

United Nations Global Compact: Where are we going?

Matteo Podrecca, Marco Sartor and Guido Nassimbeni

Matteo Podrecca,
Marco Sartor and
Guido Nassimbeni are all
based at the Polytechnic
Department of Engineering
and Architecture, University
of Udine, Udine, Italy.

Abstract

Purpose – In a world characterised by increasing environmental and social awareness, the number of corporate social responsibility and sustainability initiatives has significantly grown. Among these, the United Nations Global Compact (UNGC) is one of the most important, involving more than 12,000 companies. The purpose of this study is to investigate the UNGC's worldwide diffusion, both at country and industry level, to understand the reasons leading to the highlighted dissemination patterns, and to propose various future projections.

Design/methodology/approach – The study pursues its objectives by applying the logistic curve model to data provided by the United Nations. The analysis is complemented by adopting instability and concentration indexes.

Findings – Results suggest that, while human rights and environmental safeguard in some areas and industries will remain a controversial issue, UNGC adoption will continue growing and giving the participants the required legitimacy to compete in worldwide markets.

Originality/value – To the best of the authors' knowledge, this is the first paper that analyses the UNGC's worldwide diffusion and proposes a prediction model for its future dissemination. The findings are of considerable importance in extending the knowledge of the initiative and in understanding the potential values of its adoption.

Keywords United Nations Global Compact, Global compact, UNGC, Corporate social responsibility, CSR, Sustainability

Paper type Research paper

Received 25 June 2020
Revised 20 December 2020
29 April 2021
Accepted 4 May 2021

© Matteo Podrecca,
Marco Sartor and
Guido Nassimbeni. Published
by Emerald Publishing Limited.
This article is published under
the Creative Commons
Attribution (CC BY 4.0) license.
Anyone may reproduce,
distribute, translate and create
derivative works of this article
(for both commercial and non-
commercial purposes), subject
to full attribution to the original
publication and authors. The
full terms of this license may be
seen at [http://creativecommons.org/licenses/by/4.0/
legalcode](http://creativecommons.org/licenses/by/4.0/legalcode)

The authors acknowledge the
financial support of the Regione
Autonoma Friuli-Venezia Giulia
(Specific Program 89/2019 –
Fondo Sociale Europeo 2014/
2020).

1. Introduction

In the past decades, corporate social responsibility (CSR) has increased its importance; today, it is considered one of the top managerial priorities in many organisations (Moura-Leite and Padgett, 2011; McKinsey, 2013; Walker *et al.*, 2014; Pratihari and Uzma, 2020). As a consequence, various initiatives have been developed to help firms in their sustainability goals and to signal this commitment to their stakeholders by providing a moral point of view to justify a common cross-culturally accepted basis (Gilbert and Rasche, 2007). Although such initiatives are all voluntary and have shared purposes, they present several differences that have led extant research (Gilbert *et al.*, 2011; Rasche, 2012; Brunsson *et al.*, 2012) to classify them into four categories:

1. general guidelines and general principles for sustainable behaviour such as United Nations Global Compact (UNGC) and the Organisation for Economic Co-operation and Development (OECD) Guidelines;
2. certification standards such as ISO 14001 and SA 8000;
3. reporting standards that provide a framework for sustainable reporting such as Global Reporting Initiative (GRI); and

4. process standards that define processes to enable the creation of management systems around sustainability such as ISO 26000.

While the diffusion of certification and reporting standards has been widely discussed in the literature (Casadesus *et al.*, 2008; Alonso-Almeida *et al.*, 2014; Llach *et al.*, 2015), studies related to general guidelines are scarce. They have been analysed in terms of motivations for the adoption (Lehmann *et al.*, 2010; Rasche and Waddock, 2014), benefits (Arevalo and Aravind, 2017; Branco and Delgado, 2012), weaknesses (Sethi and Schepers, 2014; Berliner and Prakash, 2012), performance implications (Rodriguez-Fernandez, 2016; Orzes *et al.*, 2020) and contextual factors affecting implementation (Coulmont *et al.*, 2018; Bernhagen *et al.*, 2013; Lim and Tsutsui, 2012), but, to the best of our knowledge, an exhaustive analysis of their worldwide dissemination is still lacking. Diffusion studies are interesting not only for their descriptive and predictive capacity but also because they can help to shed light on an extremely complex phenomenon which is influenced by several factors: economic/entrepreneurial structure, industrial environment, customer pressures and government incentives. In addition, dissemination analyses offer empirical evidence on whether an analogy can be drawn between the diffusion process of different initiatives thus highlighting critical issues or areas where improvements are required (Marimon *et al.*, 2006).

In light of the prominence of the topic and of the scant evidence currently available, our paper aims to overcome this research gap by opening the debate on diffusive patterns and trends of general guidelines. In particular, we decided to investigate the most important and widely adopted guideline (Orzes *et al.*, 2018, 2020), i.e. UNGC. Announced in 1999 by the Secretary General of the United Nations (UN) Kofi Annan and officially launched in 2000, UNGC is presented as a self-regulatory guideline that encourages organisations to monitor their social performance in the areas of human rights, labour, environment and anti-corruption. The prestige and the reputation of the UN have made UNGC one of the World's largest corporate sustainability initiatives involving more than 12,000 active participants in 159 countries (Orzes *et al.*, 2018; United Nations Global Compact, 2019).

Literature has shown that UNGC improves social (Ortas *et al.*, 2015; Branco and Delgado, 2012) and environmental performances (Pangsapa and Smith, 2008; Einwiller *et al.*, 2016), relationships with the stakeholders (Andrianova and Yeletskikh, 2012; Garsten and Jacobsson, 2011), attractiveness to new investors (Coulmont and Berthelot, 2015) and corporate image (Gilbert and Behnam, 2013; Mele and Schepers, 2013). We, therefore, believe that the significant amount of benefits that UNGC is able to bring to the adherent organisations, combined with the high number of registered members, make UNGC the ideal subject to shed light on the dissemination mechanisms of the general guidelines. Hence, the objective of this paper is threefold; firstly, to analyse the current diffusion of UNGC; secondly, to predict UNGC's future dissemination; and thirdly, to compare UNGC with other available initiatives so as to evaluate the existence of similar patterns.

To achieve our aim, we build a series of hypotheses by drawing on Signaling Theory (ST) and by relying on the literature on UNGC and on diffusion studies. As far as the methodology is concerned, the study is based on the list of organisations that have adhered to UNGC from 2000 to 2018 (available at: www.unglobalcompact.org/what-is-gc/participants); consistently with previous research on CSR initiatives diffusion (Llach *et al.*, 2015; Marimon *et al.*, 2012), we test the research hypotheses by using the approach of combining the logistic curve with the instability index and the concentration index.

This paper offers a contribution to both theory and practice. It contributes to theory as, by proposing the first diffusive analysis on general guidelines, the study traces a synthesis of what has happened and what is in progress all over the world; thus, providing several hints to further shed light on the drivers of their dissemination. Besides, the paper increases the understanding of UNGC and identifies its possible future trends. It contributes to practice

as companies can improve their knowledge about UNGC, understand the potential values of its adoption and take more informed decisions about the implementation of guidelines and CSR initiatives in general. It will be also useful for the UNGC technical committee by highlighting the current profile of the initiative and by providing forecasts that can be used to identify areas of improvement to prioritise actions. Finally, societies with more companies engaged in social issues could improve the quality of life of their citizens.

The remainder of the paper is structured as follows. Section 2 presents the state of the literature and formulates the research hypotheses. Section 3 describes the adopted methodology. Sections 4 and 5 illustrate and discuss the findings. Finally, conclusions and contributions of the paper to theory and practice are pointed out in Section 6.

2. Literature review and hypotheses development

Our study is grounded on two research streams: literature on UNGC and literature on quality and sustainability initiatives diffusion.

2.1 United Nations Global Compact

UNGC is designed as a general freely adherable initiative, supported by the moral legitimacy and the political backing of the UN (Ruggie, 2002), aimed at enhancing dialogue and relationships among a diverse set of actors. Based on ten principles (Table 1) (derived from the International Labor Organisation's Declaration on Fundamental Principles and Rights at Work, the Universal Declaration of Human Rights, the UN Convention against Corruption and the Rio Declaration on Environment and Development), UNGC seeks to engage the private sector to collaborate with the UN – in partnership with organised labour, agencies, non-governmental organisations (NGOs), governments and academia – to promote the implementation of sustainable and socially responsible policies, to address issues concerning human rights, labour, environment and anti-corruption, and to report on their implementation (Ruggie, 2001; United Nations Global Compact, 2020a).

