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Macro Uncertainty Impacts on ESG Performance and Carbon Emission Reduction Targets

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Abstract: This study examines the impact of three macro uncertainty factors: economic policy uncertainty (EPU), political instability (PIS), and cultural uncertainty avoidance (UA), on corporate environmental, social and governance (ESG) performance and carbon emission reduction targets. Additionally, we examine whether these macro factors are affected by the profitability of the company. Using an unbalanced sample of companies located in the USA, China, and the UK during the period 2013–2020, results show that during times of economic uncertainty, companies are more likely to engage in ESG activities, including establishing emission reduction targets. Companies in countries with lower levels of political stability (PS) exhibit greater levels of social and environmental engagements, and companies operating in societies that tolerate risks, including the risk associated with climate change, are more likely to have better ESG performance and be committed to emission reduction targets. The results also suggest that profitable companies are more likely to deal with uncertain environments successfully, as they have the required resources to invest in ESG. The study suggests several practical implications for managers and policymakers.

Keywords: economic policy uncertainty; political stability; uncertainty avoidance; ESG performance; carbon emission

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1. Introduction

Environmental, social, and governance (ESG) practices represent the main pillars of sustainability, and they have drawn great attention from policymakers, governments, the general public, and academics since the adoption of the UN Sustainable Development Goals (SDGs) [1–5]. Corporate implementation of ESG practices differs among companies operating in different countries, despite the universal necessity for all companies to contribute toward attaining the SDGs [6,7]. National uncertainty in macroeconomic and general national conditions (e.g., socio-cultural, political, and environmental contexts) can affect ESG performance and the efforts to reduce carbon emissions of companies operating in particular countries.

Economic policy refers to government activities designed to facilitate economic growth [8]. During times of uncertainty concerning economic policies, companies may be more inclined to be involved in ESG practices, to alleviate risks arising from volatile economic conditions [7,9]. Moreover, companies' ESG actions and carbon decisions are shaped by the political environment of a country. Political stability is generally associated with the principles of the SDGs, and with their achievement [10,11]. In contexts with relatively less political stability, companies may be more inclined to push forward with various social and environmental initiatives to substitute for such a lack of political stability [12], as described in detail in the following section. The national culture in which a company operates has also been proven to influence corporate behavior and strategic plans and actions [5,13]. Members of a society that have no tolerance toward uncertainty and unknown situations are likely to be resistant to investing in long-term innovative strategies that combat climate

change risks, which may seem safer in the short to medium term, but which can render them more vulnerable to long-term threats [14,15].

The purpose of this study is to understand whether corporate ESG performance and carbon emission reduction targets (CERTs) are influenced by the unexplored macro uncertainty factors (MUFs) associated with economic and political uncertainties, and prevailing national cultural features. We specifically examine three uncertainty factors, i.e., economic policy uncertainty (EPU), political instability (PIS), and cultural uncertainty avoidance (UA). Prior research mostly focuses on the impact of national culture and other country-level factors on firm-level corporate social responsibility (CSR) disclosure. However, engagement in CSR reporting could confer merely symbolic legitimacy and reflect a level of managerial opportunism rather than actual ESG performance (e.g., disingenuously "greenwashing" by presenting environmentally responsible branding while doing little or nothing to make meaningful progress toward environmental SDGs, such as CERTs) [4,16–18]. Moreover, the prior literature argues and shows that country-level drivers of ESG performance can be different from those of ESG disclosures [4,19], and they need to be examined separately. Therefore, evidence from the prior literature is insufficient to explain the impact of country-level factors on ESG performance.

This study analyzes companies located in the USA, the UK, and China, covering the period 2013–2020. The USA and the UK are at a relatively advanced stage of development in ESG practices [20,21], and the USA and China are the pre-eminent global economies. Furthermore, China is a developing economy with a stronger emphasis on economic growth, per se, and has a massive manufacturing sector responsible for a major proportion of global CO_2 emissions, but it is working toward achieving a sustainable economy and is making tentative progress toward increased sustainability [22,23]. This study makes several contributions to the existing literature.

First, to the best of our knowledge, this is the first study to investigate the impact of national MUFs (i.e., EPU, PIS, and UA) on ESG performance. Therefore, we extend the limited body of literature that investigates the association between country-level factors and ESG performance [4,14,15] but has not looked into the effect of these MUFs combined.

Second, we investigate how those MUFs affect corporate efforts to reduce carbon emissions and commitments to achieve carbon neutrality by a target year. The existing literature has generally focused on examining the main pillars of ESG while ignoring the subdimension of each pillar. It is imperative to examine a single subdimension of environmental performance; such specific examinations are still lacking in extant empirical research.

