

# University sustainability performance as a catalyst for societal change

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## Abstract

**Purpose** - Despite broadening acceptance in society of the need to prioritise social and environmental sustainability, individuals and groups who dispute its relevance represent a grand challenge. Universities are uniquely placed to institutionalise the idea that pursuing sustainability is the ‘right thing to do’. As universities that prioritise sustainability themselves are more likely to be effective in promoting sustainability more broadly, this study explores what drives universities’ sustainability performance.

**Design/Methodology/Approach** – We combine external rankings data and internal sustainability performance data from the top 700 universities globally, using a regression model to explore the key determinants of sustainability performance. Drawing upon institutional theory, we critically examine the drivers shaping sustainability performance within higher education.

**Findings** – Overall, we find that large universities with greater access to resources and strong academic reputations are associated with better sustainability performance. The findings reveal the following characteristics to be drivers of sustainability performance: faculty student ratio, international student ratio, number of students, public university, university ranking, academic reputation, citations per faculty member, international research network and employment outcomes, legal tradition, academic freedom and political stability.

**Practical Implications** – Policymakers and university administrators should recognise the importance of economic and geopolitical factors in shaping sustainability performance within the higher education sector. Greater public funding, growing international student enrolments at higher tuition fees, as well as growing domestic enrolments, allow greater access to resources that positively influence sustainability performance. By leveraging regional sustainability initiatives and international research networks, universities can enhance their sustainability performance and contribute meaningfully to institutionalising the notion of sustainability globally.

**Originality/Value** – This study contributes to a deeper understanding of the transformative potential inherent in universities as agents of societal change and sustainability advocacy to overcome the grand challenge of groups and individuals who resist and promote ignoring social and environmental sustainability. By elucidating the mechanisms through which universities embrace and perpetuate sustainability, this research contributes to informed policy interventions and strategic initiatives aimed at fostering a more sustainable and equitable future.

**Keywords:** *University sustainability performance; Sustainability rankings; Normative isomorphism*

## 1.Introduction

Universities create and disseminate new knowledge to new generations, influence life-long learners, and act as the ‘critic and conscience’ of society (Coy *et al.*, 2001; Ntim *et al.*, 2017). Universities are known advocates for environmental and social awareness (Di Nauta *et al.*, 2018) and have the potential to exert their influence to help to institutionalise sustainability across society more broadly (Guthrie *et al.*, 2020; Pee and Vululleh, 2020; Purcell *et al.*, 2019). Normative isomorphism, which concerns believing and taking-for-granted that something is the ‘right thing to do’, is often driven by education (DiMaggio and Powell, 1983). Universities that express their commitment to social and environmental issues are more likely to attract funding (Manes Rossi *et al.*, 2020) and future generations of students who are passionate about sustainability topics (THE, 2021), perpetuating societal interest in pursuing social and environmental concerns. Yet, despite their potential to drive societal change, universities have been criticised for focusing on reporting and rankings rather than genuine change (Guthrie and Neumann, 2007; Lozano, 2011; Sassen and Azizi, 2018; Shattock, 2017; Swartz *et al.*, 2019). In addition, there are barriers to innovation and sustainable development, particularly for universities in certain geographical regions (Ávila *et al.*, 2017). These issues suggest the need for rigorous academic inquiry into the determinants and dynamics shaping sustainability performance within the higher education landscape, a topic that has not been answered through prior research.

Our study focuses on the multiple factors that shape university sustainability performance, as measured by university sustainability rankings. Using a global sample of 700 universities and data from both ranking systems and university reports, we conduct regression analyses to understand the determinants of sustainability performance. We find that the following specific factors are positively related to sustainability performance in universities: faculty student ratio, international student ratio, number of students, public university, university ranking, citations per faculty member, international research network, employment outcomes, legal tradition, academic freedom, and political stability. These findings can be summarised as providing evidence that large universities with better reputations and greater access to resources are associated with better sustainability performance. By exploring the interplay between institutional forces and organisational behaviour, using an institutional theory lens, we reveal the mechanisms driving universities' commitment to sustainability, given the pressures they face.

Against the backdrop of escalating global sustainability challenges, this study contributes by highlighting the pivotal role of universities as agents of societal change and sustainability advocacy. By leveraging their position as global repositories of knowledge and influence (De Villiers *et al.*, 2024a), universities can confront the formidable obstacle of systemic resistance to sustainability, cultivating a societal understanding that prioritising social and environmental well-being is not only commendable but imperative, and should be seen as the ‘right thing to do’. Our findings can be used to inform policy development and interventions, and strategic initiatives geared towards developing a more sustainable and equitable future for generations to come. Our study also contributes to the academic literature on sustainability in higher education.

The structure of this paper is as follows. The second section provides the theoretical background of this study along with an overview of university sustainability performance, and an examination of sustainability and university characteristics. The third section details our sample and the measures used. In the fourth section, we present the regression results and findings from robustness tests. The fifth section discusses our findings from an institutional theory perspective and the sixth section concludes the paper, presenting suggestions for further research.

## **2. Background and theory**

### *2.1 University sustainability performance and rankings*

In the university context, sustainability performance encompasses not only operational sustainability practices but also the university's broader influence on societal norms, through education, research, and community engagement. We consider sustainability in its broadest sense in our paper, following the United Nations (UN) Brundtland Commission definition of sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987, p41). The broader notion of university sustainability performance includes how effectively universities implement sustainability goals aligned with the SDGs (Kauffman and Lafarre, 2021; De Villiers et al., 2024a). Universities' sustainability performance contributes to societal change by shaping values, behaviours, and policies across generations. This concept is distinct from traditional business sustainability performance as explored by Kauffman and Lafarre (2021), which is focused primarily on corporate social responsibility and economic efficiency in business.

Sustainability performance refers to a university's measurable achievements in social and environmental initiatives as assessed through sustainability rankings. Universities assess their sustainability performance by identifying and quantifying key performance indicators (Jódar and De la Poza, 2020). This practice has given rise to the widespread adoption of university rankings systems, including the QS World University Rankings, established by Quacquarelli Symonds in 2004, which we use in this study. The QS Sustainability Rankings (QS-SR), first published in 2022, are the largest of their type in the world, assessing 700 universities worldwide to determine their social and environmental impact. These rankings are based on the Scopus database and a survey of university portfolios (Symonds, 2023). Notably, European and North American universities consistently dominate the QS rankings, possibly attributable to the UK origin of the rankings and the influence of Anglo-American culture (Muñoz-Suárez *et al.*, 2020). Only 17% of the information pertaining to QS reputation surveys comes directly from Elsevier's Scopus literature metrics and other third-party data; the added benefit of utilising reputation survey information for QS-SR is still up for debate (Calderon, 2023).

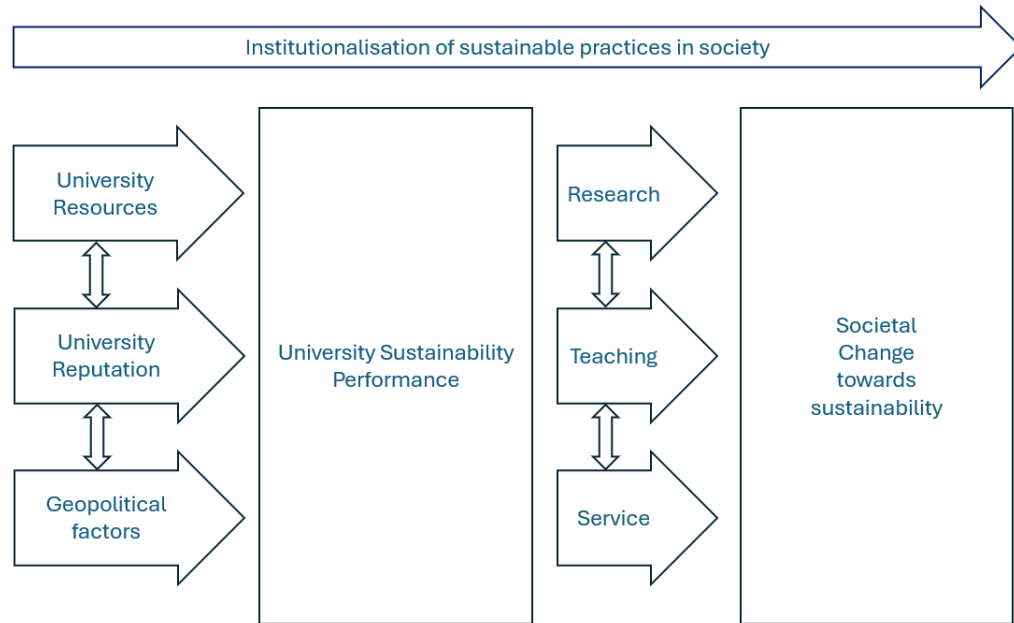
Universities are motivated to release sustainability information because of stakeholder accountability and the evaluation of their influence on university sustainability performance (Chatelain-Ponroy and Morin-Delerm, 2016; Deegan, 2002). Improvements in university rankings send signals to the market, which are then continually amplified and reflected in the market, encouraging universities to keep

improving (Safón, 2019). Sustainability rankings serve to enhance a university's global reputation, attracting participation from other universities that have not engaged in rankings due to limiting factors (Calderon, 2023). Rankings also give universities competitive advantage in attracting students and funding in an increasingly competitive sector (Shin and Toutkoushian, 2011), as students and funders use rankings when benchmarking and selecting universities (Kehm and Stensaker, 2009; Rehman, 2019). De la Poza *et al.* (2021) show a significant correlation between sustainability performance goals and university rankings. Modifying a university's sustainability practices through sustainability rankings can improve planning and future sustainable performance reporting (Moggi, 2023). Crucially, universities taking a leading role in sustainability can set examples for other universities to follow suit, encouraging a wider sense of imitation among the academic community (DiMaggio and Powell, 1983).