To join the initiative, organisations are required to write a letter of commitment where they express their adherence to the ten principles of UNGC. This puts companies into an “active” status. To maintain this status, participants must annually provide a report called “Communication on Progress” (COP). The COP must contain at least:

- a statement by the chief executive officer expressing continued support for the UNGC and renewing the participant's commitment to the initiative;

Table 1 Ten principles of UNGC (United Nations Global Compact, 2020a, 2020b)

Principle	Topic	Definition
1	Human rights	Businesses should support and respect the protection of internationally proclaimed human rights
2	Human rights	Make sure that they are not complicit in human right abuses
3	Labour	Business should uphold the freedom of association and the effective recognition of the right to collective bargaining
4	Labour	The elimination of all forms of forced and compulsory labour
5	Labour	The effective abolition of child labour
6	Labour	The elimination of discrimination in respect of employment and occupation
7	Environment	Business should support a precautionary approach to environmental challenges
8	Environment	Undertake initiatives to promote greater environmental responsibility
9	Environment	Encourage the development and diffusion of environmentally friendly technologies
10	Anti-corruption	Business should work against corruption in all its forms, including extortion and bribery

- a description of practical actions the organisation has taken or plans to carry out to implement the ten principles; and
- a measurement of outcomes.

Two consecutive failures in submitting a COP cause the firm to be delisted.

UNGC is grounded on the idea that the learning process resulting from dialogue and partnerships can lead organisations to improve their responsibility. This highlights two important points. Firstly, the absence of specific regulations to measure and verify the compliance does not necessarily mean that requirements are not binding, but that the initiative must be complemented by a dedicated dialogue approach (Rasche, 2009). Secondly, UNGC only represents a set of guidelines, and for that reason, organisations' reports are not externally verified (Hamid and Johner, 2010).

Since its enactment, UNGC has attained the interest of academics and has been identified as an influential CSR guideline (Vormedal, 2005; Runhaar and Lafferty, 2009). In their extensive literature review on UNGC, Orzes *et al.* (2018) highlighted that globalisation has increased the awareness of ethical related issues. Various internal and external stakeholders (e.g. NGOs, activists, unions, media, governments, investors, competitors, customers and employees) are putting pressure on companies demanding responsible behaviour towards environment and human rights (Lehmann *et al.*, 2010; Perez-Batres *et al.*, 2011). UNGC is seen as a response to these pressures (Berliner and Prakash, 2015). Hemphill (2005) defined UNGC as the world's largest network-based voluntary corporate citizenship initiative as, by adhering, companies can show their commitment to meet the responsibilities requested by stakeholders (Néron and Norman, 2008). The improvement of firms' image is one of the main benefits attributed to the UNGC (Arevalo and Aravind, 2017; Cetindamar, 2007; Garayar *et al.*, 2016). It enables participants to exploit the recognised standing of the UN logo (Hughes and Wilkinson, 2001; Fritsch, 2008) and thus increase their reputation (Selvik, 2013). It is also used to enter new markets, expanding the customer portfolio (Garayar Erro and Calvo Sánchez, 2012; Arevalo and Aravind, 2011). Some empirical papers (Bennie *et al.*, 2007; Perkins and Neumayer, 2010) show a positive relationship between UNGC adoption and the country's intensity of foreign direct investment. Other papers highlight a related result: firms which have high commercial dealings with foreign (Western) countries are more likely to follow initiatives such as the UNGC (Perez-Batres *et al.*, 2011; Berliner and Prakash, 2012).

2.2 Quality and sustainability initiatives diffusion

Studies on certifications, standards and initiatives dissemination have emerged as a popular research topic in quality management since the early 2000s when Franceschini *et al.* (2004) proposed the first model to study their diffusion. The aforementioned authors noticed that standards adoption processes follow an S-shaped or sigmoid curve characterised by an initial exponential growth (expansion phase) because of the firms' willingness to give formal evidence of their commitment towards a specific practice (e.g. quality assurance, social responsibility, sustainability), a subsequent phase (maturation phase) characterised by a linear (arithmetic) growth, and a last phase (retrocession phase) in which, after reaching the peak, the interest becomes stable and the growth slowly tends towards saturation.

This diffusion pattern was the same as production innovation paths (Gurbaxani, 1990), new technologies dissemination (Stoneman, 1995) and population growth in habitats with limited resources availability (Pearl, 1978), i.e. three topics already widely studied applying Verhulst's logistic curve and related equations.

Franceschini *et al.* (2004) applied the logistic curve to investigate diffusive patterns of some international standards. Firstly, they adopted Verhulst's equation to study the dissemination of ISO 9001 across Europe. Subsequently, other scholars showed that the aforementioned model can describe diffusive patterns of other international standards (i.e. ISO 14001, GRI and SA 8000) both considering them alone or in terms of integrated management systems (see Table 2).

Table 2 Diffusion studies

<i>Initiative</i>	<i>Authors</i>	<i>Level of analysis</i>
ISO 9001	Franceschini et al. (2004)	Country
ISO 9001	Franceschini et al. (2006)	Country and economic sector
ISO 9001	Llach et al. (2011)	Economic sector
ISO 9001 and ISO 14001	Marimon et al. (2006)	Country and economic sector
ISO 9001 and ISO 14001	Casadesus et al. (2008)	Country
ISO 9001 and ISO 14001	Marimon et al. (2010)	Country
ISO 9001 and industry-specific "Q" standard	Alonso-Almeida et al. (2013)	Spanish tourism sector
ISO 14001	Marimon et al. (2011)	Economic sector
GRI	Marimon et al. (2012)	Country and economic sector
GRI	Alonso-Almeida et al. (2014)	Country and economic sector
GRI	Alonso-Almeida et al. (2015)	Universities
SA 8000	Llach et al. (2015)	Country and economic sector
Integrated management systems (ISO 9001, ISO 14001 and OHSAS 18001)	Cabecinhas et al. (2018)	Country

2.3 Hypotheses development

In this section, we develop a set of research hypotheses related to current and future dissemination of UNGC, drawing on both literature on UNGC and studies focused on initiatives diffusion. Signaling Theory is used here to provide a theoretical framework to the future dissemination of the UNGC. This theory was selected because of its direct relevance to the research questions being investigated and its wide adoption to ground studies about UNGC ([Janney et al., 2009](#); [Coulmont and Berthelot, 2015](#)).

Extant research ([Llach et al., 2015](#); [Marimon et al., 2012](#)) has often identified the S-shaped curve as the main dissemination process followed by standards and initiatives. Compared to other CSR initiatives (GRI, ISO 14001 and SA 8000), however, general guidelines like UNGC exhibit several differences that may result in alternative adoption patterns.

The absence of rigorous third-party audits could lead to a faster adoption, thanks to a formal rather than substantial implementation ([Bellace, 2014](#); [Behnam and MacLean, 2011](#)). On the contrary, audits lack could determine a loss of trust in the initiative ([Lau et al., 2017](#); [Janney et al., 2009](#); [Seppala, 2009](#)) and consequently a slow-moving diffusion.

Besides, unlike other initiatives, the UNGC publishes the list of companies that initially joined but were then delisted. This could be a strong deterrent for many organisations uncertain about their ability to stay in line over time with the principles of the UNGC, making the adoption speed lower.

Another important aspect that may result in fast adoption is that UNGC represents a great opportunity for networking and partnerships. By adhering to UNGC, organisations are included into a CSR community with the chance "to build participatory relationships within a network of international actors" ([Bennie et al., 2007](#), p. 4) whereby exchange experiences and learn from each other.

Finally, while performance implications of other CSR initiatives (SA 8000) are acknowledged as positive ([Orzes et al., 2017](#); [Battaglia et al., 2014](#)), the literature on UNGC exhibits conflicting results with positive ([Orzes et al., 2020](#)), negative ([Janney et al., 2009](#)) and neutral ([Rodriguez-Fernandez, 2016](#)) outcomes. This ambiguity surrounding UNGC payoff may affect the adoption pattern thus lowering the diffusion speed.

In light of the controversial aspects highlighted, we wonder whether also UNGC spreads following an S-curve or if the initiative follows different patterns. The first hypothesis is, therefore:

H1. UNGC adoption process follows an S-shaped diffusion pattern.

Developed by [Spence \(1973\)](#), who showed how high-quality prospective employees distinguish themselves from low-quality ones via the (costly) signal of rigorous higher education, Signaling Theory has been widely used in economics, management and entrepreneurship ([Connelly et al., 2011](#)). ST argues that some products exhibit attributes for which consumers can assess the quality neither before nor after purchase. To reduce this information asymmetry, companies whose products possess desirable characteristics send signals to the consumers, i.e. actions that succinctly convey relevant information ([Akerlof, 1970](#)). A signal will be credible if firms with inferior capabilities and products find the costs of the signal higher than the benefits, whereas firms with superior capabilities and products find the benefits higher than the costs ([Scott, 2014](#)). Therefore, a company's willingness to incur such costs can be a signal that distinguishes it from less-committed organisations.

The literature on UNGC has shown that this general guideline can complement local laws ([Kobrin, 2009](#); [Gupta and Gupta, 2008](#)). While developed countries mostly have strict rules and governmental control in many areas covered by UNGC, developing countries usually highlight a general lack of regulations, so that the [Human Rights Watch \(2019\)](#) report showed that they are the worst violators of basic human rights. Given the increasing awareness of social issues, consumers are often reluctant against goods or services coming from developing countries ([Giesler and Veresiu, 2014](#)). Hence, organisations coming from such countries feel strong pressure to prove their social commitment ([Jha and Aggrawal, 2020](#); [Garayar Erro and Calvo Sánchez, 2012](#)).

