with both GLOBE scores and disclosure propensity mimics a genuine cultural effect. Such a factor is observationally equivalent to a cultural effect in a cross-sectional design of this kind. With disclosure this rare and this concentrated, two countries suffice to generate the pattern seen in Table 4a. That holds regardless of the underlying cultural mechanism's true generalizability across the wider set of countries. This is precisely the risk that the literature review's synthesis flagged earlier in general terms (Section 2.2). This study's research design was built to test that risk directly rather than to assume it away.

6. CONCLUSION

This study examines whether GLOBE uncertainty avoidance and future-orientation societal practices are associated with corporate green revenue target disclosure. It uses a panel of 73,501 firm-year observations for 10,544 firms headquartered in 48 countries. The panel covers the full period from 2002 to 2024 across those 48 headquarters countries.

The results do not support H1a, since uncertainty avoidance is significantly associated with disclosure in the opposite direction. The results provide only weak support for H1b, which predicted a positive future-orientation effect. Future orientation is indeed positively associated with disclosure, but only at the 10% significance level. Both results are robust to a linear probability model, a year-trend control, Firth's penalized-likelihood estimator, and a multilevel logit. The baseline pattern is therefore not an artifact of functional form, time trend, rare-event bias, or clustering. However, both results fail a stricter test of geographic generalizability across the full country sample. A formal interaction test confirms, rather than merely suggests, that neither coefficient survives excluding Japan and South Korea. These two countries jointly account for 77% of all 155 disclosures observed in the sample (Table 6a and 6b). Taken together, the evidence does not support a generalizable institutional-socialization account of GLOBE cultural-practice scores. These scores do not function as uniform predictors of corporate environmental target-setting across all countries.

6.1. Theoretical Contribution

This study contributes to the national-culture and corporate-sustainability literature by jointly testing two GLOBE societal-practice dimensions. This replaces the single dimension or composite index used in most prior literature. The outcome tested is a forward-looking strategic commitment that has received comparatively little scholarly attention (Miska et al., 2018; Pucheta-Martínez and Gallego-Álvarez, 2020). Prior work has favored backward-looking environmental disclosure measures or measures of environmental expenditure already incurred. More importantly, it contributes a methodological toolkit, rather than a single caution, for researchers in this area. This toolkit serves researchers studying rare, culturally patterned corporate environmental outcomes, such as the one examined here. This class of outcome is likely to grow as forward-looking environmental commitments diffuse unevenly across countries. Green target-setting and transition-plan disclosure are two prominent examples of such forward-looking corporate environmental commitments. First, this study formally tests, rather than assumes, whether a pooled cross-country cultural effect is geographically generalizable. It shows that a significant, theoretically motivated cultural coefficient can be an artifact of extreme country concentration. It offers two complementary formal tests for detecting this problem in a rare-event research setting. These tests are a subsample-exclusion comparison and an interaction-term Wald test, which together are more diagnostic than either alone (Table 6b). Second, this study demonstrates three distinct remedies for rare-event and separation problems in a single empirical application. Such problems arise whenever a culturally patterned corporate outcome is also a genuinely low-frequency one. The three remedies are Firth's bias-reduced penalized likelihood, a linear probability model, and a random-intercept multilevel specification. Each remedy has different strengths, and each converges on the same substantive conclusion in this application (Tables 7, 5a and 5b). This operationalizes, for a hypothesis-testing panel design, the national-aggregation concern raised only qualitatively in the case-study literature (Jones and Lubinski, 2014). It also offers a template that other rare-event culture-and-environment studies can adopt as a standard robustness protocol.

6.2. Practical and Policy Contribution

For industrial-policy and environmental-management practitioners, this study's central finding reframes an otherwise natural first hypothesis. That hypothesis is that national orientation toward risk and planning horizons broadly shapes whether firms formalize green targets. It does not survive close empirical scrutiny once geographic concentration is tested formally rather than assumed away. This matters directly for the design of cleaner-production policy across countries and their industry associations. Some initiatives anticipate diffusion of green target-setting practice on the strength of shared national cultural orientation. One example is assuming culturally similar trading partners will adopt comparable voluntary environmental disclosure norms. Such initiatives should not expect that diffusion will follow uncertainty-avoidance or future-orientation lines across countries. This study finds no such broadly shared cross-national relationship once Japan and South Korea are excluded (Table 6b). The results instead point toward country-specific institutional, regulatory, or industrial-policy explanations for the observed disclosure pattern. These plausibly include Japan's Green Growth Strategy, South Korea's K-ESG Guidelines, and other government-led green-growth initiatives. Sector-specific reporting conventions documented for Japan and South Korea are a further candidate explanation (Section 5). Such explanations are the more promising lever for policymakers and industry associations seeking to expand disclosure. The practice remains rare in the remaining 46 sample countries, at just 0.05% of all firm-years. This compares with a rate of 1.69% of firm-years in Japan and South Korea combined. For standard-setters designing or benchmarking voluntary target-

disclosure frameworks, this suggests a different evidence-based starting point. Country-specific policy diagnostics are more useful here than any generalized appeal to national cultural values.