## *2.2 Influences on university sustainability performance and rankings*

The potential influences on university sustainability performance and rankings come from outside and within universities. Rowlands *et al.* (2017) and other researchers in higher education such as Fulton (2002) and McCann *et al.* (2021) consider two categories of influence: internal and external. Internal factors comprise resources such as students and faculty, and external factors comprise social and political factors. As our paper is heavily focused on rankings, which represent both internal and external factors, we introduce a third category, reputation, to reflect factors that cross the boundary between internal and external. We therefore name our categories of interest as university resources (internal), university reputation (internal and external), and geopolitical considerations (external). The three categories also differ in terms of their tangibility. University resources consist of tangible factors, such as funding and student numbers, that influence sustainability performance. Reputation is an intangible factor that nonetheless has a considerable influence on university sustainability performance. Geopolitical factors are mainly intangible factors outside a university's immediate control but with the potential to exert a strong influence over their activities. Universities exert varying levels of influence over the three categories, and the categories themselves are continually evolving in terms of their overall influence on university activity (Shattock, 2013), with rankings having an increasingly important bearing (Shattock, 2017).

In Figure 1, we provide a framework that shows our three categories and their influence on sustainability performance. The empirical analysis of our paper focuses on the drivers of sustainability performance (the left-hand side of Figure 1), while our critical discussion, based on the empirical findings, extends to the right-hand side of the figure, i.e. how universities influence societal change through their core activities of research, teaching, and service. We expand on these areas later in the paper where we consider practical and policy implications and future research avenues. In the remainder of this section, we focus on the three core groupings of resources, reputation, and geopolitical factors, and how these three categories influence university sustainability performance.



**Figure 1: Conceptual model of the factors shaping university sustainability performance and universities' societal impact**  
 (Source: Developed by the authors)

### 2.2.1 University Resources

Universities are heavily influenced by the resources available to them, making the student body a key potential influence on sustainability performance. Sustainability is a potential competitive advantage for global universities in attracting students (Atici *et al.*, 2021). Students are a key source of revenue for universities and also provide a future network of alumni to promote universities and their academic and sustainability credentials. Universities consistently communicate values of environmental sustainability to their students (Gamage and Sciulli, 2017) at national and societal levels (Alshuwaikhat and Abubakar, 2008). Students are participants and decision makers in the society of the future and attracting them brings resources and legitimacy to universities (de Lange, 2012). Leading universities typically exhibit substantial scale, featuring an average student population of approximately 30,000 and a faculty size around 3,000 (Liu *et al.*, 2019). McAleer *et al.* (2019) argue that university size, particularly Full-Time Equivalent (FTE) scale, student enrolment, and internationalisation, can have a significant impact on the academic rankings of public and private universities. The rise in international student mobility contributes to increased university revenue (Liu *et al.*, 2019), leading to more technological advancements and research (Soyer *et al.*, 2020), and thereby playing a role in the sustainable development of universities.

Teaching, identified as one of the key dimensions within the indicators of university sustainability reporting (Sepasi *et al.*, 2018), serves as a reflection of societal and cultural norms (Lukman *et al.*, 2010). Many countries assess university teaching programs from the perspective of sustainable performance. A global study by Leal Filho *et al.* (2019) encompassing 17 countries focused on data related to university sustainable development goals (SDGs) and the integration of sustainable development

into teaching. Piasentin and Roberts (2018) presented a pilot study based on a master's level sustainability programme at the University of Lincoln. Sepasi *et al.* (2018) utilised the University of California as a case study to examine its sustainability performance in the realm of education. These studies highlight how the concept of university sustainability and its integration into the curriculum is constantly being validated, showing that teaching measures are suitable for a comprehensive assessment of university sustainability performance (Hernández-Díaz *et al.*, 2021). They further suggest that when an entire nation is sustainability-conscious, the impact of a university's sustainability education and research becomes more substantial (Atici *et al.*, 2021). Nevertheless, it is difficult for universities to compare themselves with each other in terms of sustainability education, due to the absence of studies on syllabus evaluation (Chuvieco *et al.*, 2022). In addition, the corporate-style criteria used to assess curricula have led to claims that traditional measures of academic quality are increasingly being overtaken by measures of success associated with the private sector (Maingot and Zeghal, 2008). For example, while faculty/student ratios are a popular measure of teaching quality, suggesting smaller classes and easier access to faculty, this ratio does not reflect the quality of the curriculum.

Governments and other funders also play a critical role in university resourcing. Financial support from public and private sources is increasingly tied to sustainability performance, following trends favouring socially responsible investments. Joint initiatives and partnerships with funders may require shared sustainability goals, formalised through reporting mechanisms (Manes Rossi *et al.*, 2020). According to our analysis of both QS and QS-SR rankings, the number of public universities consistently surpasses that of private universities. The top 500 universities entering the global university rankings in the UI GreenMetric rankings also show that there are twice as many public universities as private ones (Muñoz-Suárez *et al.*, 2020). This suggests that public universities are better equipped than private universities to cope with the setbacks and problems that may arise on the road to sustainability such as climate change and economic profitability (Muñoz-Suárez *et al.*, 2020). It underscores the crucial role played by governments in different nations in advancing the sustainability performance of universities by supporting public institutions. As an example, the number of sustainability reports produced by public universities in Ghana far outnumbers the number of sustainability reports produced by private universities in the country (Amoako, 2023). This provides evidence that stakeholders are more interested in the financial status of public universities, and related qualitative information, than they are for private universities (Greiling and Grüb, 2014). Additionally, younger universities demonstrate a stronger commitment to sustainability, being more adaptable to societal needs and actively engaging in environmental conservation efforts (Muñoz-Suárez *et al.*, 2020). Universities interact with numerous external bodies, often partnering with other organisations to promote sustainability issues. This not only fosters research connections and collaborations, but it also shows how universities can perform a service to society in a broader sense. Universities have a responsibility to promote innovative technologies for environmental sustainability, including the sharing and implementation of initiatives to reduce carbon emissions, thereby creating a positive societal impact (Filho *et al.*, 2019). In New Zealand, universities explicitly highlight environmental aspects in their sustainable development reports (An *et al.*, 2017). However, other scholars have shown that universities that have been subjected to comparative analyses of environmental sustainability have not fully utilised the

relationship between economic effectiveness and socio-environmental efficiency (Muñoz-Suárez *et al.*, 2020).

### 2.2.2 University Reputation

Reputation, as an intangible asset, affords sustainable competitive advantage (Barney, 1991) which is of strategic importance to universities and therefore likely to influence performance (including sustainability performance). The reputation of universities is often subject to the influence of general or context-specific factors and multiple reputation rankings, with the dynamically changing real-world reputation proving more intricate than static theoretical reputation rankings (Topaler and Ayvaz-Cavdaroglu, 2021). Altbach (2012) states that the motivation for universities to pursue prestige is universal across the globe, with economic, historical, ecological, political and social factors driving this. Hence, viewed from a macro perspective, universities should not only secure and safeguard their reputations but also actively cultivate them (Askin and Bothner, 2016). In practical terms, university vice-chancellors must recognise the potential benefits brought by organisational reputation and strategically reallocate resources to exert influence on internal and external stakeholders (Martinez and Henkle, 2022). Prestige is an important feature in attracting a steady stream of talented students, scholars, and administrators (Espeland *et al.*, 2016). University prestige affects the production of academic outputs (Sine *et al.*, 2003), and the technological and academic outputs of universities play a pivotal role in a nation's technological advancement, scientific progress, and economic growth (Rosenberg and Nelson, 1994). In addition to rankings as a measure of prestige, universities may also sign up to agreements and principles that paint them in a favourable light in terms of sustainability performance, for example signing up to the Principles for Responsible Management Education (PRME).

Academic reputation reflects the achievements of a university (Alessandri *et al.*, 2006). Output-based performance measures such as the number of research publications not only stand as a crucial metric for evaluating academic professionals but also act as a further incentive for their scholarly output (Ghabban *et al.*, 2019). Studies have shown that the expansion of master's and doctoral programs has contributed positively to the increase in the number of publications (Masum *et al.*, 2015). The quantity of articles published by countries and universities in the sustainability field often serves as a microcosm of these organisations' place in the field. These measures are likely to influence measures of sustainability performance. However, some scholars contend that the emphasis on publication quantity has a detrimental impact on sustainability, as many universities seek to enhance their global rankings by increasing the volume of publications, while potentially overlooking crucial objectives of working towards sustainability (Fauzi *et al.*, 2020; Muñoz-Suárez *et al.*, 2020). In addition, a frequently overlooked aspect is that most research published in non-English languages is not considered in world ranking systems (Liu *et al.*, 2019). Traditionally, assessments of academic reputation in universities have been predominantly motivated by the objective of enhancing university rankings (Hazelkorn, 2015), not to imply that the university makes a social contribution (Aksnes *et al.*, 2019). Muñoz-Suárez *et al.* (2020) observed a low correlation between academic and sustainability performance in universities. However, scholars such as Atici *et al.* (2021) posit that a significant and positive relationship exists between energy, climate change,

waste, water, transportation, and the academic performance of universities. For example, where a university is situated in a country with a better environmental performance, there is a substantial correlation between environmental and infrastructure factors and educational, research, and academic accomplishments (Atici *et al.*, 2021).