According to ST, CSR initiatives can be viewed as a credible signal that allows participants to show to the consumer unobservable product features through a labelling or certification system. UNGC label, therefore, signals to the market the respect of human and labour rights thus allowing firms to improve their reputation ([Selvik, 2013](#)), to differentiate from non-members located in the same countries ([Janney et al., 2009](#); [Coulmont and Berthelot, 2015](#)) and to achieve legitimacy in the eyes of the customers interested in CSR issues. For that reason, we expect that organisations in developing countries have greater incentives to quickly adhere to UNGC than those coming from developed countries. The second hypothesis is, therefore:

H2. UNGC will be more quickly and extensively diffused in developing countries.

In recent years, several social and environmental scandals have affected many labour-intensive multinational firms (e.g. Nike, Adidas and ArcelorMittal), resulting in increased attention to ethical and pollution issues ([Bachmann, 2016](#)). Such firms are not allowed anymore to operate “under a cloak of secrecy” ([Post, 2013](#), p. 6) and must show their responsibility efforts to several influential stakeholders ([Egels-Zandén and Kallifatides, 2009](#)). Globalisation, in fact, is weakening the states' power of regulation and engaging companies as agents in charge of negotiations with respect to their employees and to the context where they operate ([Mueckenberger and Jastram, 2010](#)). In this perspective, CSR initiatives can act as “soft laws” able to ensure environmental friendliness and better working conditions to workers of adherent firms ([Rasche, 2010](#)).

Grounding on ST, UNGC represents a credible signal to show labour-intensive firms' commitment as nine out of ten UNGC principles refer to the issues of labour, human rights and environment (see [Table 1](#)). Consequently, it is likely to expect that companies operating in labour-intensive industries will show greater interest in the initiative. Thus, the following hypothesis is made:

H3. UNGC will be more quickly and extensively diffused in labour-intensive industries.

3. Methodology

3.1 Data set

The data set used in this paper comes from the list of UNGC adherent organisations publicly available on the UNGC official website ([United Nations Global Compact, 2019](#)). Analysed data refers to the period from 2000 (UNGC enactment year) to 2018. The number

of participants has steadily grown over the years; 12,121 organisations (n_{tot}) from 159 countries and 49 industry sectors were reported in December 2018.

Each record of the data set contains the name of the organisation, the organisation type, the country, the economic sector and the UNGC joining date. Based on the classifications proposed by the UN for the countries (United Nations, 2019) and Eurostat for the industries (Eurostat, 2019), we extracted the records of:

- “developed” ($n_{developed} = 5,707$) and “developing” ($n_{developing} = 5,770$) countries. We have, therefore, deleted records involving “transition” countries.
- “capital-intensive” ($n_{capital} = 1,142$) and “labour-intensive” ($n_{labour} = 2,254$) industries. We have, therefore, deleted records involving organisations not belonging to the manufacturing industry (e.g. services).

3.2 Data analyses

3.2.1 Logistic curve. Given the aim of the analysis, namely, verify that UNGC follows an S-shaped pattern and predict its future diffusion, we used the logistic curve model. Formulated during the 19th century by the Belgian mathematician Pierre François Verhulst, the logistic equation was originally developed to account for the growth of a biological population. The model is based on the assumption that the growth rate is maximum at the beginning when there are few individuals in the population and the competition for resources is low. As the number of individuals increases, the competition increases too and the growth rate reduces. When the resources become scarce and cannot support the increase of the population anymore, the growth rate is reduced to zero and the saturation point is reached resulting in an asymptotic behaviour. This succession of phases has an S-shaped pattern [for a more detailed discussion of Verhulst logistic equation, the interested reader might refer to Tsoularis and Wallace (2002) and Bacaër (2011)].

Over the years, the Verhulst's equation has been applied in the study of various diffusion trends including telecommunication systems (Jha and Saha, 2020; Gamboa and Otero, 2009), online shopping (Naseri and Elliott, 2013) and production innovations (Gurbaxani, 1990). In the field of certifications and standards, the logistic equation has been used to shed light on the dissemination of ISO 9001 (Franceschini *et al.*, 2006), ISO 14001 (Marimon *et al.*, 2011), GRI (Alonso-Almeida *et al.*, 2014) and SA 8000 (Llach *et al.*, 2015).

We adopted the logistic function to verify that UNGC follows an S-shaped pattern and to predict its future diffusion. The used equation is as follows (see Appendix for a detailed mathematical explanation):

$$N = \frac{N_0 K}{(K - N_0)e^{-r_0 t} + N_0}$$

Equation (1): Logistic function

Where:

N = represents the number of companies adhering to the initiative (over time);

N_0 = represents the number of adherents at the starting point (year 0);

K = is the theoretical saturation level;

r_0 = is the initial growth rate; and

t = is the independent variable (time).

To fit the logistic model, we followed the suggestions of Jha and Saha (2020) and adopted a nonlinear least squares (NLS) approach in which the starting parameters (N_0 , r_0 , K) are directly estimated from the data.

Given the asymptotic nature of the curve, the theoretical saturation level will never be reached. Consistently with previous literature (Alonso-Almeida *et al.*, 2015; Llach *et al.*, 2015), this study used 95% of the saturation to establish a feasible value defining it as “feasible saturation level”:

$$Kf = 0.95 * K$$

Equation (2): Feasible saturation level

The logistic equation is useful to understand diffusive patterns but it cannot take into account whether the UNGC spreads consistently and homogeneously across countries (Llach *et al.*, 2011). For that reason, in the following sections, we will introduce two indexes aimed at complementing the analysis: the instability and the concentration index.

3.2.2 Instability index. The level of instability sheds light on the changes in the rate of participants held by each industry (or country) over time. By analysing the evolution of the instability index, we can verify if the different industries/countries maintain their share of participants and therefore if the UNGC is maturing and the adoption rates are becoming stable. The most widespread [see, for example, Marimon *et al.* (2006) and Llach *et al.* (2011)] instability index is defined as follows:

$$I = \frac{1}{2} \sum_{i=1}^n |s_{i2} - s_{i1}|$$

0 (minimum instability) < I < 1 (maximum instability)

Equation (3): Instability index

Where:

s_{i1} = is the quota of the industry/country i during period 1;

s_{i2} = is the quota of the industry/country i during period 2; and

n = is the number of industries/countries.

Low values of the index reflect a situation in which the different industries (or countries) maintain their share over time, while high values relate to continuously changing rates.

Previous adoptions of the instability index can be found in Cabral (1997), Llach *et al.* (2011) and Marimon *et al.* (2006).

3.2.3 Concentration index. The concentration index is used to analyse whether the diffusion of UNGC is (dis)homogeneous across different industries or countries.

Following the suggestions by Greer (1992) and Cabral (1997), we resorted to the widely adopted Herfindahl–Hirschman Index (HHI):

$$HHI = \sum_{i=1}^n s_i^2$$

1/n (minimum concentration) < HHI < 1 (maximum concentration)

Equation (4): Concentration index

Where:

s_i = is the quota of industry/country i ; and

n = is the number of industries/countries.

High values of the index indicate that a large number of members are concentrated in a small number of industries or countries, while low values point out that UNGC spreads evenly across the different industries or countries.

HHI is often used because of its high degree of consistency (Jacquemin, 1987; Lin and Ho, 2011). Application fields of this technique include physics, economics and politics. For

