

Institutional Structure, Union Density and Voluntary Sustainability Commitments: A Panel Data Analysis of European Countries

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Abstract

This study empirically examines the macroeconomic and institutional determinants shaping participation in the United Nations Global Compact (UNGC) using a panel data set created for 26 European countries for the period 2013–2022. Within this scope, the effects of the rule of law, economic capacity, trade openness, and union density on voluntary sustainability commitments were tested. Due to violations of key panel data assumptions regarding cross-sectional dependence, heteroskedasticity, and autocorrelation, the fixed effects model and Driscoll-Kraay robust standard errors were used in the estimations. The findings show that the rule of law, economic capacity, and trade openness have a statistically significant and positive effect on UNGC participation. This result indicates that strong institutional structures and integration into global markets encourage firms to engage in international sustainability and transparency initiatives. In contrast, union density, representing labor institutionalization, was found to have a significant and negative effect on UNGC participation. This finding suggests that strong organized labor may, in some institutional contexts, steer firms toward more local and binding worker-rights mechanisms rather than global voluntary commitments, suggesting a possible substitution effect. The key findings are supported by robustness tests using lagged variables and cluster-robust standard errors. The study contributes to the literature by revealing the interaction between global sustainability policies and countries' institutional structures and labor dynamics.

Keywords: United Nations Global Compact (UNGC), Voluntary Sustainability Commitments, Rule of Law, Union Density, Panel Data Analysis, Driscoll-Kraay Estimator

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1. Introduction

Voluntary disclosure refers to the disclosure of information by firms beyond mandatory legal requirements. In addition to financial information, this disclosure may also include corporate commitments in social, environmental, and governance domains. In this respect, voluntary sustainability commitments can be considered a specific form of voluntary disclosure through which firms communicate their broader responsibility orientations to external stakeholders (Güneş, 2021). In this context, the United Nations Global Compact (UNGC) is a corporate voluntary initiative that calls on businesses to adhere to common principles in the areas of human rights, labor standards, the environment, and anti-corruption (Kell, 2005). The voluntary nature of the UNGC distinguishes it from mandatory reporting regimes while making participants' corporate responsibility and sustainability commitments publicly visible (Berliner and Prakash, 2012). Therefore, participation in the UNGC can be considered an observable indicator of companies' voluntary sustainability commitments (Laborda and Pérez, 2025). Stakeholder and legitimacy theories can be used to discuss voluntary public disclosure. The legitimacy theory is predicated on the idea that institutions have obligations to society by upholding a social compact and that they must function with respect for all values within the society in which they exist (Almutawaa, 2013). If these requirements and responsibilities are not fulfilled, the institution may not be able to continue to exist. Therefore, the concept of voluntary public disclosure is a mechanism that enables businesses seeking to establish social legitimacy to ensure that their activities are in line with the values of the communities in which they operate (Patten, 2002). According to legitimacy theory, businesses aim to secure their existence and continuity by voluntarily disclosing detailed information (Bilgiç, 2014). In stakeholder theory, each stakeholder group has the right not to be seen to an end and, for this reason, should participate in determining the future decisions of the business in which they hold shares (Freeman, 1994). Theoretically, stakeholders encompass not only shareholders but also a broad spectrum of entities, including workers, clients, suppliers, investors, the community, governmental and civil society organizations, political parties, and unions. Therefore, the theory has gained prominence in accounting theory for studying social, environmental, and sustainability issues in recent years, even if it is essentially based on strategic management (Yücenurşen, 2022). Stakeholder power affects inter-company competition, organizations' strategic positions, and past and current financial performance, all of which determine the degree of voluntary public disclosure (Khilifi and Bourri, 2010).

However, voluntary sustainability commitments are not determined solely by firm-level preferences. The institutional structure, governance quality, economic capacity, and level of stakeholder organization in the country where firms operate can influence both the prevalence and continuity of such voluntary initiatives.

Participation in corporate voluntary programs such as the UNGC is not independent of the national context in which firms operate. Differences in governance arrangements across countries, the level of international economic integration, and local stakeholder structures can alter the incentives and constraints associated with participation in such initiatives (Berliner and Prakash, 2012; Knudsen, 2011). This suggests that participation in voluntary sustainability initiatives should be evaluated not only as a strategic choice at the firm level, but also as an outcome shaped by institutional conditions at the country level. The existing literature has largely examined the determinants of voluntary disclosure and sustainability behaviors at the firm level. In contrast, the country-level institutional determinants of UN Global Compact participation have been addressed in only a limited number of studies. Research focusing on the country context shows that institutional quality, economic structure, and stakeholder systems can influence sustainability disclosures and corporate responsibility practices (de Villiers and Marques, 2016; Baldini et al., 2018; Bhatia and Makkar, 2020). However, studies evaluating the effects of the rule of law, economic capacity, trade openness, and union density on UNGC intensity within the same empirical framework remain limited. Therefore, examining the country-level determinants of voluntary sustainability commitments through a holistic approach constitutes a clear research gap in the literature. The starting point of this study is the question of the extent to which institutional and economic conditions at the country level shape voluntary sustainability commitments. More explicitly, it examines whether the quality of enforcement and sanctions represented by the rule of law, income levels reflecting economic capacity, trade openness indicating integration into global markets, and unionization rates as an organized indicator of stakeholder pressure have a systematic effect on countries' UNGC intensity. This research problem is significant in that it links the voluntary disclosure literature with country-level institutional analysis. The inclusion of these variables in the analysis is based on theoretical and empirical justifications. The rule of law provides an institutional foundation that supports the credibility of voluntary corporate commitments through the predictability of rules and enforcement capacity (Erragragui et al., 2025; Atta and Sharifi, 2024). Economic capacity reflects the resource base available to firms to adopt sustainability principles and translate them into practice (Bhatia and Makkar, 2020). Trade openness can expose firms to more intense international competition, investor expectations, and global legitimacy pressures (Flammer, 2015; Knudsen, 2011). Union density, reflecting the level of organized employee representation, can strengthen stakeholder pressure on social responsibility and disclosure practices (Boodoo, 2020; Baldini et al., 2018). Taken together, these variables constitute a relevant set of explanatory factors for UNGC intensity.