Graduates from universities with a positive reputation and credibility are considered worthy of being employed (Sultan and Wong, 2012), indicating promising future career prospects (Harahap *et al.*, 2018). Employers benefit from competent employees who contribute value (Murrar *et al.*, 2021), as skilled employees increase productivity, which in turn improves the sustainable competitiveness of the organisation (Hamilton and Davison, 2018). Organisations with positive evaluations and word-of-mouth, rooted in employee experiences such as welfare and compensation, career opportunities, company culture, and values, are more likely to be preferred (Saini and Jawahar, 2019). Organisations that can motivate and keep their employees healthy contribute to the development of sustainable people's employability and maintain long-term stable employment relationships (Piwowar-Sulej and Bąk-Grabowska, 2020). In recent years, there has been a notable increase in the reported number of cases related to organisations' failure to provide equal opportunities for women for judicial access and services (Filho *et al.*, 2022). This emphasises the pivotal role of gender equality as a key factor in sustainable performance (Filho *et al.*, 2022). The underrepresentation of women in technology and education fields is attributed to gender stereotypes (Taher, 2021). Equal opportunities in scientific careers (Hansmann, and Schröter, 2018), and equal digital rights (Chen *et al.*, 2020), all contribute to the realisation of social equality and thus to the sustainable development of society. Universities have a key role as educators and influencers in promoting equal opportunities and rights and encouraging others to follow suit.

### 2.2.3 Geopolitical factors

When examining the performance of universities in sustainability rankings across the world, it becomes evident that the universities committed to sustainability performance are not confined to developed, high-income nations but are dispersed globally (Calderon, 2023). Furthermore, sustainability rankings indicate that the academic hegemony of the Anglo-American sphere is facing potential threat from sustained competition coming from East Asia (Muñoz-Suárez *et al.*, 2020). There are notable differences in the global distribution of universities, with a concentration in Asia, Europe, Latin America, and North America. Differences in geographic climates and living environments have led to different energy needs for universities, resulting in different missions in sustainability for universities in different geographic regions (Lauder, 2015). In addition, the level of political stability in a country may influence the sustainability activities of universities.

In addition to geographic influences, legal and political influences are also likely to be in play. There has been an increase in the voluntary provision of sustainability-related information by a number of institutions, including universities, and this may be due to a perceived future necessity to provide such information (Adams, 2013; Alonso-Almeida *et al.*, 2015; Ceulemans *et al.*, 2015; Hummel and Schlick, 2016). Universities are increasingly tasked with articulating their contributions to the national agenda through their teaching and research, operating within a global and

national regulatory landscape in which voluntary reporting on sustainability is commonplace and in which mandatory reporting is increasingly likely (De Villiers *et al.*, 2024b; Shan *et al.*, 2022). In Europe, for example, the EU Directive requires large companies and listed companies to disclose information on the risks and opportunities arising from social and environmental issues, and on the impact of their activities on people and the environment. The UN SDGs are now widely reported on (Adams, 2013), and this is often a feature of a country's commitment to the SDGs and reporting norms (Carungu *et al.*, 2022). The legal environment is another likely influence on university sustainability performance, as a country's legal origin shapes institutions and practices. In civil law countries, where there is a strong emphasis on written law and statutes, principles for sustainable development can be incorporated into key statutes, which then become a mechanism for disseminating sustainability goals (Gordon *et al.*, 2014; Garmestani *et al.*, 2013). Research has found that firms from civil law countries have higher CSR rankings than those from common law countries and are more responsive to CSR shocks (Liang and Renneboog, 2017). The same may be true for universities. The level of academic freedom also has important implications for international higher education (Gibbs, 2016) and may impact the attention paid by universities to sustainability initiatives in the face of changing political pressures around the ESG agenda (Fowler, 2025).

### *2.3 Institutional theory in the context of universities' pursuit of sustainability*

We consider and discuss university sustainability performance using the lens of institutional theory. The many determinants introduced above have varying levels of influence over the sustainability performance of universities, and consequently varying levels of influence over society at large. Institutional theory provides insights into how organisations respond to pressures in their environments, adopt certain practices, and seek legitimacy (De Villiers and Alexander, 2014). At the core of institutional theory lies the concept of isomorphism, which refers to the process of organisations becoming more similar to one another over time (Di Maggio and Powell, 1983). This convergence is driven by various forces within the organisational environment, leading to behavioural similarities among organisations within the same field. It may, therefore, help in understanding the determinants of sustainability rankings of world universities.

Mimetic isomorphism occurs when organisations imitate or emulate the practices of others, particularly those deemed successful or legitimate within their field. In the context of sustainability rankings, universities may mimic the sustainability initiatives of peer universities, driven by a desire to enhance their reputation or maintain competitiveness (De Villiers *et al.*, 2024a). For example, a university may replicate the sustainability reporting practices of a prestigious university in response to perceived legitimacy or market pressures. Coercive isomorphism involves organisations conforming to external pressures, such as regulations, mandates, or societal expectations (Di Maggio and Powell, 1983). Universities may face coercive pressures from regulatory bodies, government policies, or stakeholder demands to prioritise sustainability initiatives (De Villiers *et al.*, 2024a). For instance, legislative mandates requiring universities to reduce carbon emissions or enhance environmental stewardship can drive conformity to sustainability standards. Normative isomorphism occurs when organisations internalise and institutionalise shared norms, values, or beliefs prevalent within their professional or social context (Di Maggio and Powell, 1983). Universities play a pivotal role in disseminating and reinforcing norms

surrounding environmental stewardship, social responsibility, and ethical conduct (De Villiers *et al.*, 2024a). Isomorphic forces often operate in tandem, shaping organisational behaviour and field-level change over time. Initially, organisations may resort to mimetic isomorphism to navigate uncertainty and emulate best practices (Di Maggio and Powell, 1983). As regulatory frameworks and societal expectations evolve, coercive pressures may intensify, compelling organisations to comply with sustainability mandates and standards. Over time, normative isomorphism emerges as shared norms and professional standards become institutionalised within the field (De Villiers and Alexander, 2014).

According to institutional theory, organizations tend to conform to prevailing norms and expectations within their environment (DiMaggio and Powell, 1983). In the context of higher education, universities engaging in sustainability reporting and pursuing sustainability rankings demonstrate their commitment to societal and environmental responsibility. By reporting their sustainability efforts, universities not only reinforce their legitimacy but also contribute to the broader adoption of sustainable practices within society. Building on this foundation, this study seeks to understand the key factors influencing university sustainability performance. Thus, our research question is: What drives university sustainability performance?

### **3. Research Method**

#### *3.1 Choice of research method*

Considering the cross-sectional nature of our study data, we explore the determinants of university sustainability performance by running cross-sectional ordinary least squares (OLS) regression model, following Artiach *et al.* (2010). We consider university sustainability performance as the dependent variable and examine the relationship between university sustainability performance and a series of independent variables representing our three categories of interest.

#### *3.2 Data and sample*

The research sample comprised the 700 universities in the QS Sustainability University report database for 2022 and 2023. Data are from the QS World University Rankings, QS Sustainability Rankings and the annual reports of each university. We started with 1,400 observations (700 universities for two years). After excluding seven observations due to missing variables, the final sample consisted of 1,393 observations. We winsorised the top and bottom 1% of each variable (excluding the sustainability overall score) to minimise the impact of outliers on the results.

#### *3.3 Sample distribution*

Table 1 shows the sample distribution by country, including the number of universities from each country, the percentage out of the total 1,393 observations, and the mean sustainability score for universities in each country. The two countries with the most universities in the top 700 are the US with 19% and the UK with almost 10%. The average sustainability score is about 47 out of 100, with the US and UK averages being higher at about 55 and 60 respectively.

