

INFLUENCE OF COUNTRIES' INSTITUTIONAL PROFILE ON VOLUNTARY CARBON DISCLOSURES

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Doctoral thesis

A thesis submitted in fulfilment of the requirements for the doctoral degree at
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Delhi, India, the most polluted city in the world, according to the World Health Organization. (<https://cen.acs.org/environment/pollution/Searching-solutions-Delhis-air-pollution/97/i7>)



UNIVERSIDAD DE SEVILLA

DEPARTAMENTO DE CONTABILIDAD
Y ECONOMÍA FINANCIERA

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DOCTORAL THESIS

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List of abbreviations

BNEF	Bloomberg New Energy Finance
CDP	Carbon Disclosure Project
CSR	Corporate Social Reporting
EPSI	Environmental Policy Stringency Index
ETS	Emissions Trading Schemes
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse gas
GICS	Global Industry Classification Standard
GLOBE	Global Leadership Organizational Behaviour Effectiveness
IPCC	Intergovernmental Panel on Climate Change
NGER	National Greenhouse and Energy Reporting
NIS	New Institutional Sociology
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
ROA	Return on assets
TCFD	Task Force on Climate-Related Financial Disclosures
VIF	Variance Inflation Factor

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Chapter 1. Introduction

Research motivations, research objectives, theoretical framework, methodology, research contributions, structure of the thesis

1.1. Research motivations

Anthropogenic greenhouse gas (GHG) emissions have been identified as the dominant cause of observed warming since the pre-industrial period. Global warming has already caused unprecedented risks to natural and human systems such as increases in droughts, heat waves, heavy rain etc. (IPCC, 2018). Climate change has led to an increase in concern over companies' levels of GHG emissions, and their contribution to global warming (Hahn et al., 2015).

Social concern regarding climate change and its consequences has developed into a relevant matter for organizations in both the public and private sector. More specifically in the case of the latter, investors have increased their demands for information concerning impacts, risks and strategies related to climatic change (Luo, 2019). As a result, organisations find themselves under pressure from different stakeholders to report on their strategies for climate change, as well as on the risks and opportunities it entails (Freedman & Jaggi, 2010), so that said stakeholders may incorporate this information into their decision-making process (Luo et al., 2013). In 2000, a group of institutional investors created the Carbon Disclosure Project (hereinafter CDP). The CDP is a voluntary initiative that is used by several global companies for the disclosure of carbon information (Depoers et al., 2016). Since its creation, the number of companies disclosing their carbon information through CDP has continued to increase. In this sense, CDP reports have become an important part of companies' voluntary carbon reporting (Depoers et al., 2016; Kolk et al., 2008).

As climate change is an increasingly important social and economic issue, understanding the determinants of carbon disclosure is a worthy topic. Previous studies have provided some evidence on the determinants of corporate carbon disclosures (P. M. Clarkson et al., 2008; Cotter & Najah, 2012; Jira & Toffel, 2013; Luo, 2019; Luo et al., 2012; Prado-Lorenzo et al., 2009; Rankin et al., 2011; Reid & Toffel, 2009; Stanny, 2013). They found that various factors affect corporate

carbon disclosures such as firms' characteristics (e.g. profitability, leverage, size), disclosure-related (e.g. corporate sustainability reports, firms' CDP participation), environment-related (e.g. carbon emissions, carbon-intensive industry), as well as country-level factors (e.g. the stringency of environmental regulations, common-law countries, presence of emissions trading schemes (hereinafter ETS), ratification of the Kyoto Protocol).

Voluntary carbon disclosure has already been the subject of considerable research, but it nonetheless merits further investigation, especially as regards its link to the three climate-related institutional pillars (regulative, normative and cultural-cognitive). It has been argued that the institutional context plays a crucial role in moderating voluntary carbon disclosure (Hahn et al., 2015; Luo, 2019; Luo et al., 2012). The majority of previous studies that consider the influence of institutional factors on carbon disclosure have focused on a single dimension of institutions such as regulative (e.g. Rankin et al., 2011; Reid and Toffel, 2009), cultural (e.g. Luo and Tang, 2016), or on institutions as a whole (e.g. Luo et al., 2012). Moreover, these studies have used generic factors to measure institutional pressures, for example, Luo et al. (2012) used the ratification of the Kyoto Protocol and the nature of the general legal system to proxy for the regulative pillar of institutions. While these measures may include some reference to climate change, they are somewhat generic in nature. In terms of cultural pressures, Luo and Tang (2016) analysed whether national culture influences voluntary carbon reporting. However, they employed national culture factors that are rather general in nature, such as uncertainty avoidance, power distance or long-term orientation. In this sense, it is of interest to examine how institutional pressures affect firms' disclosure behaviour by considering institutional factors that are directly related to climate change such as climate-related laws or levels of social concern about climate change.

Perrault-Crawford and Clark-Williams (2010) suggested that countries' institutional contexts may be a key driver of voluntary carbon disclosures. Although they considered the three institutional pillars, their analyses cannot be extrapolated to other countries or industries since they only considered banking companies from two countries (France and the United States of America). They called for further empirical research that would move beyond institutional theory as a whole and consider a larger sample of countries and sectors. Furthermore, it is not yet clear whether the climate-related normative and cultural pillars of institutions impact on voluntary carbon reporting. Hence this thesis addresses these problems by taking the three institutional pillars related to climate change into account, and by building on a wider sample of companies and industries.