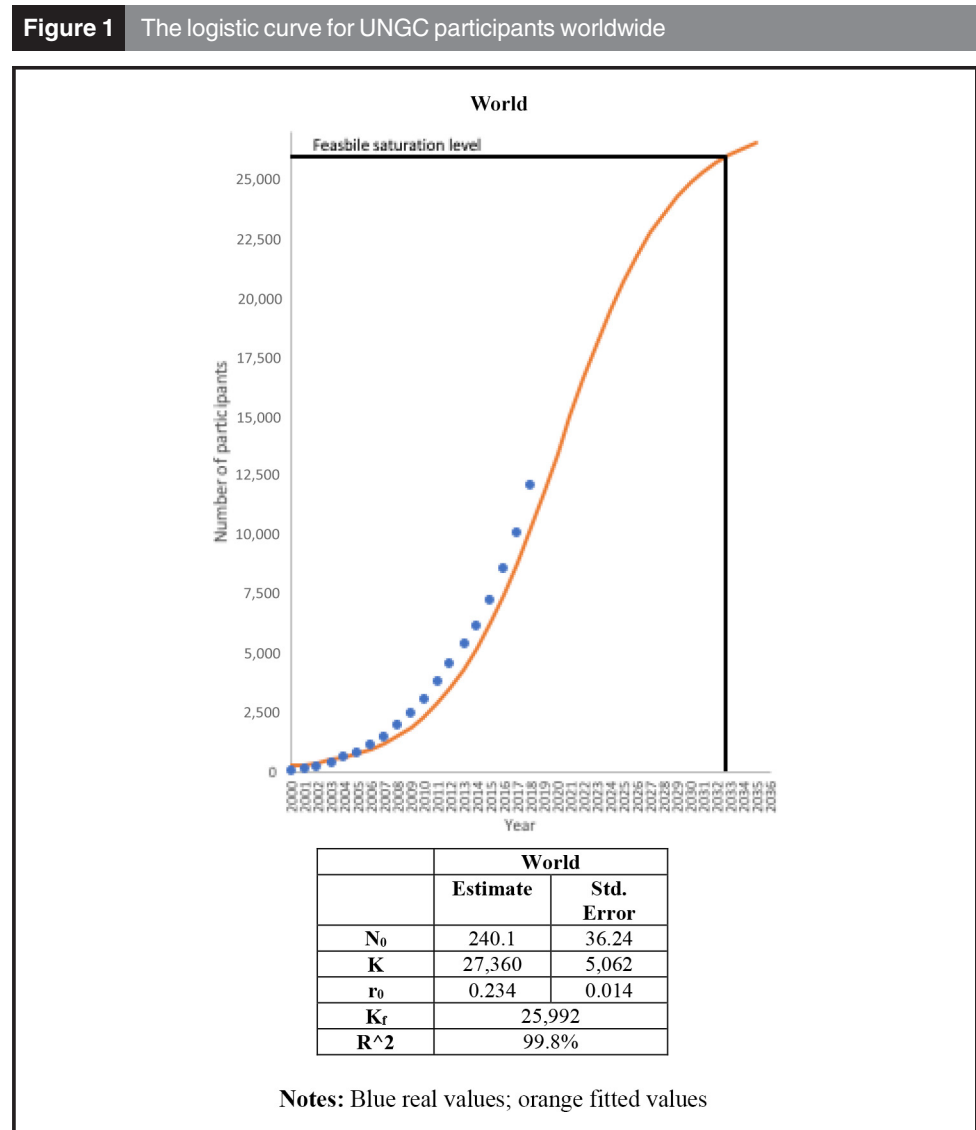
studies related to international standards and frameworks diffusion, it was previously adopted to shed light on ISO 9001 (Llach *et al.*, 2011), GRI (Marimon *et al.*, 2012), SA 8000 (Llach *et al.*, 2015) and ISO 14001 (Marimon *et al.*, 2011).

4. Results

This chapter is structured into four sections. The first one presents the worldwide diffusion of UNGC based on the results of the logistic curve analysis. It discusses in particular to what extent UNGC dissemination follows an S-shaped pattern. The second and third sections focus on UNGC diffusion predictions by country and industry type. Finally, the last section discusses the instability and concentration indexes to check the consistency and homogeneity of the diffusion.

4.1 Worldwide diffusion

To test its adaptability to UNGC (*H1*), the logistic equation was applied to the worldwide ($n_{tot} = 12,121$) data provided by the UN. As stated in the methodology section, a NLS approach was adopted to estimate the parameters of the model.



The goodness of fit was verified through the coefficient of determination R^2 which captures the ability of the model to replicate real outcomes. Figure 1 shows that the fitted values (orange line) are very close to the real values (blue dots) and that the model suits the data with an R^2 of more than 99%. These outcomes verify that the logistic curve model accurately describes the diffusion of UNGC. There is enough evidence to state that UNGC follows an S-shaped diffusion pattern, thus supporting $H1$. Equation (1) can, therefore, be used to explain the diffusion of UNGC.

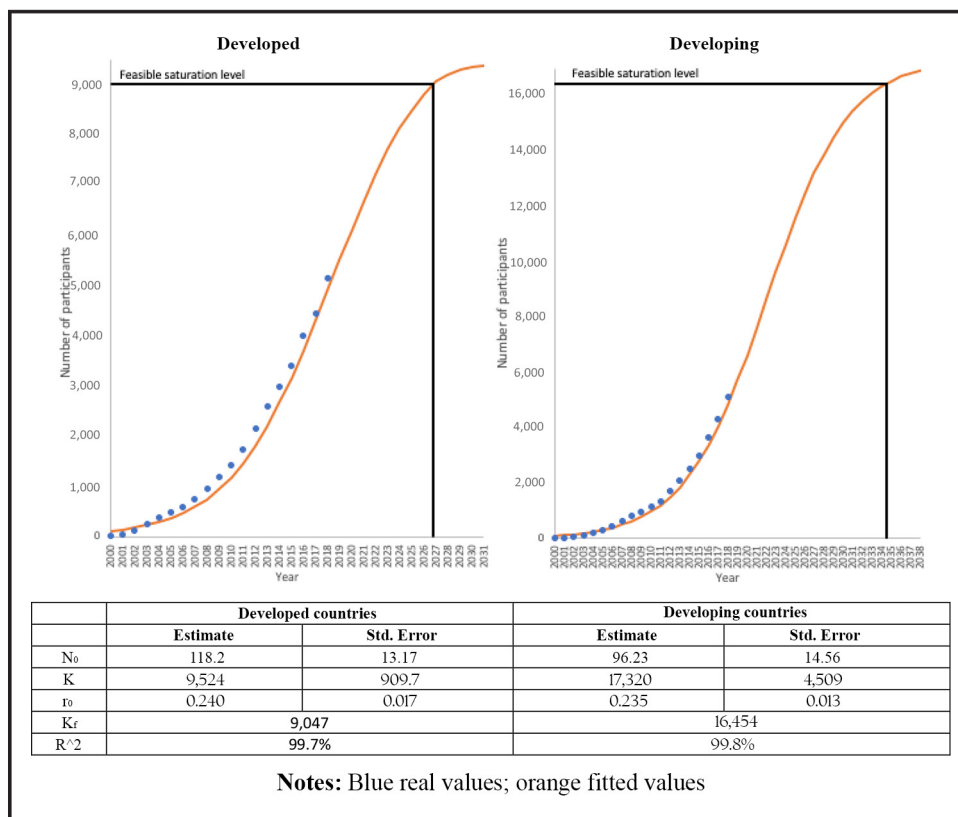
The 12,121 active participants of UNGC at the end of 2018 represent a worldwide feasible saturation level of 46.6%. The model predicts that the worldwide number of joiners will reach this level in 2033. A possible explanation is that as the UNGC spreads, the perceived advantage of joining the initiative diminishes and the number of interested firms decreases until the saturation point is reached.

4.2 Diffusion by country

To test $H2$, the logistic curve was applied to the developed ($n_{\text{developed}} = 5,707$) and the developing ($n_{\text{developing}} = 5,770$) countries' data. Figure 2 shows that the logistic curve describes well the data as both the regressions exhibit fitted values (orange line) very close to observed values (blue dots) and coefficients of determination R^2 larger than 99%.

As we can see, the model forecasts developed countries' feasible saturation at 9,047 adherents. This means that, in 2018, these countries have reached 63.1% of their feasible saturation level, which is expected in 2027. On the other hand, the model forecasts developing countries' feasible saturation at 16,454 members, significantly higher than

Figure 2 The logistic curve for UNGC participants in developed and developing countries



developed countries. Nowadays developing countries have reached 35% of their feasible saturation level, which is expected in 2035. Therefore, our analysis supports *H2*: UNGC will be more quickly and extensively diffused in developing countries.

4.3 Diffusion by industry

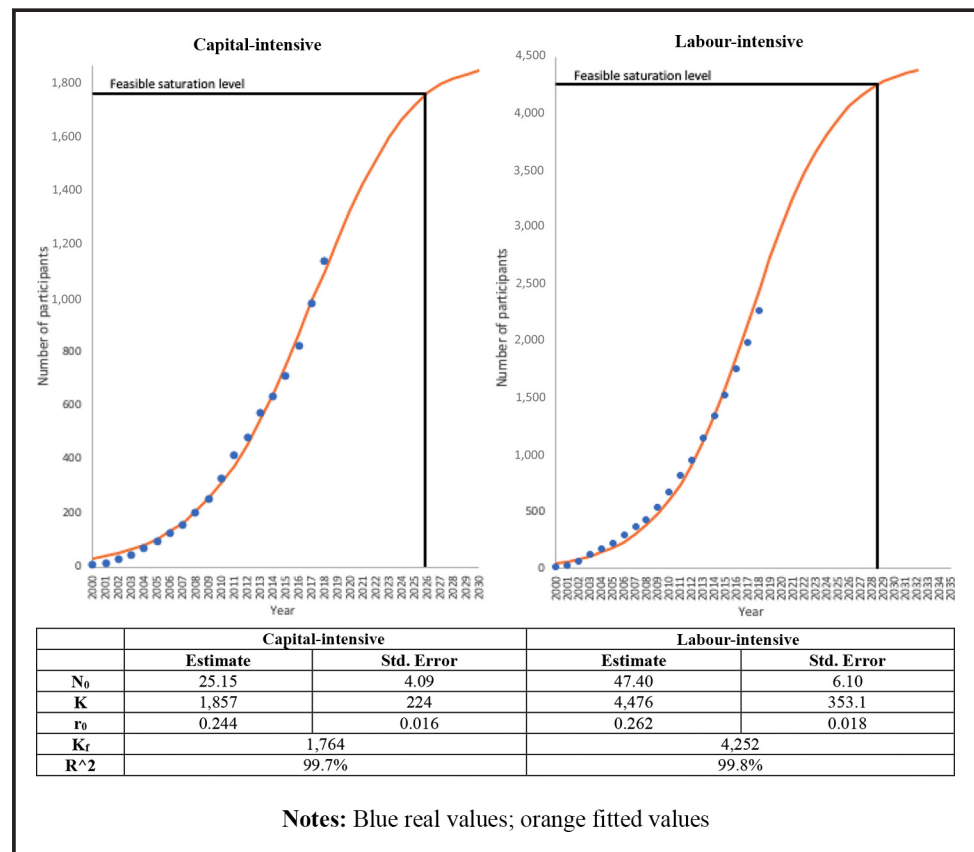
The next step in the analysis was focusing on the diffusion of UNGC in capital-intensive ($n_{\text{capital}} = 1,142$) and labour-intensive ($n_{\text{labour}} = 2,254$) industries (*H3*). The logistic curve suits well the data (Figure 3); the fitted values (orange line) are very close to the real values (blue dots) with a coefficient of determination R^2 higher than 99%.