The primary objective of this study is to test the effects of the rule of law, economic capacity, trade openness, and union density on UNGC intensity at the country level. Accordingly, the study seeks to extend the voluntary disclosure literature beyond the firm level by evaluating voluntary sustainability commitments within the national institutional context. It also aims to identify empirically the institutional and economic determinants of cross-country variation in UNGC intensity. To this end, the study focuses on three key research questions. First, it examines whether the rule of law, representing enforcement capacity, increases

voluntary sustainability commitments. Second, it investigates whether economic capacity and trade openness play a meaningful role in determining UNGC intensity. Third, it examines whether union density is an independent determinant of voluntary sustainability commitments. These questions assume that voluntary corporate commitments are related not only to internal firm preferences but also to institutional and economic conditions at the country level. This study contributes to the literature in three ways. First, it extends the voluntary disclosure and sustainability literature to the country level within the UNGC context, moving beyond the dominant firm-level focus (de Villiers and Marques, 2016; Berliner and Prakash, 2012). Second, it brings together the quality of institutional enforcement, trade openness, economic capacity, and organized stakeholder pressure within the same empirical framework, jointly assessing the multidimensional determinants of voluntary sustainability commitments (Knudsen, 2011; Baldini et al., 2018; Bhatia and Makkar, 2020). Third, by linking legitimacy and stakeholder approaches to country-level institutional analysis, it provides empirical evidence on cross-country variation in UNGC intensity.

This study is based on a panel data set covering the period 2013–2022 and comprising 26 European countries. As the analysis is conducted at the country level, the findings should be evaluated within the framework of the selected period, sample scope, and indicators used. Furthermore, the study examines voluntary sustainability commitments through specific institutional and economic variables and does not cover factors outside this framework. This article consists of five sections. The first section is devoted to the introduction. The second section reviews the relevant literature. The third section presents the methodology, data set, and model. The fourth section reports and evaluates the empirical findings. The fifth section presents the conclusions and implications.

2. Literature Review

Firm-Level Determinants of Voluntary Disclosure

A survey of the literature on voluntary public disclosure reveals that most research conducted in both developed and developing nations is empirical in nature and aim to ascertain how company factors affect voluntary public disclosure. The first study on which factors influence voluntary disclosure in companies was conducted by Cerf in 1961 on companies listed on the New York Stock Exchange. It found that shareholder size, profitability, and number had a positive effect on voluntary disclosure. In a study conducted by Firth in 1979 on 180 businesses in the UK, it was found that large-scale businesses were more inclined to voluntarily disclose information to the public. Similar to Firth's study, McNally et al. (1982) in New Zealand, Chow and Wong-Boren (1987) in Mexico, Cooke (1989) in Sweden, Hossein et al. (1994) in Malaysia, Raffournier (1995) in Switzerland, Depoers (2000) in France, Aksu and Kösedag (2006) in Turkey, and Almutawaa (2013) in Kuwait have found a significant and positive relationship between firm size and voluntary public disclosure.

Particularly in the 1990s, the idea of voluntary public disclosure started to garner greater interest, and more research was done on the topic. In a study conducted by Lang and Lundholm in 1993, a positive relationship was found

between high profitability and voluntary public disclosure. This result has been confirmed in studies conducted by Raffournier (1995) in Switzerland, Haniffa and Cooke (2002) in Malaysia, Aksu and Köseadağ (2006) in Turkey, Lim et al. (2007) in Australia, Wang et al. (2008) in China, and Gamerschlag et al. (2011) in Germany. Meek et al. (1995) found that, in addition to company size, country/regional differences and trading on international stock exchanges were the most significant factors influencing voluntary public disclosure in a study that covered the United States and European nations like France, the United Kingdom, and Germany. Another study conducted on a country-by-country basis by Williams (1999) in businesses in Asia-Pacific countries found that culture, political systems, business size, and sector variables significantly affect the level of voluntary public disclosure.

Ho and Wong (2001) examined the connection between voluntary disclosure and corporate governance traits among businesses listed on the Hong Kong Stock Exchange. The study found a negative correlation between the number of family members and non-independent executive directors on the board of directors and voluntary disclosure, and a positive correlation with the presence of an audit committee. The positive results are consistent with studies conducted by Babio Arcay and Vazquez (2005) in Spain, Barako et al. (2006) in Kenya, and Appuhami and Tashakor (2017) in Australia. The negative results, however, are parallel to the studies conducted by Haniffa and Cooke (2002) in Malaysia, Barako et al. (2006) in Kenya, and Almutawaa (2013) in Kuwait. Chau and Gray (2002) investigated the relationship between ownership structure, one of the key indicators of corporate governance, and voluntary public disclosure in their studies of businesses in Singapore and Hong Kong. Eng and Mak (2003) examined this relationship in their study of businesses in Singapore. Chau and Gray (2002) found that voluntary public disclosure is less common in businesses with a dominant family ownership structure, while Eng and Mak (2003) concluded that low managerial ownership and high public ownership increase voluntary public disclosure. These results are like those of a study conducted in Turkey by Atağan and Fidancı (2016) in terms of the negative relationship between voluntary public disclosure and family ownership and the positive relationship with public ownership. Arcay and Vazquez (2005) in Spain, Cheng and Courtenay (2006) in Singapore, Lim et al. (2007) in Australia, Patelli and Prencipe (2007) in Italy, Qu et al. (2013) in China, Muttakin and Subramaniam (2015) in India, and Milad (2019) in Turkey have all found a positive correlation between voluntary disclosure and board independence, another crucial measure of corporate governance. The negative relationship between board independence and voluntary disclosure has been identified in studies conducted in Hong Kong by Gul and Lung (2004), in France by Faten (2005), in Malaysia by Ghazali and Weetman (2006), and in Jordan by Alhazaimah et al. (2014) in Jordan. The geographic location of businesses, the cultural environment, societal habits, legal regulations, and the degree of development of nations are the main reasons why variables affecting the level of voluntary public disclosure have different positive or negative effects (Güneş, 2021). These studies show that the voluntary disclosure literature has long focused primarily on firm-level determinants. However, subsequent literature has revealed that voluntary disclosure and sustainability behaviors cannot be explained solely by

internal firm characteristics; country-level institutional structures, economic contexts, and stakeholder systems are also decisive in this process (de Villiers and Marques, 2016; Baldini et al., 2018). In this context, labor institutionalisation, the rule of law, and other country-level mechanisms should also be considered to understand voluntary sustainability commitments and participation in the United Nations Global Compact (Knudsen, 2011; Berliner and Prakash, 2012).