In addition, many countries exert pressure on companies by establishing regulations that require them to measure and reduce their GHG emissions (Depoers et al., 2016). The Kyoto Protocol represented an important step forward since it established emissions reduction targets for the majority of industrialised countries (UN, 2018). Indeed, the Kyoto Protocol has been used in several previous studies to measure the influence of a country's regulative context on companies' carbon reporting. However, no consistent results have been obtained: while certain authors have detected a positive relationship between the two (e.g. Freedman & Jaggi, 2005; Jira & Toffel, 2013; Prado-Lorenzo et al., 2009), others have not been able to find a significant relationship (e.g. Brouhle and Harrington, 2010; Luo et al., 2012). In recent times, many countries have increased their environmental regulations in order to respond to the challenges of climate change, and they have passed specific laws for the reduction of GHG emissions (Nachmany et al., 2015). This evolution towards greater specificity in climate change regulations together with the inconsistency of the results obtained in the previous literature have also prompted the writing of this thesis. In this sense, this research aims to analyse the pressure exerted by a country's regulative context

on companies' carbon reporting strategies, taking into account whether they do or do not disclose information as well as the quality of the information disclosed. Furthermore, the vast majority of previous studies have considered the regulatory context of institutions as a whole (as a single variable), despite the fact that it is possible to differentiate various components of the regulatory context (rules and laws; monitoring mechanisms and penalties; and rewards), making it possible to delve into the influence of the regulatory context on through the analysis of the influence of its components, which up to now has not been done.

1.2. Research objectives

The primary aim of this thesis is to improve our understanding about the relationship between countries' institutional profile and voluntary carbon disclosure (considering the three institutional pillars: regulative, normative and cultural-cognitive (Scott, 2014)) and empirically testing a theoretical model to fill in the gap in knowledge. In addition, given its importance, this research aims to analyse the influence of the components of the regulative pillar of institutions on voluntary carbon disclosures on the part of companies.

In particular, drawing on the theoretical framework of New Institutional Sociology (hereinafter NIS) this research establishes the following objectives:

1. To identify and empirically analyse the influence of countries' climate-related institutional context (regulative, normative and cultural-cognitive) on companies' decisions to voluntarily disclose carbon information, as well as on the quality of carbon disclosures.
2. To investigate whether the different components of the climate change-related regulative pillar of countries influence companies' decisions to voluntarily disclose carbon information, as well as the quality of disclosures.

1.3. Theoretical framework

Given that this research is focused on countries' institutional profile, NIS theory has been used in order to examine the pressure of a country's climate-related institutional pillars on companies' response to demands for carbon disclosure. This theory establishes that the decision to disclose or not to disclose carbon information, and how to disclose it, is not necessarily the result of a rational decision-making process on the part of organizations that act independently (Larrinaga-González, 2007), but rather it may be conditioned by pressures of the institutional context of the country common to them (Grauel & Gotthardt, 2016). Along these lines, Scott (2014) pointed out that organizations are deeply immersed in institutional contexts, which at the same time both facilitate and restrict said organizations' behaviour. Scott (2014) identified three institutional pillars that influence the behaviour of organizations. These are regulative, normative and cultural-cognitive. This thesis will measure each of these pillars and test whether they influence companies' decisions to voluntarily disclose carbon information, as well as the quality of the information reported.

Although NIS theory is the main theoretical approach of this research, in Chapter 2 other relevant theories that have been used to explain voluntary carbon disclosure are revised such as legitimacy theory, stakeholder theory, economic-based theories, etc. (Hahn et al., 2015).

1.4. Methodology

Both the incidence in the decision to disclose and the quality of the information disclosed, are analysed by using logit, Tobit and the Heckman two-stage models. These models are built on control variables which have been widely used in previous studies based on different theories that justify their relationship with dependent variables (decision and quality of disclosure). Therefore, different theoretical models are proposed in order to address the objectives of this thesis.

1.5. Research contributions

This research provides the first comprehensive assessment of the relationship between countries' climate-related institutional pillars and voluntary carbon disclosure, taking into account both the response decision as well as the quality of disclosures. Hence, this thesis contributes to the existing literature in several ways.

First, it links countries' institutional contexts to the decision of firms that operate in said countries to voluntarily disclose carbon information (Grauel & Gotthardt, 2016). Second, it uses specific climate-related measurements for the regulative, normative and cultural-cognitive dimensions of countries' institutional context (Kostova, 1997; Scott, 2014), more specifically, it is the first to consider the three institutional pillars related to climate change in the study of voluntary carbon disclosures. Therefore, the novelty of this study is that it considers specific climate-related variables to measure the different institutional pillars. Third, it considers the three institutional pillars related to climate change in the same regression model and provides empirical evidence that companies' decisions to voluntarily disclose carbon information and the quality of the information disclosed should be examined separately because it is possible that they are influenced by different factors. Fourth, regarding the regulative pillar of institutions, unlike previous studies which consider generic environmental regulative components (Luo et al., 2012; Rankin et al., 2011; Reid & Toffel, 2009), this thesis identifies and measures the different components of countries' climate-related regulative contexts. Specifically, it examines the pressure exerted by the different regulative components (rules; monitoring mechanisms and punishment; rewards) on voluntary carbon disclosure on the part of companies, again in contrast to previous studies which either focus on countries' regulative pillars as a whole (Freedman & Jaggi, 2005; Luo et al., 2012; Rankin et al., 2011; Reid & Toffel, 2009), or center on one specific component, e.g. climate-related rules (Mateo-Márquez

et al., 2020). Five, it demonstrates which countries present higher levels of pressure from said regulative dimensions. Thus countries with higher levels of pressure may reflect a greater commitment to the fight against climate change. Finally, this study took into consideration all the companies that appear in the 2015 CDP reports by country/region, thus avoiding the bias found in many previous studies which only consider larger-scale companies or those listed in the main indices of specific countries (e.g. Freedman and Jaggi, 2005; Luo et al., 2012; Prado-Lorenzo et al., 2009; Tang and Luo, 2011).

1.6. Structure of the thesis

The remainder of this thesis is organised as follows. Chapter 2 presents the conceptual framework and the development of hypotheses. This chapter also includes a comprehensive review of the different theories that have been used in the research field of voluntary carbon disclosures. Chapter 3 describes the research design including sample selection, the theoretical models and the variables introduced in the study. Chapter 4 includes the descriptive analysis, the correlation analysis, the empirical results, and the robustness analysis. This chapter also presents a comprehensive analysis of the distribution of countries' climate-related institutional profile. Chapter 5 presents the main conclusions of this study, as well as implications for future research.