The estimates predict the feasible saturation of capital-intensive industries in 2026 at 1,764 participants. This means that in 2018, they have reached 64.7% of their feasible saturation level. On the other hand, in 2018, labour-intensive industries are at 53% of their feasible saturation level (i.e. 4,252), which will be reached in 2029. These findings support *H3*: UNGC will be more quickly and extensively diffused in labour-intensive industries.

4.4 Instability and concentration

4.4.1 *Instability*. To shed light on the stability of the rate of participants held by each industry and each country over time, we estimated their instability indexes. The

Figure 3 The logistic curve for UNGC participants in capital-intensive and labour-intensive industries



pattern shown in Figure 4 highlights that UNGC diffusion does not present instability issues neither at country nor industry level as both the trends are evolving towards lower values. We can therefore state that the UNGC initiative is maturing, and, as time goes by, the rates of participants are strengthening and becoming more and more stable.

A similar evolution was already observed for ISO 14001 (Marimon *et al.*, 2011), GRI (Marimon *et al.*, 2012) and SA 8000 (Llach *et al.*, 2015).

4.4.2 Concentration. To shed light on whether and how the adoption of UNGC among different industries and countries shows inequalities over time, we estimated their concentration indexes.

Figure 5 shows that the concentration index is decreasing over time with trends very similar to the instability index. We can clearly state that UNGC is becoming very widespread and no disproportions are detected.

Observed patterns are comparable with those already highlighted for other sustainability initiatives, e.g. GRI (Marimon *et al.*, 2012) and SA 8000 (Llach *et al.*, 2015).

Figure 4 Evolution of the instability index for industries and countries

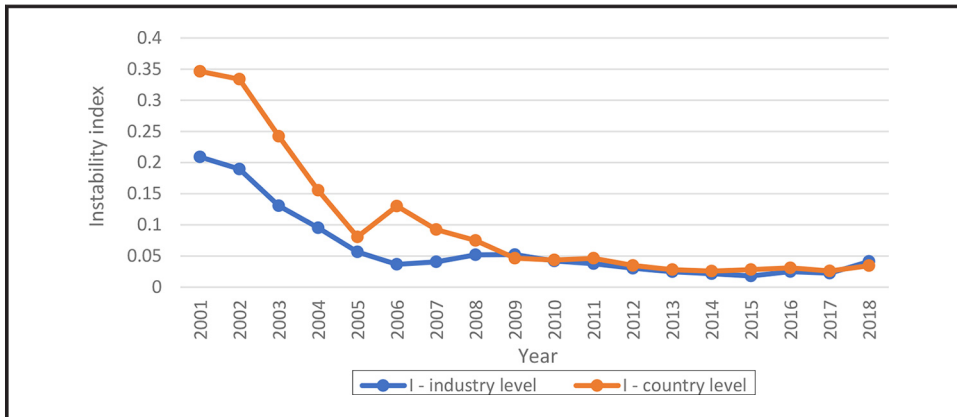
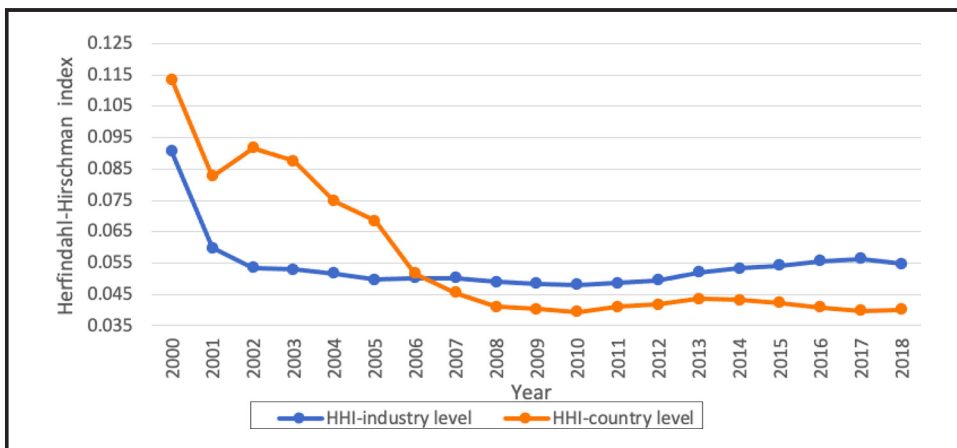


Figure 5 Evolution of the Herfindahl–Hirschman index for industries and countries



5. Discussion

The outcomes of this study offer some insights that deserve a detailed explanation.

Firstly, we highlighted that the past decade has been characterised by an exponential growth in the number of UNGC participants and further expansion is expected. Our results show that, despite many unique features (i.e. the absence of auditing procedures, the publicly available list of the delisted companies, the support of the UN and the relationships network), UNGC diffusion can be described by the logistic curve. *H1* is hence supported. UNGC has diffusive patterns similar to management systems, reporting and certification standards such as ISO 9001 (Franceschini *et al.*, 2004), SA 8000 (Llach *et al.*, 2015), ISO 14001 (Casadesus *et al.*, 2008) and GRI (Marimon *et al.*, 2012). Although the data were analysed at different aggregation levels (i.e. worldwide, by country type or by industry type), the logistic curve has always shown a good fit. Verhulst's equation is thus useful in explaining the UNGC diffusion and predicting its possible future trends. Besides, both instability and Herfindahl indexes exhibit results very close to other more mature certification and reporting standards such as ISO 9001 (Llach *et al.*, 2011) and GRI (Marimon *et al.*, 2012). Compared to these initiatives, UNGC has spread faster and more homogeneously. Hence, the learning process followed for other initiatives could help to adhere more quickly to UNGC.

Findings also support the theoretical predictions of ST made in *H2*. While the potential geographic scope of the UNGC is global, our outcomes highlight that this general guideline will be more quickly and extensively diffused in developing countries. A possible motivation could be the massive regulations on social issues enacted by the governments of developed countries that limit the UNGC effects on organisation performances and that reduce the need to signal their social responsibility for companies coming from these nations. For a further understanding of this result, we can refer to the contributions of Clarke *et al.* (2007). The aforementioned authors highlighted that, in recent years, several consumers have developed particular attention to the origin of goods avoiding products coming from countries with known social problems. These attitudes are putting strong pressure on developing countries' organisations (Donaghey *et al.*, 2014) that increasingly perceive the need to demonstrate their CSR commitment. Guidelines, certifications and reporting standards are voluntary, and, for that reason, their adoption dynamics are bound on the characteristics of the local contexts (Kell and Levin, 2003); therefore, differing from rules and norms (Brunsson and Jacobsson, 2000). In this perspective, UNGC complements weak regulations and its signaling effect can give legitimacy to the firms coming from developing countries thereby answering to the growing international pressure towards sustainability (Gilbert and Rasche, 2007). Additionally, by enhancing their social performances, developing countries' organisations can improve their image and their ability to attract investments (Gilbert and Rasche, 2007).

Our analyses also show that UNGC is expected to grow more in labour-intensive industries. This result is consistent with the predictions made by relying on ST. *H3* is therefore supported. CSR initiatives are benchmarks in sustainability levels set by different organisations (Husted *et al.*, 2016) and act as coordinators of firms' interactions (Terlaak, 2007). Labour-intensive firms can, therefore, perceive strong pressures to adhere to UNGC to offer guarantees about their practices (Rasche, 2009). According to Elliott and Shimamoto (2008), several governments try to attract labour-intensive firms by competitively undercutting environmental and labour regulations or by proposing appropriate derogations. Initiatives like UNGC, in these cases, run as institutional actions able to promote corporate responsibility (Rasche, 2010) and to balance the absence of rigorous local laws and control systems thus signaling the care labour-intensive firms pay to the respect of labour rights and environment (Rasche, 2012).

Summing up, our outcomes suggest that while human rights and environmental awareness in some areas and industries will remain a controversial issue, UNGC adoption will continue

growing and giving participants the required legitimacy to compete in worldwide markets. This strengthens the idea that motivations such as pressures, globalisation, laws and regulations could affect the adoption rate of UNGC and more broadly of general guidelines.