Labor Institutionalisation and Stakeholder Pressure

Stakeholder theory bases the legitimacy and strategic orientation of businesses not only on a shareholder-focused approach but also on the capacity to manage the expectations of all actors affected by their operations (Freeman, 1984; Pothuri, 2025). Within this theoretical framework, employees are positioned among the most critical ‘primary stakeholders’ with direct influence over corporate decisions and sustainability reporting processes (Pothuri, 2025; Vitolla et al., 2019). The level of unionisation, representing the organised structure in the labor market, reflects the collective power of this stakeholder group, creating a significant institutional determinant and pressure channel on companies' voluntary sustainability disclosures (Doshi and Khokle, 2012). Indeed, empirical findings show that in environments with high unionisation, managers resort more intensively to voluntary commitment mechanisms such as UNGC participation in order to mitigate conflicts of interest among stakeholders and normalise relations with the workforce (Chantziaras et al., 2021).

However, the impact of stakeholder pressure on reporting may vary depending on the corporate and geographical context. While Vitolla et al. (2019) argue that employee pressure has a meaningful and positive effect on reporting quality, Rudyanto and Siregar (2018) found that in emerging market examples, employees may perceive CSR expenditures as a cost factor that limits their own economic gains, and that this situation can negatively affect reporting quality. On the other hand, the effective participation of trade unions in sustainability-focused multi-stakeholder initiatives (MSIs) may be constrained by structural factors such as the procedural design of the initiative and the resource constraints of trade unions (Martens et al., 2018).

From an institutional theory perspective, it is argued that companies have adopted ‘strategic’ CSR forms that support traditional business imperatives rather than meeting the broad stakeholder demands, thereby weakening the concept of stakeholders at the corporate level (Bondy et al., 2012). In this process, Boodoo (2016) states that management prioritises according to the salience of stakeholders and that regulatory pressures play a key role in improving social performance. The fact that the effect of unionisation yields statistically insignificant results, particularly in empirical models, can be explained by methodological limitations such as measurement errors and selection bias in longitudinal data sets, as highlighted by Freeman (1984). This situation indicates that labor institutionalisation exhibits an integrated structure with the country's general legal infrastructure and the quality of institutional enforcement, rather than an independent effect.

Organised Labor and Trade Union Power

Organised labor is considered an institutionalised stakeholder force that can influence companies' social responsibility priorities and reporting preferences. In the literature, this power is measured on different levels: (i) country-level union density/labor protection indicators, (ii) firm-level union strength and (iii) legal/institutional indices reflecting employee rights. For example, Baldini et al. (2018) examine the impact on ESG disclosure levels by operationalising the Labor Protection variable at the country level with union density and report that union density increases social and governance disclosures in particular; however, the effect on total ESG and environmental disclosure can be weak/unstable. This finding indicates that the pressure of organised labor is reflected more directly in reporting on employee/corporate governance themes. Studies based on firm-level measures indicate that union power may generate a trade-off (reallocation) mechanism among CSR components. Boodoo (2020) theoretically and empirically argues that an increase in union density at the company level could create substitution/complementation dynamics between the employee-focused and non-employee (external stakeholder-focused) dimensions of CSR; showing that at low levels of unionisation, there may be an increased orientation towards employee-focused policies, while at higher levels of unionisation, both dimensions may strengthen together. Similarly, Shin and Park (2024) report that unionisation may show a negative relationship with CSR participation using firm-year data in Korea; however, this relationship weakens in the presence of institutional structures such as chaebol affiliation, revealing that the union-CSR relationship is sensitive to country/institutional context.

The impact of organised labor is not limited to CSR performance/disclosure; it can also be reflected in the financial aspects of reporting. Farber et al. (2012) find that union power reduces conditional accounting conservatism and link this to unions' bargaining power to reduce the likelihood of layoffs. This result suggests that union power may have a multi-channel effect on the reporting regime; therefore, unionisation should be considered not only in terms of CSR scores but also in conjunction with a broader set of reporting behaviours. The role of unionisation in participation in multi-stakeholder voluntary programmes is also discussed, particularly in the context of the UN Global Compact (UNGC). The UNGC emphasises that, in addition to the business community, NGOs, organised labor, UN agencies and governments are stakeholders in its design. However, it has been argued that factors such as programme design and network embeddedness can be decisive in the cross-country diffusion of the UNGC; while embeddedness in IGO networks encourages participation, embeddedness in INGO networks can be dissuasive (Berliner and Prakash, 2012). Abdelzaher et al. (2019), who measure organised labor not directly through union density but through labor rights, argue that participation in the UNGC varies significantly at the country level and that the legal framework of workers' rights may be related to this participation; they also establish the measurement of labor rights based on ILO convention ratifications. The accountability of organised labor—whether through institutional reporting practices or workplace representation and participation mechanisms—presents an

explanatory conceptual distinction in the literature on unionisation. Johansen (2010) demonstrates that in the Danish context, where employee representation mechanisms (e.g., workplace representatives/committees) are relatively strong, non-financial reporting alone serves a limited accountability function from the employees' perspective; in contrast, workplace-level institutional arrangements play a more decisive role in company-employee relations.