**Table 1: Sample distribution by Country**

Country/Area	# of university observations	Percentage (%)	Mean score of SUSTAIN PER
Argentina	2	0.14	50.425
Australia	66	4.74	63.773
Austria	14	1.01	41.903
Bangladesh	4	0.29	31.825
Belgium	16	1.15	60.050
Brazil	28	2.01	44.083
Brunei	2	0.14	34.525
Canada	52	3.73	63.753
Chile	8	0.57	50.731
China (Mainland)	74	5.31	43.978
Colombia	8	0.57	44.606
Costa Rica	2	0.14	31.475
Croatia	2	0.14	44.725
Cyprus	2	0.14	37.000
Czech Republic	8	0.57	53.506
Denmark	10	0.72	65.780
Egypt	6	0.43	43.533
Estonia	2	0.14	39.375
Finland	18	1.29	55.175
France	48	3.45	44.706
Germany	78	5.60	48.824
Ghana	2	0.14	34.375
Greece	8	0.57	42.800
Hong Kong	12	0.86	61.879
Hungary	6	0.43	44.800
India	30	2.15	40.065
Indonesia	4	0.29	46.450
Iran	6	0.43	35.075
Ireland	14	1.01	58.864
Israel	12	0.86	44.558
Italy	62	4.45	47.002
Japan	26	1.87	56.853
Jordan	4	0.29	40.562
Latvia	4	0.29	36.050
Lebanon	2	0.14	65.125
Lithuania	2	0.14	38.375
Malaysia	18	1.29	51.192
Mexico	8	0.57	52.038
Morocco	2	0.14	26.975
Netherlands	26	1.87	59.838
New Zealand	16	1.15	67.278
Norway	8	0.57	60.088
Oman	2	0.14	41.175
Pakistan	10	0.72	38.120
Peru	2	0.14	41.050

Philippines	4	0.29	40.550
Poland	6	0.43	49.800
Portugal	12	0.86	58.129
Puerto Rico	2	0.14	33.175
Qatar	2	0.14	52.300
Romania	4	0.29	45.038
Russia	10	0.72	38.385
Saudi Arabia	6	0.43	49.483
Serbia	2	0.14	37.550
Singapore	4	0.29	77.313
Slovenia	4	0.29	36.713
South Africa	18	1.29	52.264
South Korea	26	1.87	50.179
Spain	49	3.52	51.989
Sweden	16	1.15	71.688
Switzerland	16	1.15	60.572
Taiwan	22	1.58	46.184
Thailand	14	1.01	48.982
Tunisia	2	0.14	35.800
Turkey	22	1.58	41.282
Uganda	2	0.14	35.800
UAE	6	0.43	44.208
United Kingdom	136	9.76	60.190
United States	265	19.02	55.203
Uruguay	1	0.07	28.325
Vietnam	6	0.43	31.783
Total	1,393	100	47.285

**Source(s):** Table by authors

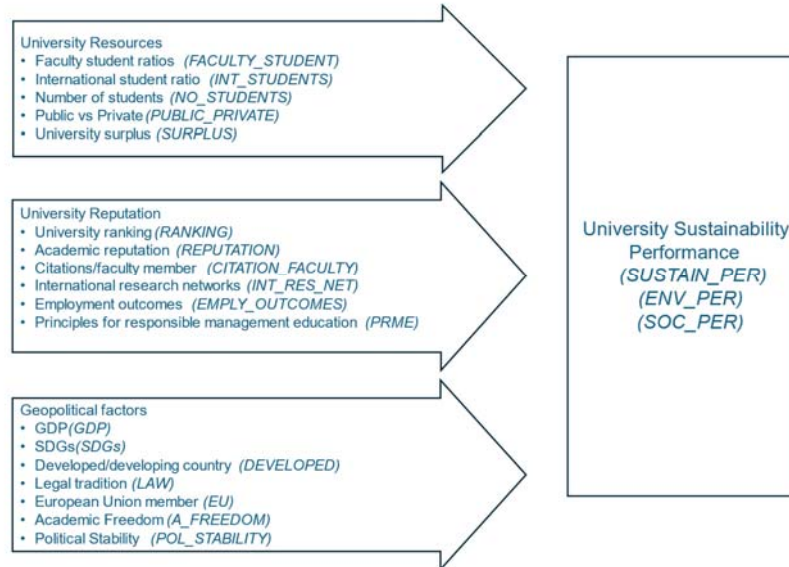
### 3.4 Regression model

We use the following model to examine the determinants of university sustainability performance:

$$LOG\_SUSTAIN\_PER_i = \alpha + \sum \beta_i \text{Determinants} + \Sigma \text{Year} + \Sigma \text{Country} + \varepsilon (1)$$

where the dependent variable  $LOG\_SUSTAIN\_PER_i$  represents the natural logarithm of the average of the social and the environmental impact in the QS Sustainability performance score of university  $i$  in year  $t$ .

The selection of independent variables (the determinants) follows the literature review in Section 2, including Hamdan et al. (2024). These sources highlighted three main categories of influence on university sustainability performance: resources, reputation, and geopolitical factors. Figure 2 summarises the dependent and independent variables under these three groupings. The measurements for each variable are discussed in detail below. Details about the measurement of the dependent and independent variables, including the data sources and justification, is provided in Appendix 1. We use annual fixed effects to control for time variations and country differences in sustainability.



**Figure 2: Summary of the dependent and independent variables**  
 (Source: Developed by the authors)

### 3.5 Descriptive statistics and correlation

Table 2 provides descriptive statistics. The average value of the sustainability overall score per university in the sample is 52.66, with a standard deviation of 20.77. Similarly, the mean value of the natural logarithm of sustainability score per university in the sample is 3.86, with a standard deviation of 0.48. The untabulated correlation matrix shows that sustainability performance is positively correlated with the following characteristics: faculty student ratio, international students' ratio, number of students, public university, university ranking, academic reputation, citations per faculty member, international research network and employment outcomes, legal tradition, academic freedom, and political stability. These results provide an initial indicator of the determinants of university sustainability.

**Table 2: Descriptive Statistics**

Variable(s)	Mean	SD	Min	P25	Median	P75	Max
<b>Sustainability Performance</b>							
SUSTAIN_PER	52.66	20.77	9.20	35.60	54.75	68.90	100.00
LOG_SUSTAIN_PER	3.86	0.48	2.22	3.57	4.00	4.23	4.61
ENV_PER	54.42	25.02	1.00	32.80	59.30	75.00	100.00
LOG_ENV_PER	3.83	0.66	0.00	3.49	4.08	4.32	4.61
SOC_PER	50.89	20.72	1.00	35.80	50.65	66.50	100.00
LOG_SOC_PER	3.82	0.52	0.00	3.58	3.92	4.20	4.61
<b>University Resources</b>							
FACULTY_STUDENT	32.18	29.38	1.60	8.90	19.60	51.30	100.00
LOG_FACULTY_STUDENT	2.99	1.05	0.47	2.19	2.98	3.94	4.61
INT_STUDENT	34.93	33.12	1.00	5.60	22.15	60.20	100.00
LOG_INT_STUDENT	2.88	1.34	0.00	1.72	3.10	4.10	4.61
NO_STUDENTS	29485.90	26499.76	1992.00	15792.00	24873.50	34914.00	346730.00
LOG_STUDENTS	10.07	0.65	7.60	9.67	10.12	10.46	12.76
PUBLIC_PRIVATE	0.91	0.29	0.00	1.00	1.00	1.00	1.00
SURPLUS	0.24	0.43	0.00	0.00	0.00	0.00	1.00
<b>University Reputation</b>							
RANKING	425.63	332.84	1.00	163.00	325.50	700.50	1500.00
REPUTATION	32.98	26.71	2.20	12.50	23.05	46.20	100.00
LOG_REPUTATION	3.16	0.86	0.79	2.53	3.14	3.83	4.61
CITATION_FACULTY	39.26	29.13	1.60	14.30	32.90	60.10	100.00
LOG_CITATION_FACULTY	3.28	1.01	0.47	2.66	3.49	4.10	4.61
INT_RES_NET	59.42	29.51	1.00	36.50	64.50	85.20	100.00
LOG_INT_RES_NET	3.83	0.92	0.00	3.60	4.17	4.45	4.61
EMPLY_OUTCOMES	31.06	26.48	1.00	11.20	20.60	44.10	100.00
LOG_EMPLY_OUTCOMES	3.07	0.89	0.00	2.42	3.03	3.79	4.61
PRME	0.32	0.47	0.00	0.00	0.00	1.00	1.00
<b>Geopolitical Factors</b>							
GDP	44799.79	25536.02	1021.04	27685.15	45757.98	67866.79	106622.83
LOG_GDP	10.42	0.92	6.93	10.23	10.73	11.13	11.58
SDG	76.89	5.18	55.02	74.74	76.81	80.54	86.76
LOG_SDG	4.34	0.07	4.01	4.31	4.34	4.39	4.46
DEVELOPED	0.47	0.50	0.00	0.00	0.00	1.00	1.00
LAW	0.45	0.50	0.00	0.00	0.00	1.00	1.00
EU	0.29	0.45	0.00	0.00	0.00	1.00	1.00
A_FREEDOM	0.71	0.27	0.00	0.69	0.79	0.90	0.98
POL_STABILITY	2.74	0.59	0.60	2.46	2.91	3.14	3.96

Note: All variable definitions are in Appendix 1.