Finally, it is worth mentioning that the outcomes of our contribution are also interesting in the light of the recent release of the Sustainable Development Goals (SDGs) (i.e. a collection of 17 objectives developed by the UN to design a better and more sustainable future for all the citizens). According to both scholarly (Rosati and Faria, 2019) and governmental (United Nations Global Compact, 2020b) contributions, UNGC is one of the main catalysts of the sustainable transformation required by the SDGs. The sound principles and values UNGC is built on can empower organisations and turn the global aims of the SDGs into local responsibilities for each participant company. Moreover, the linkage between SDGs and UNGC can be considered as a starting point to create shared values and a sustainable virtuous cycle for business growth and society well-being (Mattera and Ruiz-Morales, 2020). To strengthen the connection between UNGC and SDGs, the UN has recently launched two important initiatives: SDG Ambition and SDG Reporting. The first aims to support UNGC adherents to integrate the SDGs into their business strategies. The second builds on the ten pillars of UNGC to empower participants in making SDGs a reality. In this perspective, the predicted rise in the number of joiners of UNGC combined with the general awareness of the ethical questions addressed by SDGs (Santos and Bastos, 2020) allow us to state that we can also expect an increase in the number of organisations pursuing SDGs in the years to come. This is particularly important given the urgency of building a future in which a large number of conscious actors address the issues of inequality, poverty, working conditions and environmental protection.

6. Conclusions

This paper was aimed at providing the first systematic analysis of current and future trends of UNGC, which is considered one of the most important general guidelines. Based on the data of the number of adherents from 2000 to 2018, and by relying on the Signaling Theory, the study used the acknowledged approach of combining the logistic curve with instability and concentration indexes to shed light on the issue. Results show that UNGC has the same pattern as other leading reporting and certification standards. Therefore, a growing trend is expected in the years to come, especially in developing countries and labour-intensive industries.

According to the considerations reported in previous sections, the study contributes to both theory and practice. As far as the contribution to theory is concerned, the study advances the knowledge in the field, proposing the first exploratory analysis on the current diffusion of UNGC, understanding its diffusive patterns and shedding light on the motivations leading organisations from developing countries and labour-intensive industries to massively adhere to this general guideline. Besides, our paper offers several hints to further shed light on the drivers that impact its dissemination and identifies possible future trends together with the time required to reach the saturation level. As far as the contribution to practice is concerned, the information obtained can be useful for companies to increase their knowledge and awareness on the topic, to strengthen their business and to plan, develop and communicate practices related to social responsibility and sustainability. It can be also helpful for the UNGC technical committee to understand the current profile of the initiative, to identify areas of improvement and to strengthen UNGC and orientate the implementation practices. In addition, by showing the increasing attention that the UNGC is likely to receive in the coming years, our study might also foster the diffusion of this general guideline. This may potentially contribute to a more sustainable society, in which companies consider people's needs and environmental safeguard as top priorities along with economic profits.

To conclude, we acknowledge some main limitations of the study. Firstly, we used UNGC to shed light on diffusion patterns of general guidelines. However, other initiatives, such as the

OECD Guidelines, may have different patterns or may spread across countries or industries with different profiles. An important direction for future research is hence related to the analysis and the comparison between the diffusive dynamics of guidelines with distinct characteristics or more focused on other aspects of CSR. Secondly, the logistic curve can explain past trends and predict the future diffusion of UNGC. Nevertheless, the model only considers endogenous factors of growth and neglects the possible effects of exogenous factors such as changes in the global economic situation, the introduction of incentives and grants aimed at fostering the adoption of UNGC in some particular contexts and changes in the founding principles of UNGC. Should these discontinuities occur, it might be advisable to repeat the analysis. This would allow, on the one hand, to obtain updated data and, on the other hand, to understand the effect of the discontinuity on the diffusion of the UNGC. Thirdly, we studied UNGC adoption at macro-level rather than at country or firm-level. An interesting avenue for further research is related to the exploration of the diffusion patterns in some specific countries (e.g. those with the highest number of adherents) or to check whether countries that are very close from a commercial, social or political point of view exhibit some commonalities. Finally, future studies could also explore the diffusion of multiple sustainability initiatives together (e.g. UNGC and SA8000; UNGC and ISO 14001) in terms of integrated adoption or to assess whether competition effects exist.

References

- Akerlof, G.A. (1970), "The market for "lemons": quality uncertainty and the market mechanism", *The Quarterly Journal of Economics*, Vol. 84 No. 3, pp. 488-500.
- Alonso-Almeida, M., Llach, J. and Marimon, F. (2014), "A closer look at the 'global reporting initiative' sustainability reporting as a tool to implement environmental and social policies: a worldwide sector analysis", *Corporate Social Responsibility and Environmental Management*, Vol. 21 No. 6, pp. 318-335.
- Alonso-Almeida, M., Marimon, F. and Bernardo, M. (2013), "Diffusion of quality standards in the hospitality sector", *International Journal of Operations & Production Management*, Vol. 33 No. 5, pp. 504-527.
- Alonso-Almeida, M., Marimon, F., Casani, F. and Rodriguez-Pomeda, J. (2015), "Diffusion of sustainability reporting in universities: current situation and future perspectives", *Journal of Cleaner Production*, Vol. 106, pp. 144-154.
- Andrianova, O. and Yeletsikh, T. (2012), "Societal marketing: integration of European experiences into business practices in Belarus", *International Journal of Emerging Markets*, Vol. 7 No. 2, pp. 107-131.
- Arevalo, J.A. and Aravind, D. (2011), "Corporate social responsibility practices in India: approach, drivers, and barriers", *Corporate Governance: The International Journal of Business in Society*, Vol. 11 No. 4, pp. 399-414.
- Arevalo, J.A. and Aravind, D. (2017), "Strategic outcomes in voluntary CSR: reporting economic and reputational benefits in principles-based initiatives", *Journal of Business Ethics*, Vol. 144 No. 1, pp. 201-217.
- Bacaër, N. (2011), "Verhulst and the logistic equation (1838)", Bacaër, N. (Ed.), *A Short History of Mathematical Population Dynamics*, Springer, London, pp. 35-39.
- Bachmann, B. (2016), "Ethical leadership in organizations: concepts and implementation", Idowu, S.O and Schmidpeter, R (Eds), *CSR, Sustainability, Ethics & Governance*, Springer, Eltville am Rhein.
- Battaglia, M., Testa, F., Bianchi, L., Iraldo, F. and Frey, M. (2014), "Corporate social responsibility and competitiveness within SMEs of the fashion industry: evidence from Italy and France", *Sustainability*, Vol. 6 No. 2, pp. 872-893.
- Behnam, M. and MacLean, T.L. (2011), "Where is the accountability in international accountability standards?: A decoupling perspective", *Business Ethics Quarterly*, Vol. 21 No. 1, pp. 45-72.
- Bellace, J.R. (2014), "Hoisted on their own petard? Business and human rights", *Journal of Industrial Relations*, Vol. 56 No. 3, pp. 442-457.
- Bennie, L., Bernhagen, P. and Mitchell, N.J. (2007), "The logic of transnational action: the good corporation and the global compact", *Political Studies*, Vol. 55 No. 4, pp. 733-753.