Chapter 2. Literature review and development of hypotheses

Introduction, socio-political theories of disclosure, economic-based theories of disclosure, institutional theory

2.1. Introduction

This research is situated within the broad context of voluntary environmental disclosures (Cho & Patten, 2007; Fondevila et al., 2019; Roberts, 1992), more specifically voluntary carbon disclosures (Lemma et al., 2019; Luo, 2019; Stanny, 2013). Consequently, this chapter goes on to explore the main theoretical frameworks adopted in previous studies regarding voluntary carbon disclosure. It then provides detailed reviews of the main theoretical models, which have been used to analyse environmental information, as well as the main research methods. Finally, this literature review outlines the theoretical positions that have been adopted with regard to the companies' response to demand for carbon information, as well as the hypothesis development in the present study.

During the past decade, voluntary carbon disclosure has been the subject of considerable attention in the accounting literature. Previous research has explored this topic using different theoretical perspectives, which can be classified into three groups: socio-political theories of disclosure; economic theories of disclosure; and institutional theory (Hahn et al., 2015).

2.2. Socio-political theories of disclosure

Within the group of socio-political theories, stakeholder theory and legitimacy theory (Clarkson et al., 2008) may be highlighted. The first of these argues that companies are subject to pressure from different stakeholders (e.g. suppliers, customers, investors, governments, employees etc.), all of whom may have different expectations and interests (Freeman, 1984). According to stakeholder theory, company managers may use voluntary carbon disclosure as an instrument for satisfying demands of their interest groups, as well as to manage the relationship to them (M. E. Clarkson, 1995; Roberts, 1992). In this sense, this theory holds that corporate carbon disclosure is a reaction to stakeholder demands for climate change information. Based on the stakeholder approach, Cotter and Najah (2012) found that institutional investors exert a positive influence on

corporate climate change disclosure, as well as on the transparency level. Freedman and Jaggi (2005) stressed that higher leveraged firms are more likely to provide carbon information in order to keep their investors and creditors informed about their carbon performance, thus avoiding debt-covenant's violations and higher costs of capital. Several studies have drawn on stakeholder theory to study factors that influence carbon disclosure. They found that stakeholder pressures exert a positive influence on corporate carbon information disclosure (Cotter & Najah, 2012; Freedman & Jaggi, 2005; Liu & Anbumozhi, 2009).

According to legitimacy theory (Dowling & Pfeffer, 1975), carbon disclosures are made in response to social pressures for environmental (and social) information. Legitimacy theory argues that companies operate in society under a "social contract" (Guthrie & Parker, 1989; Patten, 1992), whereby they agree to carry out socially desirable actions in exchange for the approval of their actions and objectives (Brown and Deegan, 1998; Giannarakis et al., 2017). In this way, companies are able to use the CDP questionnaire as a reporting vehicle, in order to increase their legitimacy and avoid social scrutiny (Stanny, 2013). In line with this perspective, low performance companies have a greater need to legitimize their operations, serving the CDP survey as an instrument to achieve this goal, as well as to generate positive impressions to society. Thus, this theory establishes a negative relationship between carbon performance and carbon disclosure (Li et al., 2018). Several studies have used socio-political theories to explain the factors that influence carbon reporting (e.g. Freedman and Jaggi, 2005; Luo et al., 2012, 2013; Prado-Lorenzo et al., 2009). Legitimacy theory comprises factors such as company size and media exposure, as larger companies are more visible, and therefore, are more exposed to higher levels of social pressure. In this line, several studies have found a positive relationship between corporate size and voluntary carbon disclosure (Liu & Anbumozhi, 2009; Stanny, 2013; Wegener et al., 2013).

This result is consistent with the argument of socio-political theories, which uphold that larger companies are subject to greater social scrutiny; hence they will be more likely to voluntarily disclose environmental information.

2.3. Economics-based theories of disclosure

Economics-based theories of disclosure (Verrecchia, 1983) suggest that companies' carbon reporting is based on a cost-benefit analysis (P. M. Clarkson et al., 2008). Hence, companies will voluntarily disclose environmental information if the cost of doing so is lower than the positive consequences generated by doing so (Diamond & Verrecchia, 1991). This group of theories includes the voluntary disclosure theory, which establishes that there is a positive relationship between environmental performance and environmental disclosures. In this sense, companies that invest in improving their environmental performance are more likely to voluntarily disclose environmental information in order to keep current and potential investors informed about their improvements, thus, distinguishing themselves from their competitors (P. M. Clarkson et al., 2008; Freedman & Jaggi, 2010). These companies, therefore, will be more likely to disclose a greater amount of environmental information, thereby also making it more difficult for less well-performing companies to simulate their behaviour (P. M. Clarkson et al., 2008; Freedman & Jaggi, 2010). In this line, Giannarakis et al. (2017) found that companies' climate-related disclosures are positively influenced by their environmental performance.

Signalling theory, which also falls within the group of economic theories of disclosure, maintains that companies that control their emissions are able to achieve a competitive advantage, but that they also bear higher costs (Dawkins & Fraas, 2011; Denicolò, 2008). These companies would signal their decisions to the government by means of voluntary information disclosure. The underlying idea is that the regulator will see that the current cost of complying with regulation is low, thereby leading to stricter levels of regulation which

competitors are less able to comply with but which are attainable by those companies that do voluntarily disclose information (Brouhle & Harrington, 2010; Luo, 2019). Luo and Tang (2014) refer to signalling theory as voluntary disclosure theory, claiming that firms with high carbon performance are more likely to voluntarily disclose carbon information. These theories establish a positive association between environmental performance and environmental disclosures. Thus, firms that invest in improving their environmental performance are more likely to voluntarily disclose environmental information in order to keep current and potential investors informed as regards their improvements, thereby distinguishing themselves from their competitors (P. M. Clarkson et al., 2008; Freedman & Jaggi, 2010).