Third, we contribute to existing research evidence by showing that country-level MUFs have positive impacts on ESG performance and CERTs, suggesting that companies are more encouraged to engage in social and environmental activities amidst uncertain environments to protect their image and reputation. We also show that the association between MUFs and ESG performance and a carbon reduction target is moderated by the profitability of the firm through our additional analysis. This finding indicates that companies' responses to the MUFs of a country are dependent on their financial performance. Profitable companies are more likely to use ESG practices as an insurance-like utility when operating in an uncertain environment because they can acquire the necessary resources more efficiently compared to companies that perform poorly financially.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature and develops the research hypotheses. Section 3 sets out the research methodology. Section 4 reports and discusses the empirical results, and Section 5 draws conclusions and suggests implications and future research opportunities.

2. Literature Review and Hypotheses Developments

This section reviews the extant literature analyzing the association between the MUFs used in this study (i.e., EPU, PIS, and UA), ESG performance, and CERTs.

2.1. Economic Policy Uncertainty (EPU)

Previous studies have extensively investigated the effect of economic uncertainty on corporate policies [8,9,24–27]. In terms of social and environmental engagements, the majority of existing studies examine the indirect effect of economic uncertainty on social, environmental and governance practices [28–30]. Studies that examine the direct association are limited; one recent study investigated the direct effect of economic policy uncertainties on ESG practices, and documented that firms increase their ESG performance during periods of high economic uncertainty [7]. It has been suggested that this is attributable to firms being more likely to be involved in ESG activities to alleviate risk-taking during times of economic uncertainty [7,9]. Companies have an urgent need to build trust with stakeholders during financial crises and economic downturns or turbulence through ESG engagements [31]. Moreover, the cost of debt is higher during periods of high uncertainties [32,33], and ESG engagements help to reduce this cost [7]. Furthermore, investing in ESG initiatives serves as an insurance when economic uncertainty is high, thus companies tend to invest in social and environmental schemes to shield against challenges during economic uncertainties [28,34].

A stream of economic literature examined the impact of EPU on carbon emissions at the national level [35–38]. For example, Wang et al. examined the effect of EPU on the level of CO_2 emissions in the US during the period 1960–2016 and found that EPU is positively associated with emissions in the long run [39]. Similarly, Adedoyin and Zakari investigated the same association for the UK during the period 1985–2017 and showed that the volume of CO_2 emissions decreases during short bouts of economic uncertainty, but conversely rises during prolonged periods of economic uncertainty [35]. Yu et al. investigated the impacts of EPU on carbon emission intensity at the firm level in China using a large sample of Chinese manufacturing firms during the period 2008 to 2011 and found that companies tend to respond to economic uncertainties by resorting to cheap energy sourced from fossil fuels (i.e., from coal, oil, and gas power stations) in their operations, with reduced exploration and use of renewable energy sources [40]. This may be related to the relatively more energy-intensive nature of manufacturing activities, whereby energy comprises a major fundamental production cost.

These findings suggest that companies are more likely to work toward sustainable development and set CERTs during periods of economic uncertainties, since energy spending and the associated carbon emissions are closely related to firms' decisions. Given the foregoing discussion, we thus developed the first hypothesis:

Hypothesis 1. *Companies are more likely to be associated with better environmental (including CERTs), social, and governance performance during periods of economic uncertainty.*

2.2. Political Instability (PIS)

The stability of a country's political system can form a stable context in which various practices and reforms related to sustainability can be adopted [41]. Companies operating in politically stable environments can have better access to resources [42]. Political stability (PS) can drive engagement in corporate sustainability and adherence to SDGs [43]. Politically unstable environments are likely to be associated with corporate engagement in corrupt practices [44]. Companies can be perceived as lacking legitimacy when they operate in countries that have an unstable political system [45]. As a result, firms tend to be more concerned about their social reputation and legitimacy amid uncertain political environments [4]. Corporate engagements in ESG practices can be used as a tool to signal legitimate attributes to stakeholders [46,47], and can imply credibility and good reputation [4,42,48].

De Oliveira conducted a study on Latin America, a region that is characterized by unstable political systems, and showed that corporate social and environmental engagements can substitute for the lack of a stable political environment in terms of CSR image and branding [12]. Similarly, in Nigeria, Amaeshi et al. showed that CSR activities can

offset the impact of political unrest and corruption [49]. Therefore, companies operating in politically unstable environments are more likely to be involved in ESG initiatives to gain public image and achieve legitimacy. Given the foregoing discussion, we thus developed the second hypothesis:

Hypothesis 2. *Companies operating in politically unstable environments are more likely to be associated with better environmental (including CERTs), social, and governance performance.*

2.3. Uncertainty Avoidance (UA)

Hofstede's cultural dimension of UA refers to the prevailing ethos of tolerance to uncertainty and ambiguity in a national cultural paradigm [50]. It assesses the extent to which people observe uncertainty as risky and disturbing where there is an urgent need to deal with it by taking planned actions [15,51]. Societies characterized by strong UA are more risk-averse, which is reflected in less responsiveness to changes in market conditions or investment in emerging technologies [52]. Companies operating in such societies tend to be resistant to corporate decisions around carbon reduction activities and green investments, because of inherent uncertainty [14,53]. They also tend to resist social and technological changes and adopt careful and moderate measures with lower levels of uncertainty [50]. In contrast, people in societies low in UA tend to accept more risky scenarios and are less anxious about unpredictable situations [54].