Source(s): Table by authors

**Table 3: Determinants of University Sustainability Performance - Main Results**

Variable(s)	DV =	DV =	DV =
	LOG SUSTAIN PER	LOG ENV PER	LOG SOC PER
	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
<b>University Resources</b>			
LOG_FACULTY_STUDENT	0.0509*** (5.57)	0.0597*** (4.04)	0.0481*** (3.89)
LOG_INT_STUDENT	0.0434*** (5.53)	0.0210* (1.65)	0.0653*** (6.15)
LOG_STUDENTS	0.1358*** (8.97)	0.1006*** (4.11)	0.1794*** (8.76)
PUBLIC_PRIVATE	0.0545** (2.10)	0.0174 (0.41)	0.1013*** (2.88)
SURPLUS	0.0102 (0.59)	0.0162 (0.58)	0.0021 (0.09)
<b>University Reputation</b>			
RANKING	0.0001*** (3.34)	0.0002*** (2.75)	0.0001* (1.93)
LOG_REPUTATION	0.1828*** (12.98)	0.1834*** (8.04)	0.2158*** (11.33)
LOG_CITATION_FACULTY	0.1074*** (9.84)	0.1358*** (7.68)	0.0884*** (5.99)
LOG_INT_RES_NET	0.0383*** (3.40)	0.0159 (0.87)	0.0741*** (4.86)
LOG_EMPTY_OUTCOMES	0.0388*** (3.69)	0.0103 (0.61)	0.0668*** (4.70)
PRME	0.0222 (1.36)	0.0017 (0.06)	0.0425* (1.92)
<b>Geopolitical Factors</b>			
LOG_GDP	-0.0025 (-0.14)	-0.0375 (-1.28)	0.0218 (0.89)
LOG_SDG	0.1583 (0.79)	0.1956 (0.61)	0.2487 (0.92)
DEVELOPED	0.0257 (1.17)	0.0093 (0.26)	0.0437 (1.47)
LAW	0.0872*** (3.97)	0.0502 (1.41)	0.1184*** (3.99)
EU	0.0376 (1.48)	0.0643 (1.57)	0.0278 (0.81)
A_FREEDOM	0.2216*** (5.59)	0.1246* (1.94)	0.3255*** (6.07)
POL_STABILITY	0.0701** (2.14)	0.0706** (2.30)	0.0526** (2.05)
CONSTANT	0.6278 (0.82)	1.1898 (0.96)	-0.6539 (-0.63)
YEAR_FE	YES	YES	YES
COUNTRY_FE	YES	YES	YES
Adj. R <sup>2</sup>	0.7337	0.6296	0.5879
Prob > F	(<0.01)	(<0.01)	(<0.01)
N	1,393	1,393	1,393

Note: The table reports the OLS regressions result of testing the factors determining university sustainability reporting. The dependent variables are the natural logarithm of sustainability performance overall score per university, the natural logarithm of environmental impact score per university, the natural logarithm of social impact score per university, respectively. All variable definitions are in Appendix 1.

\*\*\*, \*\*, and \* represent statistical significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests).

Source(s): Table by authors

## 4. Empirical results

### 4.1 Main regression findings

Table 3 shows the main results of the OLS regression analysis, i.e. the determinants of university sustainability performance, controlling for year and country fixed effects. The first columns show the determinants of university's sustainability performance, which is then broken into its two components in the next two columns: the environmental component, and the social component.

The results show a significant positive correlation between overall sustainability performance and the following characteristics: faculty student ratio, international students ratio, number of students, public university, university ranking, academic reputation, citations per faculty member, international research network and employment outcomes, legal tradition, academic freedom, and political stability. Except for public university, where the significance level is 5%, the other findings are all significant at the 1% level. These findings largely align with our expectations, as discussed (Atici *et al.*, 2021; Liu *et al.*, 2019 Soyer *et al.*, 2020).

Our findings show that the nature and size of a university have a profound impact on its sustainability. Our finding that universities' reputations are highly and positively related to sustainability may help to address the issue of contrasting findings in the prior literature, for example between Cuadrado *et al.* (2019) and Muñoz-Suárez *et al.* (2020). We find that academic reputation plays an important role in influencing the sustainability performance of universities, including both its social and environmental components. This is similar to Atici *et al.* (2021) and An *et al.* (2017), who argue that environmental sustainability is a core competitive advantage for universities and also find a positive correlation between the two (Atici *et al.*, 2021).

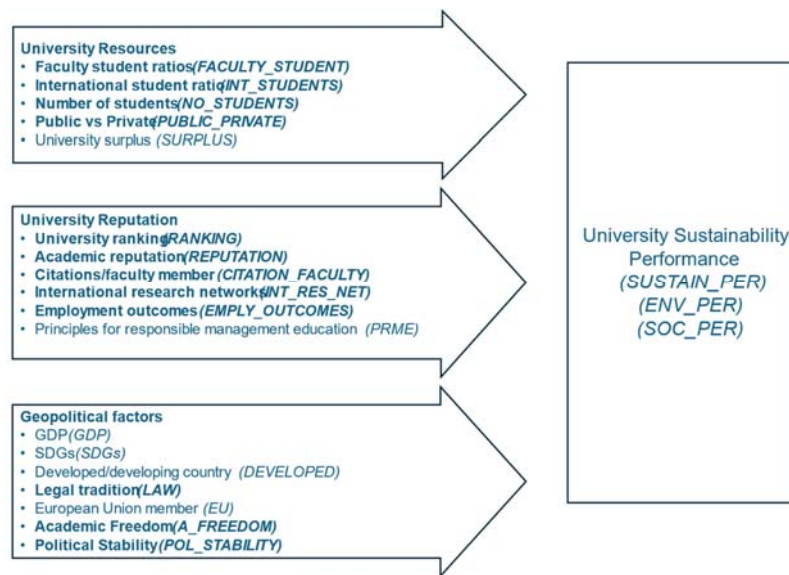
Public universities tend to have higher overall sustainability and social performance than private universities, albeit at a high significance level of 1%, reflecting their broader remit to society (Muñoz-Suárez *et al.*, 2020; Fernandez-Feijoo *et al.*, 2014), while they do not have significantly higher environmental scores.

Note that there are fewer determinants of universities' environmental performance than their social performance, specifically, legal tradition, being a public university, international research networks and student employability are not drivers of environmental performance. A Principles for Responsible Management Education (PRME) signatory, and in the EU have additional positive influences on universities' social performance. This may reflect that universities see their primary duty to serve society, rather than the more abstract notion of having a duty to the environment.

### 4.2 Robustness, endogeneity, and additional tests

We conduct a series of robustness and endogeneity tests, as well as splitting our sample into various groups. These tests include using an alternative measure of university sustainability scores (raw scores instead of the logarithm), adding university fixed effects, PRME and non-PRME signatory universities, universities in both developed and developing countries (economic), civil and common law countries (legal), and European and non-European countries (geographic). These tests all provide results consistent with the main results reported in Table 3. To address the potential concern

that reverse causality may explain our results, we employed 2SLS in our analysis, based on the idea that instrumental variables (IVs) can help provide a cleaner, unbiased estimate of the causal relationship between the variables. Following prior studies (e.g., Cheng et al., 2014; Gupta and Krishnamurti, 2018), we select the country-year mean student number and the country-university mean student number as our instruments. The unablated results are consistent with our main results, suggesting that the direction of causality is likely to be from our determinants to sustainability performance. In the interest of brevity, we leave these results untabulated.



**Figure 3: Factors impacting sustainability performance according to our findings**  
(Source: Developed by the authors)

Note: The factors in bold text impact Universities' Sustainability Performance, according to our findings.

## 5 Discussion

Our research provides empirical evidence of the specific drivers that enhance sustainability within higher education institutions, extending the work of previous scholars, including Soyer *et al.* (2020), Atici *et al.* (2021), and Liu *et al.* (2019). Our findings suggest that universities' sustainability performance is shaped by institutional pressures, which influence how universities leverage resources, develop reputational strategies, and respond to geopolitical contexts, ultimately shaping their role in institutionalising sustainability in society. In terms of university resources, we find that the faculty student ratio, international student ratio, number of students, and public status of universities are significant determinants of sustainability performance. These findings align with coercive isomorphism, as universities respond to external pressures—such as governmental funding policies and societal expectations—to maintain their legitimacy through sustainability practices (Di Maggio and Powell, 1983). In terms of reputation, the university's ranking, academic reputation, citations per faculty member, international research network and employment outcomes are significant drivers. Geopolitical factors that influence sustainability performance include the country's legal tradition, academic freedom, and political stability.

University resources are the tangible factors which universities can influence through decisions made by their management teams. Our findings for resources highlight that the scale of the university (the overall size in terms of the number of students) has a positive influence, as does the relative number of international students. The scale of a university and the impact of this on rankings (academic and sustainability) engages with the findings of McAleer *et al.* (2019). As international students provide significant fee income for many universities, this is an important consideration in terms of university funding and the relative contribution of international students compared to domestic enrolments. This suggests that universities with greater financial resources and diverse student populations are more likely to adopt sustainability initiatives. Their contribution to funding, and thereby sustainability outcomes, was highlighted by Soyer *et al.* (2020), and we find a similar connection. In addition, our findings highlight that publicly funded universities are likely to have stronger sustainability performance, especially in the social dimension. This suggests that public universities cope better with the challenges that may arise when embedding sustainability (Muñoz-Suárez *et al.*, 2020). This reflects coercive isomorphism, as government policies and public accountability structures pressurise publicly funded universities to adopt sustainability initiatives. However, our findings highlight that this is not just a question of funding and growth. Faculty to student ratios are also positively linked to sustainability performance, reinforcing the idea that high-quality teaching and increased faculty interaction contribute to normative isomorphism, wherein sustainability values are institutionalized through academic engagement and pedagogical practices (De Villiers *et al.*, 2024a). In terms of resources, our findings indicate that large, well-funded institutions with high quality teaching are associated with improved sustainability performance. De Lange (2012) finds university stakeholders, including students, to be highly influential in terms of how universities make proactive changes towards embedding sustainability into the curriculum. In addition, we find the student body and its composition to be a critical factor in the sustainability performance of universities.