2.4. Institutional theory

Apart from socio-political and economic theories of disclosure, in recent years several authors have adopted institutional theory in order to analyse voluntary corporate carbon disclosure (Hahn et al., 2015). In the mid-1970s, Meyer and Rowan introduced the institutional perspective into organizational studies. They concluded that organizations that incorporate socially legitimized elements in their formal structures maximize their legitimacy and future survival (Meyer & Rowan, 1977). Thus, besides economic-based determinants, the success of organizations depends on accepting and following social norms established in their institutional environment (Tolbert & Zucker, 1996). Hence organizations that operate in highly institutionalized environments will obtain legitimacy by becoming isomorphic in these environments (DiMaggio & Powell, 1983).

In accordance with NIS theory, organizational legitimacy is a key consequence of institutional isomorphism (Deephouse, 1996). Therefore, organizations that adapt to the pressures exerted by the regulative pillar of their country's institutional context obtain legitimacy, understood as the degree of cultural support received by an organization (Meyer & Scott, 1992). Legitimacy is a key concept in the NIS

perspective, although its consideration is different from that stated by legitimacy theory. While the latter focuses on the concept of legitimacy as the ability of organizations to alter the perceptions of other actors (e.g. regulators or public opinion), NIS focuses on the organizations' compliance with the institutions in their environment, which reflect external expectations concerning what behaviours are acceptable (Deegan, 2002). In this regard, Scott (2014) highlighted the fact that organizational legitimacy derives from the organizations' conformity with institutions.

Larrinaga-González (2007) argued that while legitimacy theory is useful for determining in the short term why an organization is disclosing environmental information, NIS is useful for explaining why certain sustainability reporting practices become common within a particular context. Perrault and Clark (2010) pointed out that the environmental and social reporting carried out by companies to respond to coercive regulative pressures entails several drawbacks. Specifically, they indicated that it usually leads to an increase in the amount of information disclosed, but not in the quality of the information. Furthermore, the information is used to justify the company's behaviour socially for the sole purpose of recovering legitimacy. They thus concluded that more mandatory information may not be necessary as it is already provided voluntarily. Although voluntary reporting also receives criticism, Perrault and Clark (2010), concluded that it is showing more promise in terms of changing undesirable corporate behaviour.

The previous literature also offers several reasons as to why companies may choose to voluntarily disclose environmental information, especially carbon information, such as: to obtain legitimacy; to improve the company's reputation; to attract investment funds; to adapt to future regulative changes; and to take advantage of synergies with existing environmental information systems (Deegan, 2002; Grauel & Gotthardt, 2016; Larrinaga-González, 2007; Ott et al., 2017; Perrault-Crawford & Clark-Williams, 2010). From the NIS perspective,

voluntary carbon reporting via the CDP is a vehicle for companies (both subject and not subject to mandatory carbon reporting) to adapt to the social expectations of their environment. These expectations encompass what society expects from companies. Thus, companies tend to incorporate these expectations into their operations, and furthermore, over time, expectations tend to become moral obligations (Järvenpää, 2009). Companies' adaptation to social expectations allows them to obtain legitimacy from both regulative bodies (legally authorised bodies that have authority over organizations), and public opinion (which has the role of establishing the norms of social acceptability) (Deepphouse, 1996). Moreover, in the case of the CDP, this initiative was launched by institutional investors, who themselves are actors that can provide financial resources, and above all, they occupy a position that allows companies to confer legitimacy (Deepphouse, 1996). Within the field of voluntary carbon disclosures, institutional theory has been widely used to explain the reason why companies disclose carbon and environmental information (Jira & Toffel, 2013; Kolk et al., 2008; Luo et al., 2012; Tang & Luo, 2016). The majority of studies regarding the determinants of environmental disclosures consider institutional pressures at country-level (Jira & Toffel, 2013; Luo, 2019; Tang & Luo, 2016).

Zucker (1987) identified institutions as the specific practices, knowledge, ideas and cognitive frameworks that have been permanently adopted by an organization. It is possible to identify multiple levels of institutions, ranging from international contexts (e.g. political systems) to local systems (e.g. professional associations) (Scott, 2014).

2.4.1. The three pillars of institutions

In addition to being economically efficient, organizations need social power and institutional legitimacy in order to survive within a certain context (DiMaggio & Powell, 1983; Meyer & Rowan, 1977). In this sense, DiMaggio and Powell (1983) highlighted the importance of the concept of institutional isomorphism for

understanding the practices that pervade certain contexts. They stated that institutional isomorphism occurs via three mechanisms: coercive, normative and mimetic. Coercive isomorphism results from political influence and the problem of legitimacy (DiMaggio & Powell, 1983). In certain cases, organizational change is driven by a government mandate, for example, in the field of carbon disclosures, companies within certain specific sectors are required to disclose their carbon emissions as consequence of the implementation of an ETS. Therefore, the existence of a legal framework does influence an organization's behaviour. These authors linked normative pressures to professionalisation and education. In this sense, professionalisation refers to the continuous struggle by the partners of an association to define how they should carry out their work. Conversely, the standard formal education provided by educational institutions influences the decision-making processes of managers in the majority of companies in the industrialised world (Matten & Moon, 2008). Mimetic processes originate from uncertainty, since uncertainty is a force that promotes imitation among organizations. Therefore, in the face of uncertainty, organizations tend to imitate the strategies of successful organizations in their institutional contexts, thus becoming isomorphic in their management structures and practices (DiMaggio & Powell, 1983).

Isomorphic pressures as identified by DiMaggio and Powell (1983) are related to the institutional pillars subsequently defined by Scott (2014). Scott designed an analytic framework of NIS theory and found that organizational behaviour is influenced by three institutional pillars: regulative, normative and cultural-cognitive. These institutions provide a framework within which organizations must operate since they are under pressure from rules, norms and cultural beliefs that have been accepted and adopted in a specific environment.