- Berliner, D. and Prakash, A. (2012), "From norms to programs: the United Nations Global Compact and global governance", *Regulation & Governance*, Vol. 6 No. 2, pp. 149-166.
- Berliner, D. and Prakash, A. (2015), "Bluewashing the firm? Voluntary regulations, program design, and member compliance with the United Nations Global Compact", *Policy Studies Journal*, Vol. 43 No. 1, pp. 115-138.
- Bernhagen, P., Mitchell, N.J. and Thissen-Smits, M. (2013), "Corporate citizens and the UN Global Compact: explaining cross-national variations in turnout", *Business and Politics*, Vol. 15 No. 1, pp. 63-85.
- Branco, M.C. and Delgado, C. (2012), "Business, social responsibility, and corruption", *Journal of Public Affairs*, Vol. 12 No. 4, pp. 357-365.
- Brunsson, N. and Jacobsson, B. (2000), "The contemporary expansion of standardization", *A World of Standards*, Vol. 1, pp. 1-17.
- Brunsson, N., Rasche, A. and Seidl, D. (2012), "The dynamics of standardization: three perspectives on standards in organization studies", *Organization Studies*, Vol. 33 No. 5-6, pp. 613-632.
- Cabecinhas, M., Domingues, P., Sampaio, P., Bernardo, M., Franceschini, F., Galetto, M., Gianni, M., Gotzamani, K., Mastrogiovanni, L. and Hernandez-Vivanco, A. (2018), "Integrated management systems diffusion models in South European countries", *International Journal of Quality & Reliability Management*, Vol. 35 No. 10, pp. 2289-2303.
- Cabral, L. (1997), *Economía Industrial*, McGraw-Hill, Madrid.
- Casadesus, M., Marimon, F. and Heras, I. (2008), "ISO 14001 diffusion after the success of the ISO 9001 model", *Journal of Cleaner Production*, Vol. 16 No. 16, pp. 1741-1754.
- Cetindamar, D. (2007), "Corporate social responsibility practices and environmentally responsible behavior: the case of the United Nations Global Compact", *Journal of Business Ethics*, Vol. 76 No. 2, pp. 163-176.
- Clarke, N., Barnett, C., Cloke, P. and Malpass, A. (2007), "The political rationalities of fair-trade consumption in the United Kingdom", *Politics & Society*, Vol. 35 No. 4, pp. 583-607.
- Connelly, B.L., Certo, S.T., Ireland, R.D. and Reutzel, C.R. (2011), "Signaling theory: a review and assessment", *Journal of Management*, Vol. 37 No. 1, pp. 39-67.
- Coulmont, M. and Berthelot, S. (2015), "The financial benefits of a firm's affiliation with the UN Global Compact", *Business Ethics: A European Review*, Vol. 24 No. 2, pp. 144-157.
- Coulmont, M., Lambert, K. and Berthelot, S. (2018), "National culture and UN Global Compact affiliation", *Social Responsibility Journal*, Vol. 14 No. 3, pp. 584-600.
- Donaghey, J., Reinecke, J., Niforou, C. and Lawson, B. (2014), "From employment relations to consumption relations: balancing labor governance in global supply chains", *Human Resource Management*, Vol. 53 No. 2, pp. 229-252.
- Egels-Zandén, N. and Kallifatides, M. (2009), "The UN Global Compact and the enlightenment tradition: a rural electrification project under the aegis of the UN Global Compact", *Corporate Social Responsibility and Environmental Management*, Vol. 16 No. 5, pp. 264-277.
- Einwiller, S., Ruppel, C. and Schnauber, A. (2016), "Harmonization and differences in CSR reporting of US and German companies: analyzing the role of global reporting standards and country-of-origin", *Corporate Communications: An International Journal*, Vol. 21 No. 2, pp. 230-245.
- Elliott, R.J. and Shimamoto, K. (2008), "Are ASEAN countries havens for Japanese pollution-intensive industry?", *The World Economy*, Vol. 31 No. 2, pp. 236-254.
- Eurostat (2019), "Eurostat indicators on high-tech industry and knowledge-intensive services", available at: https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf (accessed 24 February 2020).
- Franceschini, F., Galetto, M. and Cecconi, P. (2006), "A worldwide analysis of ISO 9000 standard diffusion: considerations and future development", *Benchmarking: An International Journal*, Vol. 13 No. 4, pp. 523-541.
- Franceschini, F., Galetto, M. and Gianni, G. (2004), "A new forecasting model for the diffusion of ISO 9000 standard certifications in European countries", *International Journal of Quality & Reliability Management*, Vol. 21 No. 1, pp. 32-50.

- Fritsch, S. (2008), "The UN Global Compact and the global governance of corporate social responsibility: complex multilateralism for a more human globalisation?", *Global Society*, Vol. 22 No. 1, pp. 1-26. Vol
- Gamboa, L.F. and Otero, J. (2009), "An estimation of the pattern of diffusion of mobile phones: the case of Colombia", *Telecommunications Policy*, Vol. 33 Nos 10/11, pp. 611-620.
- Garayar Erro, A. and Calvo Sánchez, J.A. (2012), "Joining the UN Global Compact in Spain: an institutional approach", *Revista de Contabilidad*, Vol. 15 No. 2, pp. 311-355.
- Garayar, A., Heras-Saizarbitoria, I. and Boiral, O. (2016), "Adoption of the UN Global Compact in Spanish banking: a case study", *Journal of Public Affairs*, Vol. 16 No. 4, pp. 359-367.
- Garsten, C. and Jacobsson, K. (2011), "Transparency and legibility in international institutions: the UN Global Compact and post-political global ethics", *Social Anthropology*, Vol. 19 No. 4, pp. 378-393.
- Giesler, M. and Veresiu, E. (2014), "Creating the responsible consumer: moralistic governance regimes and consumer subjectivity", *Journal of Consumer Research*, Vol. 41 No. 3, pp. 840-857.
- Gilbert, D.U. and Behnam, M. (2013), "Trust and the United Nations Global Compact: a network theory perspective", *Business & Society*, Vol. 52 No. 1, pp. 135-169.
- Gilbert, D.U. and Rasche, A. (2007), "Discourse ethics and social accountability: the ethics of SA 8000", *Business Ethics Quarterly*, Vol. 17 No. 2, pp. 187-216.
- Gilbert, D.U., Rasche, A. and Waddock, S. (2011), "Accountability in a global economy: the emergence of international accountability standards", *Business Ethics Quarterly*, Vol. 21 No. 1, pp. 23-44.
- Greer, D.F. (1992), *Industrial Organization and Public Policy*, Macmillan Publishing Company, New York, NY.
- Gupta, A.D. and Gupta, A.D. (2008), "Corporate social responsibility in India: towards a sane society?", *Social Responsibility Journal*, Vol. 4 Nos 1/2, pp. 209-216.
- Gurbaxani, V. (1990), "Diffusion in computing networks: the case of BITNET", *Communications of the ACM*, Vol. 33 No. 12, pp. 65-76.
- Hamid, U. and Johner, O. (2010), "The United Nations Global Compact communication on progress policy: origins, trends and challenges", *The United Nations Global Compact: Achievements, Trends and Challenges*, pp. 265-280.
- Hemphill, T.A. (2005), "The United Nations Global Compact: the business implementation and accountability challenge", *International Journal of Business Governance and Ethics*, Vol. 1 No. 4, pp. 303-316.
- Hughes, S. and Wilkinson, R. (2001), "The global compact: promoting corporate responsibility?", *Environmental Politics*, Vol. 10 No. 1, pp. 155-159.
- Human Rights Watch (2019), "World report 2019", available at: www.hrw.org/world-report/2019 (accessed 8 December 2019).
- Husted, B.W., Montiel, I. and Christmann, P. (2016), "Effects of local legitimacy on certification decisions to global and national CSR standards by multinational subsidiaries and domestic firms", *Journal of International Business Studies*, Vol. 47 No. 3, pp. 382-397.
- Jacquemin, A. (1987), *The New Industrial Organization: Market Forces and Strategic Behaviour*, MIT Press, Cambridge.
- Janney, J.J., Dess, G. and Forlani, V. (2009), "Glass houses? Market reactions to firms joining the UN Global Compact", *Journal of Business Ethics*, Vol. 90 No. 3, pp. 407.
- Jha, A. and Aggrawal, V.S. (2020), "Institutional pressures for corporate social responsibility implementation: a study of Indian executives", *Social Responsibility Journal*, Vol. 16 No. 4, pp. 555-577.
- Jha, A. and Saha, D. (2020), "Forecasting and analysing the characteristics of 3G and 4G mobile broadband diffusion in India: a comparative evaluation of Bass, Norton-Bass, Gompertz, and logistic growth models", *Technological Forecasting and Social Change*, Vol. 152.
- Kell, G. and Levin, D. (2003), "The global compact network: an historic experiment in learning and action", *Business and Society Review*, Vol. 108 No. 2, pp. 151-181.
- Kobrin, S.J. (2009), "Private political authority and public responsibility: transnational politics, transnational firms, and human rights", *Business Ethics Quarterly*, Vol. 19 No. 3, pp. 349-374.