Reputational (*mimetic-driven*) factors have a strong influence on sustainability performance. Our findings suggest how universities imitate the sustainability strategies of prestigious institutions to maintain their competitive advantage (De Villiers *et al.*, 2024a). Specifically, we find a strong association between academic reputation and sustainability performance. As reputation brings a competitive advantage to universities (Barney, 1991), this allows them to pursue agenda items of strategic importance, such as sustainability initiatives. The prominence of university rankings, despite their limitations, highlights the importance of the pursuit of prestige to universities (Altbach, 2012). Askin and Bothner (2016) find that universities adapt to a drop in rankings and associated drop in status by raising their prices, suggesting a strong link between prestige and university fee income. Whereas their finding was from the private sector, our findings show that the pursuit of rankings and prestige also apply to public universities and have a strong link with sustainability performance. Reputation and prestige are both essential in attracting and incentivising the next generation of students and scholars. The pursuit of prestige by universities is therefore critical to being able to exert the influence that can help to institutionalise sustainability in society. The employment outcomes of those leaving universities that have a strong academic reputation are likely to be positive, and those students are likely to contribute to the future direction of the organisations they subsequently join. In this way, universities with strong academic reputations influence sustainability beyond their campuses, as

graduates exposed to sustainability issues are more likely to integrate these values into their professional lives, contributing to long-term societal change (Hamilton and Davison, 2018). Beyond their internal sustainability performance, universities lead societal change through research, teaching, and social service, aligning with the idea behind normative isomorphism, as sustainability norms are diffused through academia, shaping societal expectations (Di Maggio and Powell, 1983). Universities serve as hubs for knowledge creation, innovation, and discourse, shaping sustainability narratives throughout society. Through research, universities contribute to proposing solutions for addressing sustainability challenges, influencing both policy and industry practices. Teaching sustainability across disciplines fosters a new generation of leaders equipped to integrate sustainable principles into their professional and personal lives. And these leaders are not only equipped to deal with sustainability, but are more likely to take-for-granted that sustainability should be pursued. Furthermore, universities engage with communities, businesses, and governments, promoting sustainability practices beyond their campuses. This role in shaping public discourse and challenging unsustainable practices further supports the idea that universities act as agents of institutional change, reinforcing the broader adoption of sustainability across society (De Villiers and Alexander, 2014).

An important geopolitical factor influencing sustainability performance is a country's legal tradition. Our results indicate that universities in common law countries exhibit stronger sustainability performance than those in civil law countries, extending the findings of Calderon (2023). Particularly, we extend this finding by demonstrating that universities committed to sustainability performance are well-dispersed geographically, and that neither rankings nor sustainability performance have a strong link with a country's GDP. Another important factor that enables universities to lead on sustainability is academic freedom, which allows faculty and students to explore, advocate for, and implement sustainability initiatives without undue restrictions. Academic freedom supports critical inquiry and innovation, both of which are essential for advancing sustainability knowledge and practices (Gibbs, 2016). This freedom not only empowers universities to address sustainability from multiple disciplinary perspectives but also helps them remain responsive to global sustainability challenges. This is particularly important when changing political situations can change global focus and funding (Fowler, 2025). These findings align with normative isomorphism, as sustainability becomes embedded in academic inquiry and institutional norms. However, focusing on social and environmental sustainability (in particular when pursuing awards or metrics) may restrict academics who wish to research in other areas, requiring trade-offs that may compromise academic freedom. A strong focus on sustainability, especially when driven by rankings or funding incentives, may inadvertently limit academic exploration in other fields, due to trade-offs in research priorities. Universities must deal with this balance carefully, ensuring that sustainability commitments enhance rather than constrain the diversity of academic inquiry. Our study also highlights the role of political stability as a contextual factor that impacts universities' ability to pursue sustainability goals. In regions facing political instability, universities may struggle to maintain consistent funding or develop long-term sustainability programs. This reinforces the significance of coercive isomorphism, as stable political environments provide the regulatory and financial support needed for sustainability commitments to thrive. From an institutional theory perspective, our research suggests that organisations, including universities, are influenced by mimetic, coercive, and normative isomorphic pressures to adopt certain practices and behaviours.

Particularly, mimetic isomorphism posits that universities might imitate the sustainability practices of prestigious institutions to enhance their own reputations and competitiveness. Universities striving for higher academic standing may adopt and emulate the sustainability practices of their more successful peers, thereby improving their own sustainability outcomes. This is evident in the positive correlation between academic reputation and sustainability performance. Coercive isomorphism highlights how pressures from regulatory bodies and societal expectations shape organisational behaviour. Normative isomorphism occurs through the internalisation of norms and values within the academic community. Universities play a pivotal role in promoting sustainability through their teaching, research, and organisational policies. The significant influence of faculty-student ratios and international research networks on sustainability performance indicates that the professional norms and values embedded within the academic environment often drive sustainability initiatives.

Overall, our findings highlight the potential for universities to promote sustainability in such a way that it becomes the established, mainstream, generally accepted 'right thing to do'. The interplay of isomorphic pressures suggests that universities' sustainability efforts are not only a strategic choice but also a response to broader institutional forces shaping the higher education landscape. Universities that pursue sustainability themselves are more likely to help in institutionalising sustainability across society more broadly. The potential reach and influence of universities can therefore help to counteract the significant grand challenge of organisations and institutions who are opposed to sustainability, reducing their influence over media narratives and government policy.

## **6 Conclusion**

Universities that themselves pursue greater social and environmental sustainability are more likely to influence their students and others in society to consider sustainability the 'right thing to do'. This can help to institutionalise this pursuit in society, helping to address the grand challenge represented by groups and individuals who dispute the need to consider social and environmental sustainability in decision-making. In this context, therefore, it is important to understand what drives universities to pursue greater social and environmental sustainability. By examining the determinants of university sustainability performance, measured through their QS sustainability scores, we shed light on the complex interplay between institutional behaviour, external influences, and normative expectations within the higher education sector.

We consider the multiple factors that shape university sustainability performance, as measured by university sustainability rankings. Employing 1,393 observations from the annual reports of 700 global universities, in conjunction with their QS University Sustainability Rankings, our analysis reveals positive relationships between university sustainability performance and the following characteristics: faculty student ratio, international students ratio, number of students, public university, university ranking, academic reputation, citations per faculty member, international research network, employment outcomes, legal tradition, academic freedom and political stability. Our findings underscore the significant influence of external factors on universities' sustainability performance, particularly being a common law country, academic freedom and political stability. The economic resources available to

universities enable them to allocate more towards sustainability initiatives, thereby reinforcing normative expectations surrounding sustainability practices. Our measures that reflect the availability of more resources, and which we find to be significantly related to sustainability performance are: academic reputation and number of students (both suggesting the ability to gain more donations and bequests), faculty student ratio (indicating greater resource availability), and international student ratio (indicating the ability to charge higher tuition fees). The legal environment emerges as another critical determinant of university sustainability performance. We find that universities in common law countries tend to score higher on sustainability. Given our sample, this finding applies to the top 700 universities in the world. Interestingly, despite the EU's reputation for leading the world on sustainability reporting, we did not find European universities to be associated with higher overall sustainability performance, environmental performance, or social performance.

Our findings contribute to several streams of academic literature. Firstly, we contribute to the literature on higher education by providing a conceptual model of the three factors (resources, reputation, and geopolitical factors) that contribute to sustainability performance. Rather than considering individual factors in isolation, we consider them together and also discuss the links between these factors. By focusing on three categories of factors which universities exert varying levels of influence over, we highlight the ways in which sustainability can become institutionalised at universities. Secondly, our findings underscore the complex interplay between academic excellence and sustainability efforts, suggesting that universities with robust academic reputations are better positioned to implement effective sustainability practices. Our research also reconciles some of the challenges found in the prior studies. For example, while Cuadrado *et al.* (2019) reported mixed results regarding the impact of academic reputation on sustainability, our study establishes a positive correlation. Additionally, we found that public universities tend to have higher social performance than private universities, aligning with Muñoz-Suárez *et al.* (2020) and Fernandez-Feijoo *et al.* (2014). This suggests that public institutions' broader societal remit drive their social sustainability efforts more robustly than their private counterparts. Our findings also contribute to the management literature by illustrating how universities' sustainability efforts mirror the organisational behaviours seen in corporate contexts, particularly those driven by stakeholder demands and resource dependency (Salancik and Pfeffer, 1978).