Investments in clean energy and carbon reduction initiatives are long-term activities and are regarded as uncertain investments, which contradict the conservative willingness to avoid uncertainty [15]. Luo and Tang argue that managers' involvement in carbon reduction activities is likely to be associated with the susceptibility of members of the society to risks and uncertainty arising from climate change itself; consequently, while sustainability investment can be regarded as a high-risk activity in corporate contexts that prioritize short-term profitability, it may be regarded as more risky *not* to invest in such activities among those who perceive environmental degradation and climate change to be emergency situations [14]. In this context, people in high-UA societies may support new rules, policies, and corporate actions that are predictable and controllable when commensurate with high resistance to situations of underlying uncertainty, such as climate change and the impetus for sustainability [13,51]. On the other hand, societies that are low in UA are more likely to take on carbon projects and investing in green technologies prima facie [15]. Given the foregoing discussion, we thus developed the third hypothesis:

Hypothesis 3. *Companies operating in low-UA societies are more likely to be associated with better environmental (including CERTs), social, and governance performance.*

3. Materials and Methods

3.1. Sample Selection

The Refinitiv Eikon database was used to obtain a sample of firms based in the USA, China, and the UK. These three major economies have a significant impact on the global economy and the environment and represent a significant proportion of the world population [55]. Our unbalanced sample comprises 15,972 firm-year observations from the USA; 2614 firm-year observations from China; and 2978 observations from the UK. The observations cover the period 2013–2020, which allows for the examination of the impact of MUFs in normative socio-economic conditions over the recent eight years prior to the exceptional economic circumstances associated with COVID-19 (from Q1 2020 onwards). The sample was purposively chosen from 11 different industries, spanning technology, telecommunication, healthcare, financial services, real estate, consumer discretionary, consumer staples, industrials, basic materials, energy, and utilities.

3.2. Variables

The studied variables are presented in Table 1 with their full definitions and are explained below. Dependent variables are ESG performance (ESG) and CERT (Emission_*target*). ESG performance is measured using ESG scores collected from the Refinitiv Eikon database, which ranks companies according to three pillars: social, environmental, and governance indicators. Refinitiv Eikon's ESG scores provide an objective and reliable measure of a firm's ESG performance [4] and have been extensively used in previous studies as a proxy of ESG performance [3,4,43,56]. CERT is also collected from the Refinitiv Eikon database and is measured using an indicator variable that takes a value of 1 if a firm sets a target year for emission reduction, and 0 otherwise. CERT is considered to be one of the key indicators of environmental performance [56,57].

The independent variables are uncertainty macro factors. First, EPU is estimated by using the newspaper article-based EPU index for 19 countries, constructed by Baker et al. [58]. They collected major newspapers in each country and counted the number of articles containing uncertainty terms for every month, including economic or economy for the term (E), regulation and government spending for the policy-related term (P), and uncertain or uncertainty for the term (U). They then scaled the monthly EPU article counts for each newspaper by the total number of articles in the same newspaper and standardized each monthly newspaper to a unit standard deviation over the period of coverage. We followed the prior literature in computing EPU as the natural logarithm of the 12-month arithmetic average of the EPU index values [8,59]. Second, country-level PS is collected from the World Bank, which adopted the seminal work by Kaufmann et al. [60] to identify country-level governance indicators [11]. A higher PS score indicates better political strength and certainty, whereas a lower score represents political uncertainty. Third, the UA cultural factor is taken from Hofstede's cultural dimensions, which refers to a society's susceptibility for uncertainty and ambiguity [50,61].

Table 1. Variable definition.

ESG_*score*	Represents the overall company score based on the reported information in the environmental, social, governance pillars.
Emission_*target*	An indicator variable takes a value of 1 if a firm sets target year for emission reduction, and 0 otherwise.
UA	A numerical variable that identifies the level of UA. A low-uncertainty culture emphasizes a higher level of standardization.
EPU	Natural logarithm of the 12-month average of the EPU index value by Baker et al. [58].
PS	Country-level political strength based on Kaufmann et al. [60], whereby a higher score indicates higher political strength.
GDP_*growth*	GDP growth of each country.
SIZE	Natural log of total assets.
ROA	Return on assets, measured by net income to total assets.
Intangible_*intense*	Intangible asset intensity, measured by total intangible divided by total assets
R&D_*exp*	The natural log of research and development expenditure.
Capital_*intense*	Capital expenditure intensity, measured by capital expenditure divided by total assets.
FCF	Free cash flow, measured by cash flow from operations divided by sales.
LIQUID	Liquidity measure, calculated as the sum of accounts receivable and inventory to total assets.