- Lau, C.L., Fisher, C.D., Hulpke, J.F., Kelly, W.A. and Taylor, S. (2017), "United Nations Global Compact: the unmet promise of the UNGC", *Social Responsibility Journal*, Vol. 13 No. 1, pp. 48-61.
- Lehmann, M., Toh, I., Christensen, P. and Ma, R. (2010), "Responsible leadership? Development of CSR at Danfoss, Denmark", *Corporate Social Responsibility and Environmental Management*, Vol. 17 No. 3, pp. 153-168.
- Lim, A. and Tsutsui, K. (2012), "Globalization and commitment in corporate social responsibility: cross-national analyses of institutional and political-economy effects", *American Sociological Review*, Vol. 77 No. 1, pp. 69-98.
- Lin, C.Y. and Ho, Y.H. (2011), "Determinants of green practice adoption for logistics companies in China", *Journal of Business Ethics*, Vol. 98 No. 1, pp. 67-83.
- Llach, J., Marimon, F. and Bernardo, M. (2011), "ISO 9001 diffusion analysis according to activity sectors", *Industrial Management & Data Systems*, Vol. 111 No. 2, pp. 298-316.
- Llach, J., Marimon, F. and del Mar Alonso-Almeida, M. (2015), "Social accountability 8000 standard certification: analysis of worldwide diffusion", *Journal of Cleaner Production*, Vol. 93, pp. 288-298.
- McKinsey (2013), *The Business of Sustainability*, Report McKinsey, New York, NY.
- Marimon, F., Casadesus, M. and Heras-Saizarbitoria, I. (2006), "ISO 9000 and ISO 14000 standards: an international diffusion model", *International Journal of Operations & Production Management*, Vol. 26 No. 2, pp. 141-165.
- Marimon, F., Casadesus, M. and Heras-Saizarbitoria, I. (2010), "Certification intensity level of the leading nations in ISO 9000 and ISO 14000 standards", *International Journal of Quality & Reliability Management*, Vol. 27 No. 9, pp. 1002-1020.
- Marimon, F., del Mar Alonso-Almeida, M., del Pilar Rodríguez, M. and Alejandro, K.A.C. (2012), "The worldwide diffusion of the global reporting initiative: what is the point?", *Journal of Cleaner Production*, Vol. 33, pp. 132-144.
- Marimon, F., Llach, J. and Bernardo, M. (2011), "Comparative analysis of diffusion of the ISO 14001 standard by sector of activity", *Journal of Cleaner Production*, Vol. 19 No. 15, pp. 1734-1744.
- Mattera, M. and Ruiz-Morales, C.A. (2020), "UNGC principles and SDGs: perception and business implementation", *Marketing Intelligence & Planning*, Vol. 39 No. 2.
- Mele, V. and Schepers, D.H. (2013), "E pluribus unum? Legitimacy issues and multi-stakeholder codes of conduct", *Journal of Business Ethics*, Vol. 118 No. 3, pp. 561-576.
- Moura-Leite, R.C. and Padgett, R.C. (2011), "Historical background of corporate social responsibility", *Social Responsibility Journal*, Vol. 7 No. 4, pp. 528-539.
- Mueckenberger, U. and Jastram, S. (2010), "Transnational norm-building networks and the legitimacy of corporate social responsibility standards", *Journal of Business Ethics*, Vol. 97 No. 2, pp. 223-239.
- Naseri, M.B. and Elliott, G. (2013), "The diffusion of online shopping in Australia: comparing the bass, logistic and Gompertz growth models", *Journal of Marketing Analytics*, Vol. 1 No. 1, pp. 49-60.
- Néron, P.Y. and Norman, W. (2008), "Citizenship, Inc. Do we really want businesses to be good corporate citizens?", *Business Ethics Quarterly*, Vol. 18 No. 1, pp. 1-26.
- Ortas, E., Álvarez, I. and Garayar, A. (2015), "The environmental, social, governance, and financial performance effects on companies that adopt the United Nations Global Compact", *Sustainability*, Vol. 7 No. 2, pp. 1932-1956.
- Orzes, G., Jia, F., Sartor, M. and Nassimbeni, G. (2017), "Performance implications of SA8000 certification", *International Journal of Operations & Production Management*, Vol. 37 No. 11, pp. 1625-1653.
- Orzes, G., Moretto, A.M., Ebrahimpour, M., Sartor, M., Moro, M. and Rossi, M. (2018), "United Nations Global Compact: literature review and theory-based research agenda", *Journal of Cleaner Production*, Vol. 177, pp. 633-654.
- Orzes, G., Moretto, A.M., Moro, M., Rossi, M., Sartor, M., Caniato, F. and Nassimbeni, G. (2020), "The impact of the United Nations Global Compact on firm performance: a longitudinal analysis", *International Journal of Production Economics*, Vol. 227, pp. 1-13.
- Pangsapa, P. and Smith, M.J. (2008), "Political economy of southeast Asian borderlands: migration, environment, and developing country firms", *Journal of Contemporary Asia*, Vol. 38 No. 4, pp. 485-514.

- Pearl, R. (1978), *The Biology of Population Growth*, Ayer Publishing, New York, NY.
- Perez-Batres, L.A., Miller, V.V. and Pisani, M.J. (2011), "Institutionalizing sustainability: an empirical study of corporate registration and commitment to the United Nations Global Compact guidelines", *Journal of Cleaner Production*, Vol. 19 No. 8, pp. 843-851.
- Perkins, R. and Neumayer, E. (2010), "Geographic variations in the early diffusion of corporate voluntary standards: comparing ISO 14001 and the Global Compact", *Environment and Planning A: Economy and Space*, Vol. 42 No. 2, pp. 347-365.
- Post, J.E. (2013), "The United Nations Global Compact: a CSR milestone", *Business & Society*, Vol. 52 No. 1, pp. 53-63.
- Pratihari, S.K. and Uzma, S.H. (2020), "A survey on bankers' perception of corporate social responsibility in India", *Social Responsibility Journal*, Vol. 16 No. 2, pp. 225-253.
- Rasche, A. (2009), "A necessary supplement: what the United Nations Global Compact is and is not", *Business & Society*, Vol. 48 No. 4, pp. 511-537.
- Rasche, A. (2010), "Collaborative governance 20", *Corporate Governance: The International Journal of Business in Society*, Vol. 10 No. 4, pp. 500-511.
- Rasche, A. (2012), "Scaling up sustainability: the role of voluntary standards", *CBS Sustainability Quarterly*, Vol. 3, pp. 26-28.
- Rasche, A. and Waddock, S. (2014), "Global sustainability governance and the UN Global Compact: a rejoinder to critics", *Journal of Business Ethics*, Vol. 122 No. 2, pp. 209-216.
- Rodriguez-Fernandez, M. (2016), "Social responsibility and financial performance: the role of good corporate governance", *BRQ Business Research Quarterly*, Vol. 19 No. 2, pp. 137-151.
- Rosati, F. and Faria, L.G.D. (2019), "Business contribution to the sustainable development agenda: organizational factors related to early adoption of SDG reporting", *Corporate Social Responsibility and Environmental Management*, Vol. 26 No. 3, pp. 588-597.
- Ruggie, J.G. (2001), "Global_governance.net: the global compact as learning network", *Global Governance: A Review of Multilateralism and International Organizations*, Vol. 7 No. 4, pp. 371-378.
- Ruggie, J.G. (2002), "Trade, sustainability and global governance", *Columbia Journal of Environmental Law*, Vol. 27 No. 2, pp. 297-307.
- Runhaar, H. and Lafferty, H. (2009), "Governing corporate social responsibility: an assessment of the contribution of the UN Global Compact to CSR strategies in the telecommunications industry", *Journal of Business Ethics*, Vol. 84 No. 4, pp. 479-495.
- Santos, M.J. and Bastos, C.S. (2020), "The adoption of sustainable development goals by large Portuguese companies", *Social Responsibility Journal*.
- Scott, W.R. (2014), *Financial Accounting Theory*, Pearson Canada, Toronto.
- Selvik, K. (2013), "Business and social responsibility in the Arab world: the zakat vs CSR models in Syria and Dubai", *Comparative Sociology*, Vol. 12 No. 1, pp. 95-123.
- Seppala, N. (2009), "Business and the international human rights regime: a comparison of UN initiatives", *Journal of Business Ethics*, Vol. 87, No. 2, pp. 401-417.
- Sethi, S.P. and Schepers, D.H. (2014), "United Nations Global Compact: the promise-performance gap", *Journal of Business Ethics*, Vol. 122 No. 2, pp. 193-208.
- Spence, M. (1973), "Job market signaling", *The Quarterly Journal of Economics*, Vol. 87 No. 3, pp. 355-374.
- Stoneman, P. (1995), *Handbook of the Economics of Innovation and Technological Change*, Blackwell Handbooks in Economics, Oxford.
- Terlaak, A. (2007), "Order without law? The role of certified management standards in shaping socially desired firm behaviors", *Academy of Management Review*, Vol. 32 No. 3, pp. 968-985.
- Tsoularis, A. and Wallace, J. (2002), "Analysis of logistic growth models", *Mathematical Biosciences*, Vol. 179 No. 1, pp. 21-55.
- United Nations Global Compact (2019), available at www.unglobalcompact.org (accessed 10 December 2019).

United Nations Global Compact (2020a), "Principles", available at: www.unglobalcompact.org/what-is-gc/mission/principles (accessed 5 February 2020).

United Nations Global Compact (2020b), "Advancing sustainable development", available at: www.unglobalcompact.org/what-is-gc/our-work/sustainable-development (accessed 9 December 2020).

United Nations (2019), "World economic situation and prospects", available at: www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2019_BOOK-web.pdf (accessed 25 November 2019).

Vormedal, I. (2005), *Governance through Learning: The UN Global Compact and Corporate Responsibility*, Center for Development and the Environment, University of Oslo.

Walker, H., Seuring, S., Sarkis, J. and Klassen, R. (2014), "Sustainable operations management: recent trends and future directions", *International Journal of Operations & Production Management*, Vol. 34 No. 5.

Appendix

Verhulst's equation is based on the assumption that the growth rate of the population r reduces with the density of its individuals. When the density is scarce ($N \simeq 0$) there is no intra-specific competition, and the growth rate is maximum and equal to r_0 . As the population increases, the growth rate decreases reaching the zero value when $N = K$, where K is the number of organisms that the environment can sustain indefinitely.

The growth rate can be therefore described as:

$$r = r_0 \left(1 - \frac{N}{K} \right)$$

Equation A1: Growth rate

While the dynamics of the population can be described as:

$$\frac{dN}{dt} = rN = r_0 N \left(1 - \frac{N}{K} \right)$$

Equation A2: Population dynamics

By separating the variables and integrating the last-mentioned differential equation, the analytical solution comes as:

$$N = \frac{N_0 K}{(K - N_0) e^{-r_0 t} + N_0}$$

Equation A3: Analytical solution (logistic equation)

Where N_0 is the number of organisms at time $t = 0$.

The equation is valid under the assumption of absence of external events or phenomena that can change the natural evolution of the population (for example, diseases).

Corresponding author

Matteo Podrecca can be contacted at: podrecca.matteo@spes.uniud.it

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgroupublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com