The regulative pillar is related to coercive pressures. This institutional pillar encompasses rules and laws as along with enforcement mechanisms sanctioned

by regulative bodies, and which are used by organizations in selecting and interpreting information (DiMaggio & Powell, 1983). Therefore, governments play a fundamental role given their capacity to sanction rules. Qian and Burritt (2008) note that the regulative dimension of institutions creates the strongest incentive for companies to develop environmental actions, as well as imposing pressures upon them to do so.

It is possible to identify countries' regulative context as the laws and norms that they have established in relation to climate change. Thus, the role of governments is fundamental given their capacity to establish laws and regulations, thereby incentivizing companies to reduce their GHG (Stoddart et al., 2012). Townshend et al. (2013) pointed out that national climate change-related regulation is of vital importance for implementing international agreements, as well as for increasing confidence for future international commitments given that experience at the national level may increase the likelihood of attaining international pledges.

Many governments use a carbon pricing instrument to internalize the external costs of carbon emissions, as well as to reduce GHG emissions to the atmosphere (Metcalf & Weisbach, 2009). Two main mechanisms can be used to set a price on carbon emissions: carbon tax and the GHG emissions trading scheme (hereinafter ETS). With regard to carbon tax instruments, governments place an explicit price on carbon emissions by establishing a tax rate, i.e. a price per tonne of CO₂ emitted, as well as by specifying those companies or industries subject to said tax (Hautes, 2018). In this sense, targeted subjects can choose between reducing their emissions or paying for them. Therefore, the GHG emission reduction depends on the decision taken by the targeted subjects. An ETS instrument sets a limit on carbon emissions by selected subjects, and issues allowances in quantities approximately equal to the limit. Emission rights are tradable, and their price is determined by supply and demand (Chevallier, 2013). ETS differs from carbon tax

in that the carbon price of emissions is not predefined whereas the GHG emission reduction outcome is (World Bank, 2018).

Apart from implementing carbon pricing instruments, governments can require mandatory reporting of companies' GHG emissions. For instance, the Australian government promulgated the National Greenhouse and Energy Reporting (hereinafter NGER) Act in 2008, which requires the reporting of GHG emissions on the part of specific organizations. This was a challenge for many companies, since they had to be mandatorily accountable for their GHG emissions. Thus, the promulgation of the NGER Act led to the emergence of many accounting implications for both organizations and the government. In this sense, the NGER Act facilitates carbon reporting and GHG emissions assurance; it provides engagement with stakeholders; it offers a tool with which to manage risks arising from climate change; it facilitates the implementation of carbon management accounting; it makes available data about GHG emissions; and is extremely useful for developing a carbon pricing mechanism (Lodhia, 2011). Four years later, Australia implemented a system which put a price on carbon emissions, but it was abolished in 2015 (Jotzo & Mazouz, 2015). In this study's sample, all the countries possess a climate change regulative framework. However, it is difficult to measure the level of seriousness of a given country based solely on the number of laws related to climate change disclosures, since while some rules are broad and integrative, others are very narrow in scope (Townshend et al., 2013).

Companies voluntarily disclose carbon information in order to be better positioned for future changes in regulation (Luo et al., 2012; Solomon & Lewis, 2002). Several previous studies use the signing of the Kyoto Protocol as a proxy for regulative pressures. Although some authors reported no significant relationship between carbon disclosures and companies headquartered in a signatory country of the Kyoto Protocol (Luo et al., 2012; Tang & Luo, 2016), the majority of these studies did find a positive and significant association between

these variables (Freedman & Jaggi, 2005; Prado-Lorenzo et al., 2009). Similarly, in their study of voluntary environmental disclosures and the supply chain, Jira and Toffel (2013) found a positive and significant relationship between companies' disclosures and their belonging to Kyoto Protocol countries.

Moreover, some studies went further still and considered other GHG-related regulation such as regulations for specific polluting sectors or those related to ETS (Kim & Lyon, 2011; Luo et al., 2013; Rankin et al., 2011; Reid & Toffel, 2009; Scholtens & Kleinsmann, 2011). Luo et al. (2013) analysed voluntary carbon disclosures in both developing and developed countries. They demonstrated that these disclosures are positively associated with companies' belonging to a country that has an established ETS. This result is similar to that reported by Kim and Lyon (2011) and Reid and Toffel (2009), who found that regulative threats did have a positive influence on companies' actions with regard to voluntary disclosure of carbon emissions. Conversely, Rankin et al. (2011) did not find evidence that companies listed in the European Union ETS are more likely to participate in voluntary GHG disclosure practices. Scholtens and Kleinsmann (2011) found mixed evidence regarding regulative determinants based on GHG-specific regulation. Although the findings of previous literature are ambiguous, it is possible to identify the predominance of a positive relationship between the regulative context and voluntary carbon disclosures.

Although response to the CDP questionnaire is on a wholly voluntary basis, it may be expected that companies which belong to countries with established specific climate change regulations will adapt and make investments to control and reduce their GHG emissions, with the aim of avoiding possible sanctions or loss of legitimacy (Cho & Patten, 2007). In addition, climate change-related regulation, apart from imposing mandatory rules on target companies, also contributes to there being greater visibility of the climate change challenge in society. This leads to the generation of social expectations that may influence the behaviour of both

target and non-target companies. Regulation may also establish a set of requirements that the information disclosed must comply with, which in turn serves as a guarantee of the quality of said information. This would then suggest that companies headquartered in countries with more stringent levels of specific climate regulation will be more likely to voluntarily disclose carbon information compared to companies based in countries with lower levels of climate change regulation. Apart from influencing company participation, countries with high levels of climate change regulation may also exert pressure on the quality of the information reported. Therefore, the first hypotheses in this thesis may be established as follows:

H1a: Countries' climate-related regulative contexts positively influence companies' decisions to voluntarily disclose carbon information.

H1b: Countries' climate-related regulative contexts positively influence the quality of voluntary carbon disclosures.