Labor as a Channel of Social Pressure: Its Impact on Policy Formation

Labor is positioned in modern corporate management literature not merely as a party to economic bargaining processes, but as a social movement actor that shapes the social legitimacy of businesses and constitutes a transformative social force influencing decisions (Fairbrother, 2008). Although trade unions initially approached the discourse of corporate social responsibility with scepticism, over time they began to use this concept as a political tool to defend workers' interests and transform corporate policies (Preuss, 2008). This approach demonstrates trade unions' capacity not only to comply with existing rules but also to steer businesses towards setting new policy objectives through alliances with civil society.

The role of the workforce in the corporate policy-making process is more clearly understood within the framework of the concepts of political corporate social responsibility and deliberative democracy. Trade unions participating in deliberative processes with multinational companies to fill transnational governance gaps serve as legitimate and effective partners in determining standards of corporate behaviour (Harvey et al., 2017). Considering that managers manage the mandatory and voluntary pressures they face when determining social responsibility strategies in a synergistic manner, the social pressure created by the organised workforce becomes a fundamental driving force in corporate policy formulation (Aragon-Correa et al., 2020). This dynamic compels businesses to comply with voluntary standards and develop more inclusive policies.

At the international level, this political pressure and dialogue institutionalises itself through tools such as international framework agreements, placing workers' rights at the centre of multinational companies' strategic planning (Lévesque et al., 2018). When combined with the intermediating capacities of local union representatives, such agreements and international organizing campaigns directly influence corporate decision-making mechanisms. Consequently, the workforce emerges not merely as a stakeholder group but as a transformative channel of social pressure in the formulation of corporate policies.

Labor Institutionalisation and UN Global Compact Participation

The theoretical framework of social pressure created by the workforce shows that unions do not limit their demands to local wage negotiations, but also steer multinational companies towards global sustainability commitments. In this context, Carby-Hall (2016) notes that the United Nations Global Compact (UNGC) has elevated the concept of corporate social responsibility (CSR) to the highest global level. The author emphasizes that the UNGC's core principles serve as a critical lever for organized labor because they guarantee freedom of association and the right to collective bargaining. Trade unions aim to use international framework agreements and global initiatives to encourage businesses to go beyond their

minimum legal obligations and adopt transformative policies that benefit both workers and society.

This interaction between labor market institutions and corporate social responsibility is based on strong empirical and theoretical foundations in the literature. Goerke (2022) demonstrates that collective bargaining agreements are an integral part of companies' CSR strategies in many OECD and European Union member countries and that high trade union density has a positive impact on CSR activities. He emphasizes that organized labor pushes management beyond mere profit maximization and encourages it to expand into the realm of social responsibility.

Overall, the literature on voluntary sustainability reporting and related disclosure practices remains largely fragmented and predominantly focused on firm-level determinants. Existing studies have mostly examined micro-level factors such as profitability, governance structure, ownership patterns, and board characteristics, often within single-country settings. Although cross-country research points to the generally supportive roles of economic capacity and trade integration—mainly through greater exposure to international markets and stakeholder expectations—less attention has been paid to how domestic institutional structures shape participation in global voluntary initiatives. In particular, the interaction between binding national institutions, such as the rule of law and organized labor, and non-binding international sustainability frameworks remains underexplored. In this respect, the present study brings these dimensions together within a unified country-level framework by jointly examining economic capacity, institutional enforcement, trade openness, and union density in explaining cross-country variation in UNGC participation.

However, the conflicting empirical evidence regarding the role of organized labor points to a theoretical ambiguity: unionization may either stimulate global sustainability commitments or generate a substitution effect, whereby strong domestic worker rights reduce the need for international voluntary initiatives. This duality can be more clearly understood through the Varieties of Capitalism framework (Hall & Soskice, 2001). In coordinated market economies, which characterize many European countries, institutionalized industrial relations and strong labor protections create structured and binding domestic mechanisms for corporate governance and stakeholder representation. Under such conditions, high union density may reduce the marginal incentive for firms to participate in global and non-binding initiatives such as the UNGC, since stakeholder demands are already mediated through established national institutions. By contrast, in liberal market economies or in contexts where labor protections are weaker, unions may be more likely to support international frameworks as complementary tools to compensate for domestic institutional gaps. Given that the sample in this study is largely composed of European countries with relatively institutionalized labor relations systems, a substitution effect is expected. Accordingly, we hypothesize that higher union density is negatively associated with the intensity of voluntary UNGC participation.

3. Methodology, Data and Model

Model Construction

This study examines the impact of the rule of law (ROL), economic capacity (lnGDP), trade openness (Trade), and union density (UD) on voluntary sustainability disclosures (UNGC). The literature frequently emphasizes that countries' institutional quality and financial reporting environment are decisive factors in the level of voluntary disclosure. A strong legal infrastructure (ROL) creates an environment of transparency that supports voluntary disclosure practices by increasing reliability and reducing opportunistic behavior. Similarly, increased economic capacity expands companies' capacity to cover the costs associated with voluntary disclosure. Trade is included in the model because increasing international integration exposes companies to higher global standards and international stakeholder pressure. This can encourage sustainability commitments through the motivation to adapt to international markets. Finally, the union density (UD), added to the model to represent labor institutionalization, reflects the social pressure power of employees as a key stakeholder group on sustainability policies.

Based on these assessments, the following model has been established:

$$UNGC_{it} = f(ROL_{it}, \ln(GDP_{it}), Trade_{it}, UD_{it}) \quad (1)$$

$$UNGC_{it} = \beta_0 + \beta_1 ROL_{it} + \beta_2 \ln(GDP_{it}) + \beta_3 Trade_{it} + \beta_4 UD_{it} + \gamma_i + \varepsilon_{it} \quad (2)$$

In the equation, i represents the cross-section of European countries, and t represents the time dimension. γ_i denotes country-specific fixed effects, δ_t denotes time-specific fixed effects, and ε_{it} denotes the error term. All variables are measured at the country-year level. The model includes country specific fixed effects to control for unobservable, time-invariant heterogeneity across nations. UNGC indicates voluntary sustainability participation intensity; ROL indicates the rule of law; lnGDP indicates economic capacity; Trade indicates the level of trade openness; and UD indicates the unionization rate. The natural logarithm of the economic capacity variable was taken to reduce scale differences and limit potential heteroscedasticity issues.