We control for national GDP growth, collected from the OECD database. This variable is measured in terms of year-over-year growth rate [8]. We also control for firm-specific variables identified from the prior literature as potential contributing factors of ESG and carbon performance [4,7,56]. We control for firm size measured by the natural logarithm of total assets, firm profitability measured by net income to total assets (ROA), intangible

assets intensity (Intangible_*intense*) measured by intangible assets scaled by total assets, capital expenditure intensity (Capital_*intense*) measured by capital expenditure scaled by total assets, free cash flow (FCF) measured by cash flow from operation scaled by sales, and firm liquidity (LIQUID) measured by receivables and inventories scaled by total assets.

3.3. Empirical Model

We estimate the coefficients for the following model using Ordinary Least Square (OLS) regression, with robust standard errors clustered at the firm level, which enables us to examine the joint significance of variable coefficients in our empirical model. The null hypothesis [(H0): $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = 0$] indicates that there exists no interpreting relation among the regressors and regressands against the alternative hypothesis [(Ha): $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq 0$]. Fixed effects contain country, industry, and year fixed effects, as in the following equation:

$$Y_{i,t} = \alpha + \beta_1 EPU_{c,t} + \beta_2 PS_{c,t} + \beta_3 UA_{c,t} + \beta_4 GDP_{c,t} + \beta_5 SIZE_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Intangible\_intense_{i,t} + \beta_8 Capital\_intense_{i,t} + \beta_9 R\&D\_exp_{i,t} + \beta_{10} FCF_{i,t} + \beta_{11} LIQUID_{i,t} + \beta_{12} FIXED\ EFFECTS + \varepsilon_{i,t} \quad (1)$$

where all variables are time-variant in nature; i, t, and c denote firm, time, and country, respectively; and the dependent variable $Y_{i,t}$ is the ESG performance of company i in year t. We also estimate the same regression by replacing ESG performance with Emission_*target*. Table 1 provides a complete definition of the study variables.

3.4. Descriptive Statistics

Table 2 reports the descriptive statistics of variables used in the study. The mean value of ESG performance is 39.00, which is lower than the mean value of 48.81 reported in Alkaraan et al. for a sample of UK companies covering the period 2013–2018 [1], but higher than the value of 18.67 reported in Nadeem et al. for a sample of Australian companies covering the period 2010–2014 [62]. On average, 11% of companies in our sample set a target year for CERTs. The mean value of EPU is 5.271, measured by the natural log of EPU index values, which is higher than the value of 4.655 reported in Attig et al. for an international sample of firms from 19 countries during the 1991–2015 period [8]. The mean value of PS is 0.23, which is higher than the mean value of 0.618 reported in Mooneeapen et al. for an international sample covering a period from 2015 to 2019 [4], and the mean value of UA is 42.46. All three countries have scores that range between 30 and 46. We also consider the average values for the EPU and PS variables over the study's period for the three countries. We find that for China, the highest EPU index value is 792 in 2019, which could be related to the increased economic uncertainty concerns in the wake of the COVID-19 pandemic. For the US, the highest EPU index value is 326 in 2020, which could also be related to the impact of the COVID-19 pandemic on the economy. As for the UK, the highest EPU index value is 289 in 2016, which is the year when the UK voted to leave the European Union and experienced subsequent economic fallout. Regarding political stability scores, we find that China recorded the lowest political stability value of -0.55 in 2015, which could be related to Tianjin explosions and the Chinese stock market turbulence in 2015. For the US, the lowest political stability value of -0.2 was recorded in 2020, which could be related to the general election campaigns and US presidential transition, and for the UK, the lowest political stability value of 0.08 was recorded in 2018, which could be related to the anti-Brexit campaigners march and the final vote on the UK exit deal.

Table 3 provides the pairwise correlation coefficients of the study variables. The correlation coefficients among explanatory variables confirm that there is no serious multicollinearity issue. The variance inflation factor (VIF) ranges between 1.09 (lowest value) and 2.56 (highest value), and the average value is 1.68. This also suggests the absence of multicollinearity.

Table 2. Descriptive statistics.

Variable	N	Mean	SD	Min	Max
ESG	21,564	39.00	18.95	0.45	94.51
Emission_*target*	21,564	0.11	0.31	0.00	1.00
UA	21,564	42.46	6.12	30.00	46.00
EPU	21,564	5.271	0.532	4.521	6.675
PS	21,564	0.23	0.30	−0.55	0.68
GDP	21,564	12.67	22.40	−3.64	69.00
SIZE	21,564	22.064	2.178	17.164	28.060
ROA	21,564	4.113	10.793	−54.950	27.380
Intangible_*intense*	21,564	0.14	0.18	0.00	5.28
Capital_*intense*	21,564	0.04	0.06	0.00	3.12
R&D_*exp*	21,564	18.250	1.927	13.305	23.129
FCF	21,564	0.059	0.135	−0.642	0.344
LIQUID	21,564	2.595	2.810	0.289	18.040

Variables winsorized to adjust for outliers. Variables are as defined in Table 1.