The normative pillar of institutions refers to the social framework based on values –defined as conceptions of the preferred or the desirable – along with norms that specify the way in which actions should be undertaken in order to achieve organizational objectives (Scott, 2014). In this sense, it may be identified with “*the morally correct thing to do*” (Jones, 1999, p. 165). Thus, while the regulative pillar’s basis of legitimacy is “legally sanctioned” and its basis of compliance is the “expediency” of avoiding sanctions, in the case of the normative pillar, the basis of legitimacy is “morally governed” while the basis of compliance is “social obligation”. Furthermore, Scott (2014) considers that the regulative pillar exhibits high values as regards the dimensions of obligation, precision and delegation, while values for these same dimensions in the case of the normative pillar are lower.

Normative pressures are related to the normative isomorphism identified by DiMaggio and Powell (1983). Therefore, companies may understand that the morally correct thing to do is to disclose information about the impact of their activities on climate change, with the CDP being the vehicle selected for this purpose. In this regard, the CDP serves as a self-regulative framework for companies' normative behaviour since there is no standardized global carbon report. In this way the CDP has created a common framework of rules that companies must adhere to if they wish to participate in the CDP questionnaire (Baldwin et al., 2012). More specifically, the normative expectations presented by the CDP establish how organizations are supposed to behave regarding climate change, and how they should report it. These expectations are also held by certain other notable actors, such as investors who support the CDP, and therefore are experienced by organizations as an external pressure.

In the field of voluntary carbon disclosure, research to date has not yet determined the effects of climate-related normative pressures on companies' voluntary carbon disclosures. Perrault-Crawford and Clark-Williams (2010) conducted a descriptive analysis which considered normative pressures measured as the participation of countries' organizations in the CDP along with corporate social reporting activities. However, they did not present an econometric association between these variables. Stanny (2013) examined voluntary carbon disclosures of the United States S&P 500 companies in the CDP questionnaire, and concluded that voluntary disclosures to the CDP have become 'routine' for these firms, and are carried out on an annual basis. In addition, Stanny (2013) found that the most relevant factor influencing companies' future disclosures is their previous disclosures. Thus it would seem that participating in the CDP questionnaire has become 'the norm' for larger listed companies. Moreover, companies' engagement in voluntary carbon disclosure seems to follow a rather consistent pattern every year. It is necessary to highlight the fact that the

information disclosed by companies to the CDP may vary between country-specific contexts (Perrault-Crawford & Clark-Williams, 2010). In this sense, the country-specific normative context may affect companies' decisions to voluntarily disclose carbon data, as well as generating higher-quality reporting. Consequently, this discussion leads to the following hypotheses:

H2a: Countries' climate-related normative contexts positively influence companies' decisions to voluntarily disclose carbon information.

H2b: Countries' climate-related normative contexts positively influence the quality of voluntary carbon disclosures.

The cultural-cognitive dimension of institutions is the main distinguishing feature of the NIS perspective (Hoffman, 1999; Phillips & Malhotra, 2008; Scott, 2014). This pillar refers to the socially shared conceptions and the common beliefs that create frameworks through which organizations interpret their environment and take action. According to Scott (2014), the basis of compliance of this pillar is the shared understanding that is taken for granted in a given context, while its basis of legitimacy is "culturally supported".

The cultural-cognitive pillar stresses that the internal interpretive processes upon which individuals and organizations rely for their decision-making – such as whether or not to disclose carbon information, for example – are configured and influenced by external cultural frameworks. Thus in this way, the belief systems and cultural frameworks which exist in countries put pressure on individual actors and organizations.

Hoffman (1999) highlighted that the cognitive aspects of institutions are the most entrenched because they form taken-for-granted beliefs and are resistant to change. According to Hoffman (1999, p. 364), "unfortunately, the presence of cognitive institutions is extremely difficult to measure", as has also been highlighted by other authors (e.g. Larrinaga-González, 2007). However, in his

study regarding the evolution of environmentalism in the U.S. chemical industry, Hoffman (1999, p. 364) identified the cultural-cognitive pillar of institutions with “a new mindset” in which the chemical industry was considered to be part of the solution to environmental problems, and not as a problem for the environment, as was the case in previous periods. In this sense, it can be argued that a new mindset is emerging in relation to climate change. While climate change was hardly considered to be a problem by society during the 1980s, social concern and awareness has been on the increase since the 2000s, thus recognizing the problem and its anthropogenic nature, along with its serious repercussions for future generations and the need for organizations to take mitigating action, etc. Social awareness has advanced from ignorance to the shared belief that climate change is a problem that requires the intervention of organizations at the global level. This in turn is putting pressure on organizations, who have thus started to provide carbon reporting as a means of responding to said pressure. Therefore, just as it is taken for granted that organizations must report on their activities and their economic and financial situation through their annual accounts, with no questions raised as to their necessity, the same may occur with the provision of information related to the impact of organizations’ climate change activities, and it may also become a taken-for-granted practice in the future.

With regard to the relationship between countries’ climate-related cultural pressures and voluntary carbon disclosures, little research has been carried out. In fact, certain authors have focused rather more on descriptive analyses and have not established a significant relationship with these variables (Perrault-Crawford & Clark-Williams, 2010). Conversely, other authors have examined voluntary carbon disclosures and national cultural values using an econometric analysis (Luo & Tang, 2016). However, they approximated national cultural values by culture indices that are rather generalist in nature (e.g. the Hofstede measure (Hofstede et al., 2010) or the Global Leadership Organizational Behaviour

Effectiveness (GLOBE) measure (House et al., 2004)), and therefore did not take into consideration specific national cultural values regarding climate change. In this sense, previous studies have not examined the influence of specific countries' climate change awareness on voluntary carbon disclosures. To fill this gap in research, this study considers countries' cultural pressures related to climate change in the study of voluntary carbon disclosures, by considering countries' mindsets concerning climate change, which is then reflected in climate change-related social awareness and concerns in each of the different countries.