Data Sources

In this study, 26 OECD member countries in the European region were included as a panel group, and annual data for the period 2013–2022 were considered (see Appendix A for the full list of countries). Türkiye is explicitly included alongside these European nations due to its deep economic integration with the EU market (e.g., the Customs Union) and its OECD membership, which introduces valuable macroeconomic and institutional variance into the panel dataset. The relationship between the financial reporting environment, labor institutionalization, economic capacity, trade openness, and voluntary sustainability disclosures (UNGC) is analyzed. The dependent variable, UNGC intensity, is

calculated as the ratio of the total number of UNGC participants to the total population of the respective country. While normalizing the number of UNGC participants by the total number of registered firms might seem like a direct approach, population was preferred as the denominator for two fundamental theoretical and methodological reasons. First, consistent with the stakeholder and legitimacy theories framing this study, the total population better captures the broad societal stakeholder base and the macro-level social pressure surrounding corporate transparency and sustainability in a given country. In this respect, the measure is intended to reflect the country-level prevalence of voluntary sustainability commitment rather than firm-level participation propensity alone. Second, from a methodological standpoint, cross-country data on the total number of registered firms often suffer from severe measurement inconsistencies due to differing national definitions of enterprises, registration criteria, reporting practices, and the size of informal economies. Population, conversely, provides a highly standardized, robust, and universally comparable macro-level denominator for panel data analysis across countries. Real GDP per capita is included in the model as the proxy for economic capacity. Rule of law (ROL) represents institutional enforcement quality. Union density is expressed as the unionization rate (%), while trade openness is expressed as the share of total trade in GDP (%). Table 1 lists the variables of the model and their data sources.

Table 1: List of Variables

Variable	Symbol	Explanation	Source
Voluntary Sustainability Disclosure	UNGC	UNGC participants divided by total population	UNGC Database & WDI
Rule of Law	ROL	Rule of Law Index (Institutional quality)	WDI / World Bank
Economic Capacity	lnGDP	Natural log of GDP per capita (constant 2015 US\$)	WDI
Trade Openness	Trade	Trade (% of GDP)	WDI
Union Density	UD	Unionization rate (% of total employees)	OECD Statistics

Source: Authors' calculations

Econometric Methodology

In the empirical analysis of this study, a sequential econometric methodology appropriate for the nature of the macro panel data set, which includes time and cross-sectional dimensions, was followed (Baltagi, 2021; Hsiao, 2022). The analysis process essentially consists of three main stages. In the first stage, empirical specification tests were applied to choose between the Fixed Effects and Random Effects approaches to ensure consistent estimation of the model parameters. In the second stage, potential violations of classical panel data assumptions (namely cross-sectional dependence, heteroskedasticity, and serial correlation) were examined using diagnostic tests to evaluate the validity of the selected baseline model. In the third and final stage, robust estimation methods were integrated into the analysis to maximize the reliability of statistical inferences by mitigating the disruptive effects of the detected assumption violations. These steps

were systematically carried out to strengthen the methodological foundation of the model and ensure the asymptotic consistency of the parameter estimates. Each of these processes is presented in technical detail in the following subsections.

Model Selection

Panel data analysis allows for controlling countries' unobservable and time-invariant heterogeneous structures by combining cross-sectional and time-series dimensions. The key distinction in this methodological framework is whether to choose Fixed Effects or Random Effects models, depending on the nature of the relationship between unobservable country-specific effects and explanatory variables (Wooldridge, 2010; Baltagi, 2021). The assumption that country-specific unit effects may be correlated with the explanatory variables forms the theoretical basis of the Fixed Effects model, while the assumption that these effects are strictly uncorrelated with the explanatory variables defines the Random Effects model. The Hausman (1978) specification test, a fundamental standard in the literature, was applied to make the empirical choice between the models. The null hypothesis of the test states that there is no systematic correlation between the unobservable effects and the explanatory variables. As a result of the analysis, the null hypothesis was rejected, indicating that the Random Effects estimator would be inconsistent and biased. Therefore, the Fixed Effects model was adopted in the study to ensure the consistency of the parameter estimates.

Diagnostic Tests

Following the estimation of the Fixed Effects model, a series of diagnostic tests were performed to check for possible violations of classical panel data assumptions. Given the macro-level structure of the dataset, which includes highly integrated European countries, testing for cross-sectional dependence (CSD) is critical; economic shocks in one country can easily spill over to others, potentially leading to biased and inconsistent parameter estimates (Pesaran, 2015). Additionally, the presence of groupwise heteroscedasticity among cross-sectional units was examined using the modified Wald test (Greene, 2000; Baum, 2001), while the potential autocorrelation issue within idiosyncratic error terms was investigated using the test procedure introduced to the literature by Drukker (2003). Identifying these methodological deviations is a fundamental preliminary step, as the presence of these issues necessitates the use of robust estimation techniques in the analysis to ensure the reliability and validity of statistical inferences.

Robustness Tests

Robust estimation methods were employed to eliminate the simultaneous effects of the issues of heteroskedasticity, autocorrelation, and cross-sectional dependence detected by diagnostic tests on the model and to preserve the validity of statistical inferences. Although clustered standard errors proposed by Arellano (1993) or panel-corrected standard errors (PCSE) developed by Beck and Katz (1995) are widely used in the literature to address heteroscedasticity and serial correlation issues, these traditional approaches fall short in modeling the cross-sectional dependence characteristic of macro-level panels. To overcome these methodological limitations, the Driscoll and Kraay (1998) estimator, which simultaneously produces asymptotically consistent standard errors for all three

assumption violations, was preferred in the analysis. The adaptation of this estimator to complex data sets containing cross-sectional interactions between units was achieved by following the application procedure presented by Hoechle (2007), thereby maximizing the reliability of the empirical findings.