Table 3. Correlation matrix.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
ESG	1.00											
UA	−0.0502 *	1.00										
EPU	−0.0276 *	−0.5439 *	1.00									
PS	0.0997 *	0.5360 *	−0.3680 *	1.00								
GDP	0.1837 *	−0.5106 *	0.0830 *	0.00	1.00							
SIZE	0.4283 *	−0.3865 *	0.2365 *	−0.2694 *	0.0923 *	1.00						
ROA	0.1294 *	−0.1069 *	0.01	0.01	0.1142 *	0.1297 *	1.00					
Intangible_*intense*	0.001	0.1193 *	−0.1198 *	0.1470 *	0.0473 *	−0.2281 *	0.0664 *	1.00				
Capital_*intense*	−0.0295 *	0.0011	−0.0302 *	0.0293 *	−0.01	0.0264 *	0.0270 *	−0.1236 *	1.00			
R&D_*exp*	0.3994 *	−0.3272 *	0.2214 *	−0.2214 *	0.1354 *	0.1732 *	0.1303 *	−0.1113 *	−0.0353 *	1.00		
FCF	0.0347 *	−0.0234 *	−0.01	0.0194 *	0.0318 *	0.0644 *	0.3129 *	0.01	0.01	0.0465 *	1.00	
LIQUID	−0.1748 *	0.1222 *	−0.01	0.01	−0.1047 *	−0.2851 *	−0.2199 *	−0.0460 *	−0.1248 *	−0.1770 *	−0.0412 *	1.00

This table reports the Pearson correlation matrix between the variables used in the analyses, where "*" indicates 5% level of significance or better. Variables are as defined in Table 1.

4. Results and Discussion

4.1. Baseline Analysis

Table 4 presents the impact of macro uncertainty effects on ESG. Model 4.1 investigates the impact of EPU and control variables on ESG, Model 4.2 investigates the impact of PS and control variables on ESG, and Model 4.3 investigates the impact of UA and control variables on ESG. The R-squared value in all models implies that the variables included in the empirical model explain most variations in the dependent variable.

Table 4. The impact of macro uncertainty effects on ESG.

	ESG	ESG	ESG
Variable	***Model 4.1***	***Model 4.2***	***Model 4.3***
EPU	8.0644 ***		
	[16.22]		
PS		−10.1966 ***	
		[−9.08]	
UA			−2.5698 ***
			[−8.65]
GDP	−0.2138 ***	−0.2047 ***	−0.9176 ***
	[−9.03]	[−8.86]	[−11.22]
SIZE	5.2480 ***	5.5237 ***	5.7116 ***
	[13.48]	[13.86]	[14.18]
ROA	0.0469 **	0.0306	0.0431 *
	[2.01]	[1.26]	[1.73]
Intangible_*intense*	−0.9231	0.2837	1.3113
	[−0.43]	[0.12]	[0.51]
Capital_*intense*	8.5008	6.7798	5.1363
	[1.39]	[1.06]	[0.81]

Table 4. *Cont.*

	ESG	ESG	ESG
Variable	***Model 4.1***	***Model 4.2***	***Model 4.3***
R&D_*exp*	1.4828 ***	2.0832 ***	2.0039 ***
	[4.27]	[5.39]	[5.32]
FCF	1.9195	3.3519	1.9243
	[0.78]	[1.33]	[0.72]
LIQUID	−0.132	−0.0782	−0.1306
	[−1.12]	[−0.66]	[−1.07]
Country fixed effect	Included	Included	Included
Industry fixed effect	Included	Included	Included
Year fixed effect	Included	Included	Included
Intercept	−200.5031 ***	−166.9523 ***	−92.0415 ***
	[−23.10]	[−19.56]	[−7.06]
R-squared	0.453	0.453	0.453

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables are as defined in Table 1.

The results reported for Model 4.1 show that EPU has a positive association with ESG at a 1% significance level, suggesting that EPU increases the ESG performance of firms in our sample. In terms of economic significance, one standard deviation increase in the EPU causes an 8.064 increase in ESG performance. Our findings are consistent with those of previous studies, implying that corporate managers tend to emphasize social and environmental practices to improve their ESG performance during periods of high economic uncertainty [7,8]. As a result, we find support for the notion that ESG practices represent risk-averse activities [7,34,63] and serve as an insurance-like utility, whereby companies tend to engage in ESG activities to shield against challenges during economic uncertainties [34].