It would appear that companies headquartered in countries with high levels of climate change awareness will be more likely to disclose carbon-related information, given that such are the patterns followed in these countries. Therefore, the climate-related cultural context of countries may influence the decisions of companies in said countries to voluntarily disclose carbon information, as well as the quality of the information reported. Consequently, the following hypotheses may be established:

H3a: Countries' climate-related cultural contexts positively influence companies' decisions to voluntarily disclose carbon information.

H3b: Countries' climate-related cultural contexts positively influence the quality of voluntary carbon disclosures.

In this study, countries' institutional profiles will be used to define climate-related pressures from the national contexts. This idea is consistent with the social embedded perspective which explains how individuals and organizations are affected by the social environment in which they operate (Kostova, 1997). Thus this study measures countries' institutional profiles focusing on the specific theme of climate change issues and considering the three institutional pillars: regulative, normative and cultural-cognitive (Scott, 2014). These institutional factors will be introduced in the same regression setting to examine their influence on

companies' decisions to voluntarily disclose carbon data, as well as the quality of the information reported.

2.4.2. The importance of the regulative pillar

As mentioned earlier, isomorphic processes were considered by Scott (2014) to be the underlying mechanisms of the three analytical elements or pillars that comprise institutions, namely regulative, normative and cultural-cognitive. Although they are underpinned by different philosophical concepts and mechanisms, Scott (2014) points out that each element plays an important role in driving organizational behaviour, and that they may be studied separately. Despite the fact that both the normative and the cultural-cognitive pillars can exert influence on corporate carbon disclosure, focusing solely on the regulative dimension is important for several reasons:

(1) regulative systems present higher values as regards obligation, precision and delegation than normative and cultural systems (Scott, 2014).

(2) while the regulative system has been widely examined in previous studies related to carbon disclosure, only a single regulative component has been considered (rules and laws) (Freedman & Jaggi, 2010; Jira & Toffel, 2013; Luo et al., 2012; Mateo-Márquez et al., 2020), and thus the remainder of the regulative components (overseeing mechanisms and punishments; rewards) has not been explored.

(3) the regulative system works through coercive mechanisms, which represent the most obvious and direct pressure on corporate environmental activities (Bebbington & Larrinaga-González, 2008; Qian & Burritt, 2008).

More specifically, Scott (2014) identified the regulative pillar of institutions as those explicit processes involving rule setting, compliance monitoring and enforcement actions (rewards and punishments) aimed at influencing the future behaviour of organizations. The basis for compliance with the regulative pillar is

expedience, since organizations adapt their behaviour to the pressures exerted by this pillar in order to avoid punishments or to seek the corresponding rewards. Furthermore, the legitimate basis of this institutional dimension is "*legally sanctioned*", since it considers whether organizations are legally established and whether they are acting in accord with relevant laws and regulations (Scott, 2014, p. 74). Thus, empirical indicators of the regulative dimension of institutions are to be found in evidence concerning rules and laws; monitoring mechanisms; and sanctioning power (rewards and punishments). Unlike previous studies that consider the regulative dimension as a whole (Jira & Toffel, 2013; Luo et al., 2012), or that do not take into account the individual components of regulative pressures, this study considers each one of the components of the regulative pillar as highlighted by Scott (2014). It subsequently analyses the influence that each of the said regulative components exerts on voluntary carbon disclosure on the part of companies.

In line with the NIS perspective, it is regulative pressure in particular – among all other institutional pressures – that displays the greatest coercive power, since it is based on laws and regulations that must be complied with; on the overseeing of compliance on the part of companies; and on the imposition of sanctions in the case of non-compliance (DiMaggio & Powell, 1983; Scott, 2014). Thus, institutions' regulative context creates a legal framework in order to influence organizations' behaviour, e.g. companies within certain sectors are required to disclose their carbon emissions as consequence of implementing an emissions trading scheme. However, according to the arguments of the institutional pillars (Järvenpää, 2009; Scott, 2014), climate change regulation generates social expectations that may affect the performance of both companies subject to regulation, and those that are not. Apart from the requirements of the regulative framework, adapting to these social expectations can lead companies to voluntarily disclose carbon information through a widely accepted mechanism

such as the CDP. In this regard, NIS predicts that the higher the number of adopters of a particular practice, the wider the social acceptance and the greater the legitimacy that it contributes (Deephouse & Suchman, 2008).

According to NIS theory, the environment in which companies operate may affect their carbon disclosure behaviour. In this sense, the regulative pressures established in a certain country may influence companies' voluntary carbon disclosure. Climate change-related regulation, which forms part of a country's regulative pillar, establishes a set of mandatory rules that oblige those companies involved to report carbon-related information. By complying with the regulation, companies will gain legitimacy and avoid the imposition of formal punishments. However, climate change regulation also contributes to the generation of social expectations that can affect the behaviour of companies both subject and not to said regulation (DiMaggio & Powell, 1983; Scott, 2014). The adaptation of companies to these social expectations leads them to voluntarily disclose carbon-related information through widely known instruments such as the CDP questionnaire. In this regard, NIS theory predicts that the greater the number of adopters of a certain practice, the broader its social acceptance and the greater the legitimacy it provides (Deephouse & Suchman, 2008).

Furthermore, climate change-related regulation establishes requirements for organizations about which they must subsequently report. Therefore, for example, it is customary for regulations to require organizations to control and reduce their carbon emissions. Organizations may develop various strategies in order to comply with said requirements, and they must also compose their emission inventory in order to report their results. In this sense, regulation does exert pressure on organizations to maintain a certain level of quality in their climate change disclosure, since organizations must report on different aspects considered relevant by said regulation. This level of quality as required by regulation may constitute, in a particular country, a benchmark for information

that is voluntarily disclosed by organizations. As specifically regards the CDP, the previous literature has considered the score provided by the CDP for each responding firm as a measure of the quality of its climate change disclosure (Ben-Amar & McIlkenny, 2014; Lemma et al., 2019).