4. Findings

This section examines the basic statistical properties of the variables used in the empirical models of the study and the preliminary relationships between the variables. Descriptive statistics calculated to reveal the general structure of the data before proceeding to the main analyses of the study are presented in Table 2.

Table 2: Descriptive Statistics

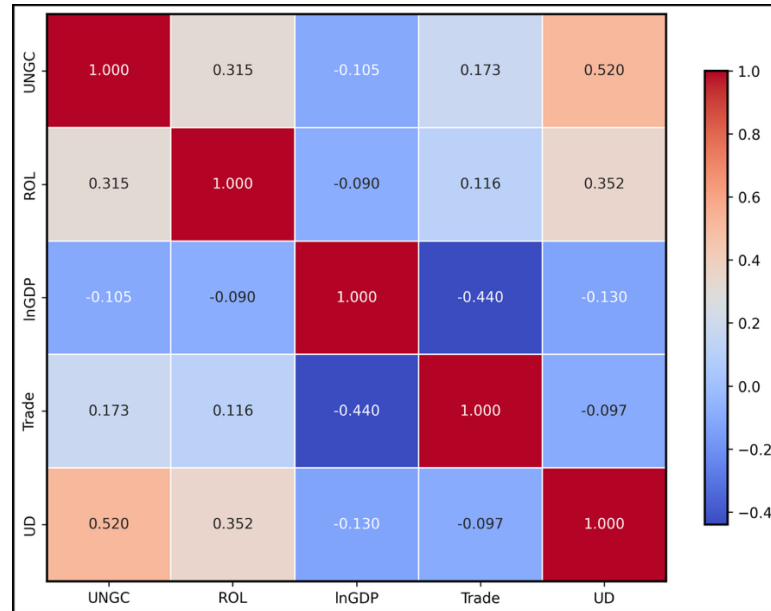
Statistic	UNGC	ROL	lnGDP	Trade	UD
Mean	4.7481	0.7382	26.5541	121.5216	26.8879
Median	1.6942	0.7572	26.7171	103.1642	15.4
Maximum	52.0071	0.9018	29.1024	412.1772	91.9
Minimum	0.0	0.4169	23.511	48.8702	4.5
Std. Dev.	7.2883	0.1243	1.4066	66.7653	22.4321
Skewness	2.8006	-0.8973	-0.2505	1.9626	1.3286
Kurtosis	12.9692	3.1765	2.3714	7.7987	3.6976
Jarque-Bera	1416.53	35.2256	6.9993	416.3792	81.7657
Probability	0.0	0.0	0.0302	0.0	0.0
Observations	260.0	260.0	260.0	260.0	260.0

Source: Authors' calculations

Table 2 shows the general distribution range and average value of our primary dependent variable included in the model, namely corporate participation (UNGC). When examining the standard deviation and minimum-maximum values of the explanatory variables, it indicates that there is a clear structural heterogeneity among OECD countries in the European region in terms of relevant macroeconomic and institutional indicators throughout the 2013-2022 period. Furthermore, when assessing the skewness and kurtosis coefficients, which indicate the distribution characteristics of the series, and the Jarque-Bera test statistics, it was found that the probability values were less than the 0.05 significance level and that the series did not show a normal distribution. This tendency toward asymmetric distribution, frequently encountered in macro-level panel data sets, is one of the empirical reasons necessitating the use of robust estimators, as outlined in the methodology section of the study.

In addition to descriptive statistics, a correlation matrix was created to determine whether there was a problem of multicollinearity among the independent variables prior to basic regression estimates. Figure 1 presents the correlation heat map showing the bivariate relationships between all variables included in the model.

Figure 1: Correlation Matrix Heatmap



Source: Authors' calculations

When examining the correlation heat map in Figure 1, it is clear that the correlation coefficients between the explanatory variables (ROL, lnGDP, Trade, UD) are well below the critical threshold value of 0.80 generally accepted in the literature. This finding empirically confirms that there is no severe multicollinearity problem among the independent variables included in the analysis that would distort the parameter estimates, and that the standard errors to be used in the model can be calculated in an unbiased manner.

Before estimating the basic regression model that will test the main hypotheses of the study, a series of preliminary diagnostic tests were applied to determine the appropriate panel data specification and to test the validity of the classical assumptions. Table 3 summarizes the findings related to the model selection process and the basic assumption tests.

Table 3: Specification and Diagnostic Test Results for the Baseline Panel Model

Test	Statistic	df	p-value	Decision
Hausman test	Chi-square = 62.3342	5	0.0000	H ₀ rejected; Fixed Effects (FE) estimator is preferred.
Pesaran CD	CD = 10.0046	-	0.0000	H ₀ rejected; cross-sectional dependence (CSD) is present.
Modified Wald	26252,51	25	0,0000	H ₀ rejected; heteroskedasticity is present.
Autocorrelation test (AR(1))	t = 20.4673	-	0.0000	H ₀ rejected; serial correlation (autocorrelation) is present.

Source: Authors' calculations

First, the Hausman (1978) specification test was applied to choose between fixed effects and random effects estimators. The resulting chi-square statistic ($\chi^2 = 62.3342$; $df = 5$) and the corresponding p-value of 0.0000 indicate that the null hypothesis is rejected at the 1% significance level. This result indicates that there is a systematic correlation between unit effects and explanatory variables and that the random effects estimator would be inconsistent. Therefore, it has been empirically confirmed that the model should be estimated within the framework of fixed effects.

Diagnostic tests conducted on the residuals of the selected fixed effects model indicate that the panel data assumptions have been violated. The result of the Pesaran CD test ($CD = 10.0046$; $p = 0.0000$) clearly reveals the presence of cross-sectional dependence among panel units. This finding indicates that macroeconomic and institutional shocks can spread simultaneously among the OECD European countries examined. However, the results of the Modified Wald test indicate the presence of the heteroscedasticity problem ($p < 0.05$). Furthermore, the high t-statistic obtained from the AR(1) autocorrelation test ($t = 20.4673$; $p = 0.0000$) reveals the presence of serial correlation in the error terms. When these findings are evaluated together, it is understood that the standard errors of the classical fixed effects estimator will not be reliable.