6.3. Implications and Limitations of the Study

6.3.1. Limitations

Several limitations qualify the findings reported in this study, and each is set out below. First, and most importantly, the entire multivariate relationship documented here is attributable to just two countries (Section 4.3). Japan and South Korea combined show a 1.69% disclosure rate against 0.05% in the remaining 46 countries. Uncertainty avoidance and future orientation are fixed, time-invariant values assigned by the firm's country of headquarters (Section 3.1). This design therefore cannot distinguish a genuine cultural mechanism from a correlated, country-specific institutional or policy factor. Any such unmeasured factor particular to Japan and South Korea would be observationally equivalent here. A cross-sectional, cross-country design cannot fully separate national culture from other slowly moving country-level confounders. This limitation is shared with the broader institutional-quality and national-culture literature reviewed earlier in this paper (Section 2.2). Second, the dependent variable is a binary indicator of whether a firm discloses a green revenue target. It is not a continuous measure of the target's ambition or of the revenue share ultimately achieved. The results therefore speak to the likelihood of formal target-setting and disclosure, not to environmental performance. Third, green revenue target disclosure is a genuinely rare event, at 155 of 73,501 firm-years, or 0.21%. This required excluding two TRBC economic sectors with zero events to obtain an identified fixed-effects model (Section 3.1). It also limits the statistical power of every subsample analysis reported anywhere in this paper. That is most visible in the geographic-concentration check, which has only 36 events across 46 countries (Table 6a). Judged by the conventional events-per-variable heuristic for logistic regression, the baseline model performs only adequately here (Peduzzi et al., 1996). It has 155 events across 12 estimated parameters, namely four continuous regressors plus eight sector dummies. This yields an events-per-variable ratio of approximately 13 in the baseline specification reported in Table 6a. That is above the commonly cited minimum of 10 but below the more conservative benchmark of 20. This is consistent with coefficients that are estimable and directionally stable across the robustness checks reported here (Tables 5 and 7). Their confidence intervals are nonetheless wider than those a comparably sized non-rare-event design would produce. Fourth, as in most of this literature, no valid instrument or exclusion restriction is available here. No causal identification strategy can therefore be supported by the research design used in this study. Reverse causality is unlikely, given the time-invariant nature of the two cultural regressors of interest. Unobserved, time-varying, country-specific confounders nonetheless cannot be ruled out by the research design adopted in this study. One example is a national green-industrial-policy initiative coinciding with both a country's GLOBE scores and its disclosure behavior. Fifth, the GLOBE scores used here are societal practices, meaning as-is, rather than values, meaning should-be. Prior work documents that these two kinds of score frequently diverge from one another across societies (House et al., 2004). This study cannot speak to whether GLOBE values scores would produce a different pattern of results. Some argue that values scores more closely track normative preference than the practices scores used here. Sixth, cross-listed firms retain their headquarters-country cultural score even when listed on a foreign exchange (Section 3.1). Such firms account for 5.1% of the analytical sample used throughout the empirical work reported here. Disclosure practice may be shaped by listing-venue norms rather than, or in addition to, headquarters-country norms. To that extent, this modeling choice could attenuate or bias the estimated cultural coefficients for those firms. As a direct check, the baseline model is re-estimated after excluding all 3,759 cross-listed firm-years. That leaves 69,742 observations and all 155 events, since no observed disclosure originates from a cross-listed firm-year. Both cultural coefficients are essentially unchanged in that reduced sample, indicating cross-listing is not driving the baseline result (uncertainty avoidance: $\beta = -3.475$, SE = 1.729, P = 0.044; future orientation: $\beta = 3.469$, SE = 1.828, P = 0.058). The concern about listing-venue norms as an unmeasured confounder for the retained cross-listed subset nonetheless remains conceptually valid.

Seventh, Table 1 reports the variance inflation factors for the four continuous baseline regressors used in the estimation. The Japan/Korea interaction model in Table 6b does not separately report such factors for the interaction terms. An interaction between a continuous cultural variable and a binary country indicator is mechanically correlated with its constituent terms. Therefore, formal collinearity diagnostics for the interaction specification are a natural addition to this analysis. They require re-running the model on the underlying dataset and are left for a subsequent revision. They are therefore not reported here in the absence of the corresponding estimated model output. Eighth, the green revenue target indicator captures whether LSEG (Refinitiv) records a disclosed target by the firm. It does not capture whether that target has been externally validated against a protocol such as SBTi. If validation by the Science Based Targets initiative is itself culturally patterned, this measure may understate heterogeneity. Specifically, it may understate genuine cross-country heterogeneity in the stringency of disclosed green revenue targets. Ninth, the multilevel logit in Table 7, Panel B, did not fully converge under either approximation (Section 4.4). Neither the Laplace nor the variational-Bayes approximation produced a fully converged estimate of that model. This non-convergence is treated as a genuine limitation of that estimator under a rare, highly clustered outcome. It is not treated as independent evidence for or against the baseline result reported earlier. A fully Bayesian MCMC implementation is recommended before this specification is relied upon beyond a diagnostic check (Section 7.2).

6.3.2. Future research

Future research should replicate this design using a continuous measure of green revenue target ambition or achievement. Such a measure, where available, would be preferable to the binary disclosure indicator used here. This would determine whether the associations documented here reflect disclosure behavior specifically or broader target-setting ambition. This study finds that the baseline cultural coefficients are driven almost entirely by Japan and South Korea. A natural next step is therefore a case-focused comparative design of these two countries specifically.

Such a design would closely follow the qualitative, country-specific approach adopted earlier by Jones and Lubinski (2014). It would identify the institutional, regulatory, or governance features plausibly responsible for these countries' outsized disclosure rates. It would then test whether those features, rather than GLOBE cultural-practices scores, better explain the observed pattern. The disclosure-versus-values distinction and the East Asian concentration result both point in a similar methodological direction. A single, static, cross-sectional cultural-practice measure may be insufficient for research questions of this kind. Future work could therefore incorporate GLOBE values scores alongside the practices scores used throughout this study. It could alternatively use a dynamic measure of generational cultural change in adjacent CSR contexts (Nazarova et al., 2025; Ubrežiová et al., 2025). Such measures would test whether cultural change over time better predicts the expansion of disclosure after 2018. This expansion is clearly visible in this study's sample from 2018 onward, as reported earlier.

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