Model 4.2 investigates the impact of PS on ESG. The results show that PS is negatively associated with ESG at a 1% significance level. More specifically, one standard deviation increase in PS causes a 10.196 decrease in ESG. The result indicates that PS is associated with higher ESG performance, consistent with previous studies in finding that companies in countries with lower levels of PS exhibit greater levels of social and environmental engagements [4,12]. This result is inconsistent with the argument that a greater level of PS can lead to a stable environment that is conducive to policies and practices related to ESG [41]. Rather, our results indicate that companies are more likely to adopt ESG initiatives when the country's political system is unstable.

The results for Model 4.3 show that UA has a significant negative association with ESG at the 1% significance level. More specifically, one standard deviation increase in UA causes a 2.568 decrease in ESG performance. Our result indicates that countries with less tolerance to uncertainties prefer more formalized rules and low-risk, short-term practices [14,41], whereas countries with low UA tend to tolerate risks, and companies operating in these countries are more likely to engage in long-term activities such as ESG activities.

Among the control variables, we find that GDP has a negative association with ESG at the 1% significance level, implying that countries with lower GDPs are more likely to focus on investing on environmental and social practices (for example, health issues or managing carbon emission levels) in order to boost economic growth [39]. SIZE and ROA have positive associations with ESG at the 1% significance level, suggesting that bigger firms that are more profitable have higher ESG performance. Furthermore, R&D_*exp* has a statistically significant positive association with ESG, suggesting that companies that spend more on R&D tend to engage more in ESG practices and have better ESG performance. Overall, the findings support our hypotheses that propose the significant impact of MUFs on ESG performance.

Table 5 repeats the same regression tests as Table 4 but replaces ESG with Emission_*target*. Model 5.1 shows that EPU is positively associated with Emission_*target* and is significant at the 1% level. More specifically, one standard deviation increase in the EPU

causes a 0.1912 increase in Emission_*target*. Model 5.2 shows that PS is negatively associated with Emission_*target* and is significant at the 1% level. More specifically, one standard deviation increase in PS causes a 0.4129 decrease in Emission_*target*. Finally, Model 5.3 shows that UA is negatively associated with Emission_*target* and is significant at the 1% level. More specifically, one standard deviation increase in UA causes a 0.073 decrease in Emission_*target*.

Table 5. The impact of macro uncertainty effects on CERT.

	Emision_*Target*	**Emision_*Target***	**Emision_*Target***
Variable	***Model 5.1***	***Model 5.2***	***Model 5.3***
EPU	0.1912 ***		
	[13.93]		
PS		−0.4129 ***	
		[−12.47]	
UA			−0.0727 ***
			[−7.70]
GDP	−0.0047 ***	−0.0040 ***	−0.0236 ***
	[−8.68]	[−7.31]	[−8.27]
SIZE	0.0625 ***	0.0562 ***	0.0577 ***
	[10.51]	[9.67]	[9.66]
ROA	0.0011 ***	0.0010 **	0.0012 ***
	[2.59]	[2.29]	[2.73]
Intangible_*intense*	0.0207	0.0262	0.0384
	[0.62]	[0.74]	[1.09]
Capital_*intense*	−0.0087	0.0277	−0.0136
	[−0.07]	[0.22]	[−0.10]
R&D_*exp*	0.0089 *	0.0126 ***	0.0105 **
	[1.85]	[2.59]	[2.17]
FCF	−0.0713	−0.0142	−0.0884 *
	[−1.46]	[−0.29]	[−1.79]
LIQUID	−0.003	−0.0018	−0.0027
	[−1.36]	[−0.82]	[−1.21]
Country fixed effect	Included	Included	Included
Industry fixed effect	Included	Included	Included
Year fixed effect	Included	Included	Included
Intercept	−3.1628 ***	−2.0010 ***	0.3062
	[−17.50]	[−14.92]	[1.04]
R-squared	0.373	0.373	0.373

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables are as defined in Table 1.

These findings suggest that companies are more likely to engage in sustainable activities during times of economic uncertainty, including managing their operational carbon emissions and setting target years for emission reduction. Engagement in these sustainable practices provide an insurance-like function that protects companies during periods of uncertainty. Moreover, the findings suggest that when the political system is unstable, companies can focus on sustainability and engage in sustainable activities to compensate for the drawbacks in governance [12,49]. Finally, companies operating in societies that tolerate risks, including the risk associated with global warming and climate change, are more likely to set CERTs. Overall, these findings confirm the proposed hypotheses.