In addition, our findings have several implications for policymakers, university administrators, and stakeholders invested in promoting sustainability. Policymakers need to recognise the importance of economic factors in shaping sustainability outcomes within the higher education sector. For example, universities with better academic reputations and larger student numbers are able to gain more donations and bequests. Universities with greater resources available to them (this could be achieved through greater public funding and allowing universities to attract international students at higher tuition fees, as well as by increasing traditional student numbers) are shown in our study to have better sustainability performance than those with fewer resources and are therefore better placed to participate in diffusing the sustainability message. Additionally, university administrators can leverage regional sustainability initiatives and international research networks to drive sustainability initiatives effectively. By aligning organisational practices with prevailing norms and regulations, universities can enhance their sustainability performance and contribute meaningfully to global

sustainability goals. Given universities' pivotal role in institutionalising sustainability, more attention should be paid to the way they account for, and are held accountable for, their sustainability performance. For example, our findings highlight the importance of academic reputation in encouraging sustainability, including that larger, wealthier universities are more likely to be associated with strong sustainability performance, and their international networks (of students, researchers, and alumni) are highlighted as critical. The implications of our findings extend beyond university administrators to include policymakers in government, who can use this knowledge to shape educational funding and sustainability policies. For instance, understanding the link between resource availability (including funding from international students) and sustainability outcomes underscores the importance of supporting universities' financial stability to further sustainability goals. Government policymakers can leverage these insights to develop a national higher education agenda that prioritises sustainability through supportive legislation, funding incentives, and collaborations. It is also instructive that a higher international student ratio is related to higher sustainability performance. In the light of recent government focus on university funding, and concerns raised about the role of international students in providing funding for universities (Adams, 2024), this is a notable finding with policy implications. The connectedness between resourcing (potentially enhanced by access to high fee-paying international students) and sustainability is clear from our study, highlighting the importance of policymakers making decisions that focus on enhancing universities' resources in the long-term.

Understanding what drives university sustainability performance is central to understanding how universities can drive broader societal change towards sustainability through their research, teaching and service. Universities can play a key role in raising awareness of social and environmental issues, helping to institutionalise its importance in society. Reductions in greenhouse gas emissions, an enriched cultural life, and improved skills and knowledge are all goals for achieving higher quality of life standards consistent with sustainable development goals (Ruiz *et al.* 2019). More educated people tend to adopt healthier lifestyles, thereby elevating the quality of life and ensuring the attainment of sustainable development goals. Echoing this sentiment, Ruiz *et al.* (2019) underscore that leading a life with the utmost quality in a sustainable environment significantly contributes to heightened happiness and improved health levels. Universities are uniquely placed to develop the desire for an improved quality of life for people and the planet they love on through their focus on educating the leaders and decision-makers of the future and promoting a sustainability focus.

## 6.1 Limitations

While our study offers valuable insights, its use of external rankings and internal performance data might not fully capture the nuances of sustainability practices across different universities. There is also the challenge of ensuring that these measures are comparable across diverse institutional contexts and geographic regions. This means that our findings may be generalisable across universities in developed countries, but less so globally.

In addition, our study relies on a series of variables that may be subject to measurement issues. First, our use of sustainability rankings to measure sustainability performance means that our results rely on organisations willing to take part in the exercise of rankings, an exercise that is costly and may therefore attract wealthier

organisations. Second, our sample only includes universities in a limited period (2022 and 2023) due to data availability, so our findings may not be generalisable to other time periods. We thus call for more research on university sustainability performance determinants with more updated data to capture the latest developments in this area,

## 6.2 Future research directions

Our conceptual frameworks presented in Figures 1, 2 and 3 not only summarise our findings, but also provide future researchers with a structure to motivate future research on the topic.

Firstly, considering the importance of the grand challenge we examine, we call for more research on the factors influencing university sustainability performance. In particular, a focus on the differences between developed and developing countries and a deeper understanding of geopolitical factors could add value.

To expand upon the potential for the three areas of research, teaching, and service to contribute to the institutionalisation of social and environmental sustainability, we call for more research incorporating qualitative data from interviews with university managers and stakeholders. More qualitative research would enhance our understanding of what enables and hinders sustainability performance within universities, and how this relates to universities' role and ability to foster sustainability. All types of organisations are affected by sustainability issues (Hörisch *et al.*, 2014), meaning that learning more about how to integrate sustainability into the operations of universities can add insights that apply more broadly (Onyido *et al.*, 2022). Other factors, such as specific institutional policies or leadership commitment to sustainability, could influence both university reputation and sustainability outcomes. Vice Chancellors act as agents for stakeholders and communicate with them through sustainability reports (Marshall *et al.*, 2010). This highlights that the support and proactive actions of universities' leaders are essential factors determining a university's stance on sustainability reporting (Adams, 2013). Lauder *et al.* (2015) suggest that university leaders should focus on sustainable projects within the university, covering policies, education, research, and operations, weaving them throughout the entire university system to create comprehensive assessment reports. Future research could explore specific sustainability initiatives and practices at individual universities to provide deeper insights into the mechanisms driving sustainability performance.

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## Appendix 1: Variable definition

Variable(s)	Label	Description	Source	Justification
<b>Sustainability Performance</b>				
Sustainability performance scores	SUSTAIN_PER	The average of the social and environmental impact in the QS Sustainability performance score of university $i$ in year $t$ . Score range 0-100. Higher scores = better performance.	QS World University Rankings: Sustainability 2023&2024 (QS-WURS23&24)	Sustainability performance scores evaluate tangible outcomes, including the impact of alumni in tackling climate change through advancements in science and technology, and the significance of university research on the United Nations' 17 Sustainable Development Goals (SDGs) (Quacquarelli Symonds, 2024). The ratings assess universities based on their contribution to social and environmental well-being, taking account of their function as centres of teaching and research, and their status as major influencers of sustainability issues.
	LOG_SUSTAIN_PER	Natural logarithm of the above.		
Environmental impact	ENV_PER	Environmental impact of university $i$ in year $t$ . Scores range 0-100. Higher scores = better performance.	QS-WURS23&24	Environmental impact considers the influence of research on sustainable development goals, primarily encompassing emission efficiency, net-zero commitments, on-site generation of renewable energy, climate strategic policies, academic reputation in Earth and environmental sciences, publicly disclosed strategies or policies for sustainable procurement and investment, alumni impact on environmental sustainability, national statistics for sustainable research, research centres focused on environmental sustainability, alumni impact on innovation, and policy citations related to the environment (Quacquarelli Symonds, 2024).
	LOG_ENV_PER	Natural logarithm of the above.		
Social impact	SOC_PER	Social impact of university $i$ in year $t$ . Scores range 0-100. Social impact consists of five	QS-WURS23&24	Social impact is evaluated in terms of research contributions to the Sustainable Development Goals (SDGs) related to equality, student and faculty gender ratios, women's

		components: equality, knowledge exchange, impact of education, employability and opportunity, health and wellbeing in the QS Sustainability Rankings. Higher scores indicate better performance.		leadership presence, and policies on Equality, Diversity, and Inclusion (EDI). It also considers academic equity, support for disabilities, national equality statistics, knowledge sharing, community outreach, staff perceptions, and the impact of policy implementation students (Quacquarelli Symonds, 2024).
	LOG_SOC_PER	Natural logarithm of the above.		
<b>University Resources</b>				
Faculty student ratio	FACULTY_STUDENT	Faculty Student Ratio of university $i$ in year $t$ . This ratio is calculated by dividing the total faculty count by the total student enrolment. A higher value indicates more academic staff per student, which should enhance the educational experience.	QS-WURS23&24	The Faculty Student Ratio serves as an indirect indicator of the quality of the learning and teaching environment at a university (Symonds, 2023), but also reflects the resources available per student, encompassing teaching, supervision, curriculum development, and related educational activities. The data for faculty and students are sourced from various entities, including government departments, educational organisations such as HESA, online databases, and other external parties (Symonds, 2023).
	LOG_FACULTY_STUDENT	Natural logarithm of the above.		
International students ratio	INT_STUDENT	The international student ratio of university $i$ in year $t$ . This ratio is defined as the proportion of international students to the total student population. International students refer to the total number of foreign undergraduate and postgraduate students studying at university for at least three months as a percentage of the total number of undergraduate and postgraduate students.	QS-WURS23&24	Data for the International Students Ratio are gathered from the QS World University Rankings website. A higher value indicates a greater proportion of international students at the university. The International Students Ratio reflects a university's attractiveness to overseas students in terms of cultural exchange, a more diverse learning experience, and alumni diversity during its internationalisation process (Symonds, 2023). Offshore exchange students and distance learning students are not included in this calculation.
	LOG_INT_STUDENT	Natural logarithm of the above.		