As a result, considering the simultaneous presence of cross-sectional dependence, heteroscedasticity, and autocorrelation problems, Driscoll-Kraay robust standard errors were used to ensure the statistical inferences of parameter estimates. This approach provides an estimation strategy that preserves asymptotic consistency in line with the macro panel data structure and provides correction for multiple assumption violations.

The results of the one-way (country) fixed effects model estimated using Driscoll-Kraay standard errors, which are robust to cross-sectional dependence, heteroskedasticity, and autocorrelation issues, are presented in Table 4 to test the main hypotheses of the study.

Table 4: Baseline Fixed Effects Estimation Results (Driscoll–Kraay Standard Errors)

Variable	Coefficient	D-K Std. Error	t-Statistic	p-value
const	-259.6701***	55.9169	-4.6439	0.0000
ROL	17.3383***	5.9503	2.9138	0.0039
LnGdp	9.2860***	1.9449	4.7746	0.0000
Trade	0.1228***	0.0376	3.2636	0.0013
UD	-0.3675***	0.1142	-3.2180	0.0015

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. D-K robust standard errors are used.

Source: Authors' calculations

Table 4 shows that the variables of rule of law (ROL), economic capacity (LnGdp), and trade openness (Trade) have a statistically significant and positive effect on companies' participation in the UNGC ($p < 0.01$). These findings demonstrate that a strong institutional and legal infrastructure, increased national income, and integration into global markets encourage companies to seek legitimacy, thereby promoting participation in international sustainability

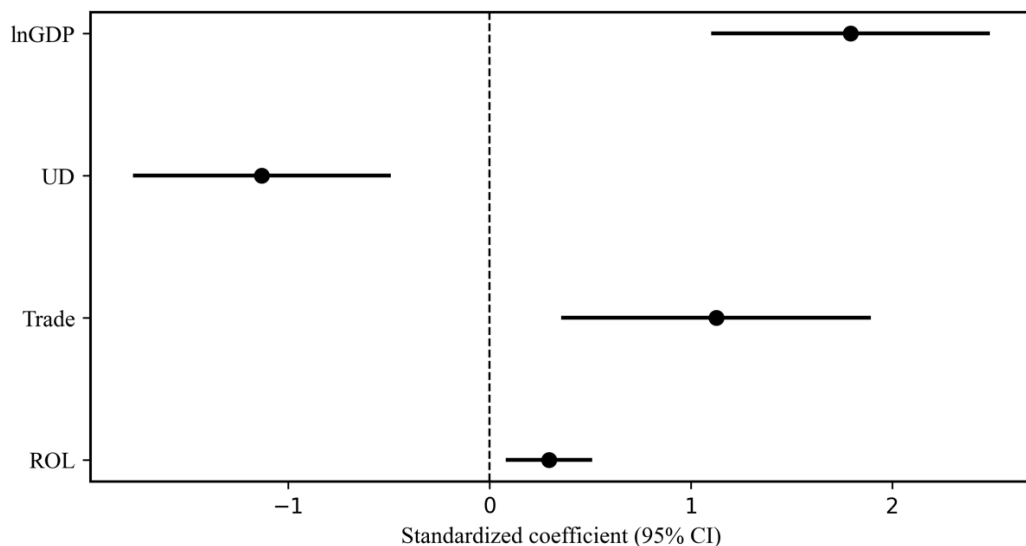
initiatives. Companies in countries with high economic capacity and openness to foreign trade adopt global norms at a higher rate in order to comply with international stakeholder pressures.

On the other hand, it was found that the union density variable has a statistically significant and negative effect on the dependent variable ($p < 0.01$). This noteworthy finding indicates that strong union structures in OECD countries in the European region cause companies to direct their resources towards local and binding collective bargaining agreements rather than voluntary corporate social responsibility projects (UNGC) at the international level. In other words, the rigidity of local labor rights regulations replaces global and flexible sustainability commitments.

Standardized coefficients and 95% confidence intervals, calculated to enable direct comparison of the relative effect sizes on the dependent variable after controlling for explanatory variables measured in different units (logarithmic, percentage, index), are visualized in Figure 2.

Figure 2 confirms that none of the estimated parameters' 95% confidence intervals intersect the zero reference line, reinforcing the statistical robustness of the basic model. Visual analysis of the standardized coefficients confirms that corporate quality and economic capacity (LnGDP) are the most dominant factors in determining companies' sustainability orientation, while commercial openness and union structure have relatively narrower but definite effects.

Figure 2: Standardized coefficients and 95% confidence intervals



Source: Authors' calculations

To test the validity of the study's main findings and their sensitivity to different econometric specifications, two different robustness analyses were conducted, and the results are presented in Table 5.

Table 5: Robustness Checks

Variables	Model 1 (Alternative SE: Cluster Robust)	Model 2 (Lagged Predictors: t-1)
ROL	17.3383 (12.5066)	15.6421** (6.0750)
lnGDP	9.2860** (3.8760)	9.8171** (4.3251)
Trade	0.1228*** (0.0454)	0.0817** (0.0326)
UD	-0.3675** (0.1521)	-0.4858*** (0.1668)
Constant	-259.6701** (112.6542)	-263.6623** (121.6025)
Observations	260	234
R-squared (Within)	0.2843	0.1659
Robust F-statistic	5.5399	5.0074

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses.

Source: Authors' calculations

In the first robustness test (Model 1), the Cluster-Robust Standard Errors method, a robust alternative to the Driscoll-Kraay estimator against cross-sectional dependence and heteroskedasticity issues, was used. The estimation results show that all explanatory variables (lnGDP, Trade, UD) except the rule of law (ROL) retained their signs and significance levels consistent with the baseline model. The loss of statistical significance of the ROL variable under the clustered specification is a methodological issue stemming from the slow-changing (rigid) structure of institutional quality indicators over time, which expands country-clustered standard errors. However, the persistence of the negative and statistically significant effect of union density (UD) strongly confirms the substitution effect between local workers' rights and global sustainability commitments presented in the literature.