4.2. Additional Analysis-Moderating Effects

Tables 6 and 7 investigate whether firm profitability has a moderating effect on the relationship between the studied MUFs and ESG performance and CERT, respectively. We added three moderator variables: EPU*ROA (Models 6.1 and 7.1), PS*ROA (Models 6.2 and 7.2), and UA*ROA (Models 6.3 and 7.3). The results show the moderator EPU*ROA is significant at the 5% level (Model 6.1) and at the 1% level (Model 7.1) and is positively associated with ESG and Emission_*target*, respectively. The moderator PS*ROA is significant at

the 5% level (Model 6.2) and at the 1% level (Model 7.2) and is negatively associated with ESG and Emission_*target*, respectively. The moderator UA*ROA is significant at the 10% level (Model 6.3) and at the 5% level (Model 7.3) and is negatively associated with ESG and Emission_*target*, respectively. These results indicate that ESG performance is higher in more profitable companies operating in countries with higher EPU. Profitable companies are more likely to set CERTs and manage their carbon emission during periods of economic uncertainty because they can bear the associated costs [4]. Moreover, ESG performance is higher in more profitable companies operating in countries with a low level of PS and UA. The result suggests that during times of political instability, profitable companies are likely to deal with such an environment as they have access to more resources to enable safer and more effective involvement in ESG. Moreover, profitable companies that are based in countries dominated by low-uncertainty-avoidance cultures are more likely to invest in risky initiatives such as ESG since they are operating in societies that tolerate risks.

Table 6. The moderating effect of firm performance in the association between macro uncertainty effects and ESG.

	ESG	**ESG**	**ESG**
Variable	***Model 6.1***	***Model 6.2***	***Model 6.3***
EPU	7.8166 ***		
	[14.61]		
EPU * ROA	0.0416 **		
	[2.71]		
PS		−9.4006 ***	
		[−7.74]	
PS * ROA		−0.1215 **	
		[−2.88]	
UA			−2.5890 ***
			[−8.59]
UA*ROA			−0.0123 *
			[−2.59]
GDP	−0.2162 ***	−0.9181 ***	−0.2083 ***
	[−9.11]	[−11.21]	[−8.96]
SIZE	5.2968 ***	5.6708 ***	5.6092 ***
	[13.52]	[13.67]	[14.03]
ROA	−0.1798	0.0531	0.0499 *
	[−1.05]	[0.32]	[1.71]
Intangible_*intense*	−0.8868	1.2854	0.3696
	[−0.41]	[0.50]	[0.16]
Capital_*intense*	8.0421	5.3384	6.5209
	[1.30]	[0.84]	[1.01]
R&D_*exp*	1.4711 ***	2.0145 ***	2.0482 ***
	[4.23]	[5.32]	[5.34]
FCF	2.5877	1.5839	4.1142 *
	[1.08]	[0.57]	[1.66]
LIQUID	−0.1358	−0.1281	−0.0821
	[−1.15]	[−1.05]	[−0.70]
Country fixed effect	Included	Included	Included
Industry fixed effect	Included	Included	Included
Year fixed effect	Included	Included	Included
Intercept	−200.2012 ***	−90.4657 ***	−168.6203 ***
	[−23.14]	[−6.66]	[−19.60]
R-squared	0.453	0.453	0.453

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables are as defined in Table 1.

Table 7. The moderating effect of firm performance in the association between macro uncertainty effects and CERT.

	Emision_*target*	**Emision_*target***	**Emision_*target***
Variable	***Model 7.1***	***Model 7.2***	***Model 7.3***
EPU	0.1713 ***		
	[12.77]		
EPU * ROA	0.0035 ***		
	[5.25]		
PS		−0.3640 ***	
		[−11.53]	
PS * ROA		−0.0080 ***	
		[−6.01]	
UA			−0.0710 ***
			[−7.48]
UA * ROA			−0.0012 **
			[−2.35]
GDP	−0.0049 ***	−0.0041 ***	−0.0235 ***
	[−8.88]	[−7.53]	[−8.22]
SIZE	0.0660 ***	0.0602 ***	0.0599 ***
	[10.95]	[10.17]	[9.81]
ROA	−0.0179 ***	0.0021 ***	0.0082 ***
	[−5.09]	[3.79]	[2.75]
Intangible_*intense*	0.0271	0.0336	0.0417
	[0.79]	[0.94]	[1.14]
Capital_*intense*	−0.0379	0.0073	−0.024
	[−0.30]	[0.06]	[−0.18]
R&D_*exp*	0.0082 *	0.0115 **	0.0098 **
	[1.70]	[2.37]	[2.00]
FCF	−0.0197	0.0361	−0.0658
	[−0.39]	[0.72]	[−1.26]
LIQUID	−0.0038 *	−0.0025	−0.0031
	[−1.72]	[−1.12]	[−1.41]
Intercept	−3.1359 ***	−2.0942 ***	0.2001
	[−17.64]	[−15.26]	[0.67]
R-squared	0.305	0.305	0.305

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables are as defined in Table 1.

4.3. Endogeneity Test

The endogeneity issue caused by error-in-management due to policy-unrelated uncertainties in the measurement of the EPU index was addressed following previous studies [7,59]. We used the EPU index of Canada to extract the economic policy-unrelated uncertainty from the US EPU index, since these two economies are closely related to each other [59]. We also used the EPU index of Japan to extract the economic policy-unrelated part from the China EPU index, and the EPU index of Germany to extract the economic policy-unrelated part from the UK EPU index. These economies are closely related and share similar international trading activities [7].