Number of students	NO_STUDENTS	Number of students reported of university $i$ in year $t$ .	University's annual report	Number of students represents the cumulative count of students registered at a university at the conclusion of the reporting period, with the information collected from the annual reports and official websites of the universities from 2022 to 2023.
Public vs Private	LOG_STUDENTS PUBLIC_PRIVATE	The natural logarithm the above. A dummy variable is coded as 1 if the university is public and 0 otherwise.	University's annual report	Public and private universities rely on different funding sources and governance structures. Public universities are typically funded by the government and are larger, offering a wide variety of programs and research opportunities. They are focused on serving the public interest. Private universities depend on endowments, donations, and higher tuition fees. We source information regarding public and private universities from their annual reports and websites.
University surplus	SURPLUS	A dummy variable is coded as 1 if the university surplus is positive in a particular year and 0 otherwise.	University's annual report	University Surplus indicates the financial excess of income over expenditure, with information derived from university annual reports and websites. The surplus amounts for all universities are denominated in US dollars, with the exchange rate determined on the date of each university's financial statement. A dummy variable is coded 1 if the university has a surplus, and 0 otherwise. It is important to note, however, that public universities are tasked with spending their income on research and teaching and should not aim for substantial surpluses (unlike some private universities which have a profit motive).
<b>University Reputation</b>				
University rankings	RANKING	Proxy for the Times Higher Education World University Rankings of university $i$ in year $t$ . The Academic Ranking of World Universities ranges from 1 to 1500.	Times Higher Education World University Rankings 2023 and 2024	The Academic Ranking of World Universities (ARWU) uses six indicators for its ranking: 10% for alumni and 20% for staff who are Nobel Prize (NP) or Fields Medal (FM) laureates; 20% for the presence of highly cited researchers as determined by Clarivate Analytics; 20% for publications in Nature and Science journals; 20% for articles listed in the

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				Science Citation Index-Expanded (SCIE) and Social Science Citation Index (SSCI); and 10% for the per capita academic performance of the university. These criteria are used to rank the top 1000 universities globally. The lower the number, the higher the global standing of the university in terms of academic achievements and research contributions.
Academic reputation	REPUTATION	Academic reputation of university $i$ in year $t$ . Scores range 0-100.	QS-WURS23&24	Academic reputation scores are collected from the QS World University Rankings website (range: 0-100), with higher scores indicating better performance. Academic reputation evaluates the performance of a university's exceptional academic achievements through the articulation of the quality of research, academic partnership methods, strategic impact, and educational innovation, reflecting the university's influence on education and society (Symonds, 2023). The academic reputation assessment is based on survey responses from scholars from different global sources, including previous interviewees, contact lists submitted by universities, university registrations, and the IBIS database. The score is based on a weighted count domestically and internationally across five academic fields (Arts and Humanities, Engineering and Technology, Life Sciences and Medicine, Natural Sciences, Social Sciences and Management), considering regional familiarity, faculty knowledge weight, national/regional weight, and year weight (Symonds, 2023). The logarithmic of the above.
Citations per faculty member	LOG_REPUTATION CITATION_FACULTY	Natural logarithm of the above. The calculation of Citations per Faculty of university $i$ in year $t$ . Paper count over a five-year period and citations counts for six years for papers published over a five-year period.	QS-WURS23&24	The Citations Per Faculty Ratio data are sourced from the QS World University Rankings website. A higher value indicates that the university's research output is considered more important (Symonds, 2023). This ratio is derived from the number of papers published over a five-year period and the citation count for these papers over six years (Symonds, 2023). Adjustments are made for the capped count of

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				indexed papers and citations, self-citation exclusion, paper-type exclusions, and faculty area normalisation.
International Research Network	LOG_CITATION_FACULTY INT_RES_NET	Natural logarithm of the above.	QS-WURS23&24	
		International Research Network of university $i$ in year $t$ . International Research Network (IRN) Index = $L / \ln(P)$ , **, where P is the distinct count of international partners (universities) and L is the distinct count of international locations represented by them.		International research network (IRN) represents a metric for assessing global involvement, focusing on a university's capacity to establish and maintain collaborative research partnerships (Symonds, 2023). These partnerships facilitate joint publication efforts with transnational entities, collaborative approaches to global issues, and the dissemination of important research outcomes to a wider community.
				It is calculated using the formula: $IRN\ Index = L / \ln(P)$
				where $\ln(P)$ denotes the natural logarithm of the unique number of international partners (universities), and $L$ represents the unique count of international countries/territories these partners come from. This metric evaluates the collaborative relationships of a university that has published three or more joint papers within a broad or specific disciplinary field over a five-year period (Symonds, 2023). Data for the International Research Network are gathered from the QS World University Rankings website. A higher value indicates that the university has stronger and more sustained relationships with its partners and greater global engagement.
Employment outcomes	LOG_INT_RES_NET EMPLY_OUTCOMES	Natural logarithm of the above.	QS-WURS23&24	
		Employment Outcomes of university $i$ in year $t$ . Employment Outcomes reflects the ability of		Employment Outcomes gauge the effectiveness of a university in nurturing its graduates' employability at a high level (Symonds, 2023). These outcomes are derived using

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Principles for responsible management education	PRME	<p>universities to ensure a high level of employability for their graduates. Employment Outcomes = Alumni Impact Index adjusted * ln (Graduate Employment Index).</p> <p>Coded 1 if the university is a signatory member of PRME, 0 otherwise.</p>	<p><a href="http://www.unprme.org">www.unprme.org</a></p>	<p>the Graduate Employment Index and Alumni Impact as primary indicators, with the formula:</p> $\text{Employment Outcomes} = \text{Adjusted Alumni Impact Index} * \ln(\text{Graduate Employment Index}).$ <p>This calculation also accounts for the size of the university and the impact of the Alumni Index relative to the number of students. The graduate employment rate is defined as the percentage of graduates who secure paid employment within 15 months of completing their degree. The Alumni Impact Index range is 1-100. Data for Employment Outcomes are obtained from the QS World University Rankings website, with higher values indicating stronger graduate employability cultivated by the university.</p> <p>Principles for responsible management education (PRME) signatory is an indicator of a university's commitment to promote sustainability education. It is a binary variable, coded 1 if the university is a signatory member of PRME, and 0 otherwise.</p>
<b>Geopolitical Factors</b>				
GDP per capita	GDP	<p>Gross Domestic Product (GDP) per capita overall score. All statistics of GDP are in United States dollars.</p>	<p><a href="http://worldpopulationreview.com">worldpopulationreview.com</a></p>	<p>Gross Domestic Product (GDP) data is obtained from the International Monetary Fund (IMF) website (<a href="http://www.imf.org">www.imf.org</a>). A higher GDP indicates better economic conditions in a country. GDP denotes the aggregate market or monetary value of all finished goods and services produced within a country during a specified period (International Monetary Fund, 2023). It serves as a measure of the economic health of a nation, encapsulating the scope and efficacy of its economic activities, and measuring the living standards of its populace.</p>
	LOG_GDP	<p>The natural logarithm of the above.</p>		

Sustainable development goals	SDG	Sustainable Development Goals score of the university's country. The overall score measures the percentage of overall progress towards achieving all 17 SDGs, ranging 0-100, with a score of 100 indicating that all the SDGs have been achieved.	United Nations Development Programme Sustainable Development Goals <a href="http://www.undp.org">www.undp.org</a>	Sustainable Development Goals (SDG) consist of 17 goals set by the United Nations in 2015, intended to be achieved by the year 2030 (UN, 2015). They address a broad spectrum of objectives across social, economic, and environmental dimensions, with the aim of advancing global well-being and safeguarding the environment. Highlights of these goals include the elimination of poverty, the improvement of health and educational, enhancing equality, and the mitigation of climate change impacts. The SDG Index evaluates the performance of each country on the 17 Sustainable Development Goals, assigning equal importance to each goal. Higher scores indicate better performance (range: 0-100).
	LOG_SDG	The natural logarithm of the above.		
Developed country	DEVELOPED	Coded 1 if the country's GDP is greater than the median, 0 otherwise.	<a href="http://worldpopulationreview.com">worldpopulationreview.com</a>	In addition to the GDP variable above, we also consider whether a country would be regarded as developed or developing, as this is a factor that could influence student choices and levels of funding. The variable is coded 1 (developed) if the country's GDP is greater than the median, and 0 (developing) otherwise.
Legal tradition	LAW	Coded 1 if the country has a common law legal tradition, 0 otherwise.	The CIA Factbook	A country's legal system can influence the adoption of sustainable practices and institutionalisation of sustainability. The variable is coded 1 for the common law legal tradition, and 0 for civil law.
European Union	EU	If the country is a member of the European Union, it is coded as 1; otherwise, it is coded as 0. This value is then multiplied by negative one.	The CIA Factbook	As countries in the EU are subject to the EU Directive on sustainability reporting, which may influence university sustainability reporting and practice, this variable is coded 1 for an EU university, and 0 otherwise.
Academic Freedom	A_FREEDOM	Proxy for the academic freedom in year t. It ranges from low to high (0-1). Higher scores represent higher freedom and vice versa.	<a href="http://Academic-freedom-index.net">Academic-freedom-index.net</a>	The value of academic freedom as both a right and a responsibility, especially as both have important implications at the level of international higher education (Gibbs, 2016), may be an important factor influencing a

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				<p>university's sustainability performance. Based on five indicators, the Academic Freedom Index (AFI) assesses the de facto level of academic freedom around the world: freedom to research and teach; freedom of academic exchange and dissemination; institutional autonomy; campus integrity; and freedom of academic and cultural expression. The variable of Academic Freedom Index ranges from low to high (0-1).</p>
Political Stability	POL_STABILITY	<p>Proxy for political stability – the absence of violence/terrorism in year <i>t</i>. It ranges from 0 to 5. Higher scores represent higher political stability and vice versa.</p>	Worldwide Governance Indicator (WGI)	<p>Political stability within countries may impact the sustainability performance of universities. The Political Stability and Absence of Violence/Terrorism index measures perceptions of the chances of political instability or violence, including terrorism. These estimates are based on a standard normal distribution, with about 99 percent of the values ranging from -2.5 to 2.5. By adding 2.5 to each value, the range is shifted to between 0 and 5.</p>

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Source: Table by authors