In the second analysis (Model 2), to control for potential endogeneity and reverse causality issues between companies' participation in sustainability initiatives (UNGC) and macro-institutional indicators, the model includes lagged (t-1) values of all independent variables. The lagged model results confirm that all variables—institutional quality, economic capacity, trade openness, and union density—have signs consistent with the basic model and high statistical significance (p<0.05 and p<0.01). While a one-period lagged model does not provide a formal solution to potential endogeneity, its consistency with the main results serves as a useful sensitivity check. These results indicate that the baseline findings are not driven solely by contemporaneous associations and are broadly consistent with the theorized temporal ordering of the variables, without implying strict causality. In conclusion, both robustness tests show that the core regression findings remain valid under different estimators and endogeneity controls.

5. Conclusions

This study examined the impact of country-level institutional and economic conditions on voluntary sustainability commitments using a panel data set comprising 26 European countries for the period 2013–2022. In the analysis, voluntary sustainability participation is represented by UN Global Compact intensity, while the rule of law, economic capacity, trade openness, and union density are considered explanatory variables. Within this framework, the study extended a topic predominantly examined at the firm level in the voluntary disclosure literature to the country level, thereby evaluating cross-country variation in UNGC participation alongside the institutional context.

The findings indicate that country-level institutional and economic variables significantly explain UNGC intensity. According to the main results obtained using the fixed effects model and Driscoll–Kraay robust standard errors, the rule of law, economic capacity, and trade openness have a positive and statistically significant effect on UNGC intensity. In contrast, the effect of union density on the dependent variable was found to be negative and significant. Robustness analyses conducted with cluster-robust standard errors and lagged independent variables also showed that the general direction of the main findings was preserved. These results reveal that voluntary sustainability commitments are not independent of the institutional structure at the country level and that UNGC participation is shaped within the macro-institutional context.

When the findings are evaluated together, they suggest that the rule of law, economic capacity, and trade openness create a supportive country context for voluntary sustainability commitments. The positive effect of the rule of law is consistent with the literature suggesting that the reliability and credibility of voluntary corporate commitments can be more easily established in strong institutional structures (Erragragui et al., 2025). Similarly, the positive finding regarding economic capacity supports studies suggesting that more developed economies have a stronger resource base necessary for the adoption and implementation of sustainability principles (Bhatia and Makkar, 2020; Berliner and Prakash, 2012). The positive effect of trade openness is consistent with assessments that international competition, investor expectations, and exposure to global norms make firms more visible and comparable, thereby increasing their propensity to engage in voluntary initiatives (Flammer, 2015; Knudsen, 2011; Berliner and Prakash, 2012). In contrast, the negative and significant effect of union density shows that organised labour does not strengthen UNGC-like global voluntary initiatives in every institutional context. While this finding challenges the theoretical expectations set by Carby-Hall (2016) and Goerke (2022), who posit that unions utilize global agreements to elevate CSR practices, it reveals that the impact of labour is highly context-dependent. This result partially diverges from studies showing that union pressure can support social and governance disclosures (Baldini et al., 2018), but strictly aligns with approaches suggesting that organised labour can create substitution relationships among CSR components (Boodoo, 2020). Thus, the study reveals that voluntary sustainability participation is not

merely a normative corporate orientation but also a contextual outcome shaped by country-level legal capacity, economic opportunities, and stakeholder structures.

These findings indicate that voluntary sustainability initiatives should be considered not only in terms of firm preferences but also in conjunction with public institutional frameworks and national stakeholder structures. At the policy level, this result shows that the proliferation of UNGC-like voluntary initiatives cannot be achieved solely through appeals to firms; it requires a broader institutional framework that strengthens the rule of law, supports economic capacity, and promotes compliance with international standards (Knudsen, 2011; Berliner and Prakash, 2012). Similarly, the positive effect of trade openness suggests that integration into global markets makes firms more responsive to international norms, indicating that the relationship between external economic integration and sustainability governance should be considered in policy design (Flammer, 2015). The negative finding regarding union density suggests that labour institutionalisation does not always increase the orientation towards global voluntary programmes and that in some countries, more local, binding, and direct worker-rights mechanisms may take precedence. Therefore, policymakers and regulatory bodies should jointly assess the country's industrial relations structure, worker representation mechanisms, and institutional enforcement capacity when promoting voluntary sustainability programmes (Baldini et al., 2018; Boodoo, 2020).

However, this study has some limitations. First, the analysis is limited to 26 European countries during the period 2013–2022; therefore, caution is required when directly generalising the findings to different regions, groups of developing countries, or institutional contexts outside Europe. Second, while UNGC intensity is an observable indicator of voluntary sustainability engagement, it may not fully reflect the depth of firms' commitments, the quality of implementation, or the difference between symbolic participation and actual corporate transformation (Kell, 2005; Berliner and Prakash, 2012). Third, as the study focuses on country-level determinants, it does not include micro-level elements such as firm size, ownership structure, sector, or corporate governance characteristics in the model; however, the voluntary disclosure literature indicates that these variables are also important (de Villiers and Marques, 2016). Future research could develop models that integrate country- and firm-level variables within multilevel frameworks; alternative indicators could also be developed that consider not only the quantity of UNGC participation but also the quality of commitments and implementation performance. Comparative studies examining how the negative impact of organised labour changes across different institutional contexts could contribute to a more detailed understanding of the relationship between voluntary sustainability programmes and local industrial relations structures (Boodoo, 2020; Baldini et al., 2018).

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Appendix A.

List of Countries Included in the Panel

The panel dataset comprises 26 OECD member countries located in or closely economically integrated with the European region. The countries are: Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and Türkiye.