In the first regression, EPU is regressed on the natural logarithm of the average Canada, Japan, and Germany EPU indices and control variables; in the second regression, we take the residuals from the first regression and replace EPU with these residuals. Table 8 displays the results for the first-stage regression (Model 8.1) and the second-stage regressions (Models 8.2 and 8.3). The positive and significant associations of EPU with ESG (Model 8.2) and Emission_*target* (Model 8.3) hold for the 2SLS estimation, confirming the first hypothesis on the impact of EPU on ESG performance and CERT.

Table 8. Robustness check: Endogeneity 2SLS.

	First-Stage	Second-Stage	
Variable	**EPU**	**ESG**	**Emission_*target***
	Model 8.1	***Model 8.2***	***Model 8.3***
Residual EPU		11.4402 ***	0.3990 ***
		[15.16]	[16.19]
GDP		0.0118	0.0031 ***
		[0.43]	[6.86]
SIZE	−0.1379 ***	3.6460 ***	0.006
	[−25.59]	[8.59]	[1.02]
ROA	−0.0039 ***	−0.0064	−0.0004
	[−4.92]	[−0.28]	[−1.01]
Intangible_*intense*	0.4261 ***	3.1755	0.1750 ***
	[11.62]	[1.60]	[5.38]
Capital_*intense*	−1.4137 ***	−6.0645	−0.4913 ***
	[−8.10]	[−0.97]	[−3.93]
R&D_*exp*	0.0263 ***	2.0780 ***	0.0211 ***
	[5.06]	[5.41]	[4.34]
FCF	0.4983 ***	8.1990 ***	0.1800 ***
	[5.76]	[3.51]	[3.54]
LIQUID	−0.001	−0.1028	−0.0029
	[−0.30]	[−0.90]	[−1.32]
EPU_instrument	−0.318 ***		
	[−13.10]		
Country fixed effect	Included	Included	Included
Industry fixed effect	Included	Included	Included
Year fixed effect	Included	Included	Included
Intercept	8.0543 ***	−107.3333 ***	−0.4216 ***
	[71.37]	[−11.38]	[−3.37]
R-squared	0.3344	0.34	0.27

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables are as defined in Table 1.

5. Conclusions

We examined the impact of three MUFs, namely EPU, PS, and UA, on corporate ESG performance and CERTs in firms based in the USA, China, and the UK. Additionally, we examined whether these macro factors were affected by the profitability of a company. ESG performance was measured using ESG scores collected from the Refinitiv Eikon database, and CERT was measured using an indicator variable that takes a value of 1 if a firm sets a target year for emission reduction, and 0 otherwise. Regarding our independent variables, EPU was estimated using the index constructed by Baker et al. [58] and was computed as the natural logarithm of the 12-month arithmetic average of the EPU index values. PS was collected from the World Bank, which adopted the seminal work by Kaufmann et al. [60], and UA was adopted, as conceptualized by Hofstede's cultural dimensions [50,61].

Using an unbalanced sample of companies located in the USA, China, and the UK during the period 2013–2020, the results showed that during times of economic uncertainty, companies are more likely to engage in ESG activities, including establishing CERTs. Companies in countries with lower levels of PS exhibit greater levels of social and environmental engagements, and companies operating in societies that tolerate risks, including the risk associated with climate change, are more likely to have better ESG performance and be committed to CERTs. The results also suggest that profitable companies are more likely to deal with uncertain environments, as they have access to more resources to facilitate safer and more effective investment in ESG.

The study suggests several practical implications for managers, policymakers, and governments. Our evidence provides an insight into how companies behave during periods of economic and political uncertainties. The results show that companies are likely to act in a socially and environmentally responsible manner and be more considerate of

the climate change issue when operating in an uncertain environment. The findings of this study or similar future studies can be applied to the materiality assessment studies executed by companies and designed to identify and understand the relative importance of ESG and sustainability topics to the company and stakeholders. Policymakers need to understand the culture in which companies operate when developing environmental policies. Governments and regulators need to understand the potential risks of economic policy uncertainties and the PS of a country when increasing carbon emission levels, and the necessity to initiate benign regulations to encourage companies to manage their carbon emission levels and commit to reaching carbon neutrality by a target year (as per CERTs). Governments can provide financial support to companies to help them invest in renewable energy supplies and transition from fossil fuels to renewable energy sources. Our study provides opportunities for future research. Our sample comprises companies listed on the stock exchanges of the USA, the UK, and China, which tend to be big-sized companies. We recommend that future research examines how the MUFs of a country affect ESG performance and emission reduction efforts in smaller companies or multinational companies. Future research could also focus on the impact of MUFs on the ESG performance of companies operating in other countries with different economic, political, and cultural environments. Finally, future research could examine the effect of MUFs on other subdimensions of ESG pillars, such as waste management and product safety concerns.

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