Additionally, a country's regulative pressures refer to the power of regulators to establish rules and laws that oblige companies headquartered in said country to disclose environmental information. By way of example, the European Union established the EU-ETS that requires energy companies to disclose their greenhouse gas emissions (Perrault-Crawford & Clark-Williams, 2010). The second objective of this thesis is more specifically focused on the state-centric approach of regulative pressures, which includes the rules and laws that have been legally enforced by the government. This perspective has been adopted since coercion is an important element of the regulative pillar, one which implies authority and capacity on the part of the actor exerting pressure, and on whom organizations depend, to sanction others. In this case, the state is the main actor and is considered as such in this study (Scott, 2014). Furthermore, governments play a key role in creating rules and laws, as well as in monitoring and sanctioning activities (Scott, 2014). In addition, many governments worldwide continue to articulate climate-related rules (Nachmany et al., 2015; Townshend et al., 2013), which provides further relevance and scope for this research.

2.4.3. Components of the regulative pillar

In the research field of environmental disclosures and, more specifically, voluntary carbon disclosure, previous studies have considered regulative determinants as a whole or have focused on generic environmental regulations, such as common law countries (Luo et al., 2012) or the ratification of the Kyoto Protocol (Freedman & Jaggi, 2005, 2010; Luo et al., 2012). Certain authors have gone further still and explored the influence of other specific carbon regulations on corporate carbon disclosures, such as the carbon trading market (Liesen et al., 2015; Luo, 2019);

other regulations regarding carbon emission reporting (Scholtens & Kleinsmann, 2011); and climate-related regulations (Mateo-Márquez et al., 2020). The majority of these studies demonstrated a significant and positive relationship between regulative institutional factors and voluntary carbon disclosures on the part of companies.

However, the relationship between each of the different components of the regulative dimension of institutions (rules; monitoring mechanisms and punishment; rewards) and voluntary carbon disclosure has not yet been explored. This study serves to fill this gap by incorporating the individual components of the regulative pillar of institutions –specifically those related to climate change issues – into the study of corporate carbon disclosures. This is, therefore, the first study to consider the components of the regulative pillar of institutions within the study of voluntary carbon disclosure. Analysis of the different components of regulative systems is extremely important, especially that of sanctioning power, given that on occasion rules are not complied with and subsequently a punishment is enacted (Scott, 2014). In addition, identifying and studying the components of the regulative pillar is key to determining which component exerts the greatest pressure on organizations as regards the voluntary disclosure of carbon information.

Hence apart from examining the rules and laws related to climate change, it is also essential to consider monitoring mechanisms and punishments, along with rewards, since each contributes to reinforcing both what is required by the regulation as well as the social expectations generated by said regulation in a certain context. In this sense, it is expected that companies will participate in the CDP survey and that they will disclose high quality carbon information in those countries where:

(1) Specific climate change-related regulation exists (Mateo-Márquez et al., 2020).

(2) Compliance is monitored, and punishments exist for non-compliance with the regulation.

(3) Rewards exist for behaviour in line with the regulation.

In this sense, based on the NIS perspective, it is expected a positive association between voluntary carbon disclosure and the different components of the regulative dimension of institutions. Therefore, the following hypotheses are proposed:

H4a: Countries' climate-related rules and laws positively influence firms' decisions to disclose carbon information.

H4b: Countries' climate-related rules and laws are positively associated with the quality of carbon disclosures.

H5a: Countries' climate-related monitoring mechanisms and punishments are positively related to firms' propensity to disclose carbon information.

H5b: Countries' climate-related monitoring mechanisms and punishments positively influence the quality of carbon disclosures.

H6a: Countries' climate-related rewards positively affect companies' decisions to participate in voluntary carbon disclosures.

H6b: Countries' climate-related rewards positively influence the quality of carbon disclosures.

Chapter 3. Methodology

Sample, sources, empirical
models, and variables

3.1. Sample

The sample was initially composed of 3,106 firms listed in the 2015 CDP climate reports from those countries with data available regarding their climate-related institutional context. The countries considered are Australia, Canada, France, Germany, India, Indonesia, Italy, Japan, South Africa, South Korea, Turkey, the United Kingdom, and the United States of America. This study considers a single year of data (2015) due to the availability of data regarding countries' institutional profile related to climate change. In line with Luo et al. (2012), companies in the financial sector (608) were subsequently identified and eliminated. Companies which were duplicated in the CDP climate reports (8), SA companies (due to their being a subsidiary or having undergone a merger during the 2015 CDP questionnaire submission process (30) and companies with missing financial data (133) were also eliminated from the sample (Luo et al., 2012). The final sample is thus composed of 2,327 companies from 13 countries, operating in the following sectors, according to the Global Industry Classification Standard (GICS): Consumer Discretionary; Consumer Staples; Energy; Health Care; Industrials; Information Technology; Materials; Telecommunication Services; Utilities.

3.2. Sources

Companies' response status and the CDP disclosure score were collected by hand from the 2015 CDP climate report for each sample country, which may be found on the CDP website. Given that the 2015 CDP climate report Hong Kong and South East Asia edition only contained firms that responded and published their response, data for Indonesian companies that either declined to respond or did not respond, as well as those that did not publish their response, was gathered from the CDP web database. CDP data has been used in several previous studies concerning voluntary carbon disclosures (e.g. Ben-Amar and McIlkenny, 2014; Kolk et al., 2008; Lemma et al., 2019; Luo, 2019).

Data regarding countries' institutional context was obtained from different sources. Firstly, regulative pressures related to climate change were measured using the Environmental Policy Stringency Index (hereinafter EPSI) provided by the OECD (Organisation for Economic Co-operation and Development). This index measures the regulative stringency of every country's environmental-related policies (OECD, 2019). It is available on the OECD's website. Secondly, normative pressures were estimated by using the information included in the 2014 CDP climate reports for each sample country. Finally, data concerning countries' cultural context was obtained by hand from the Pew Research Center's 2015 Global Attitudes Survey. In particular, this study takes into account a specific climate change concern index that was published in this report, based on a global survey regarding levels of public concern about climate change carried out in each country (Stokes et al., 2015).

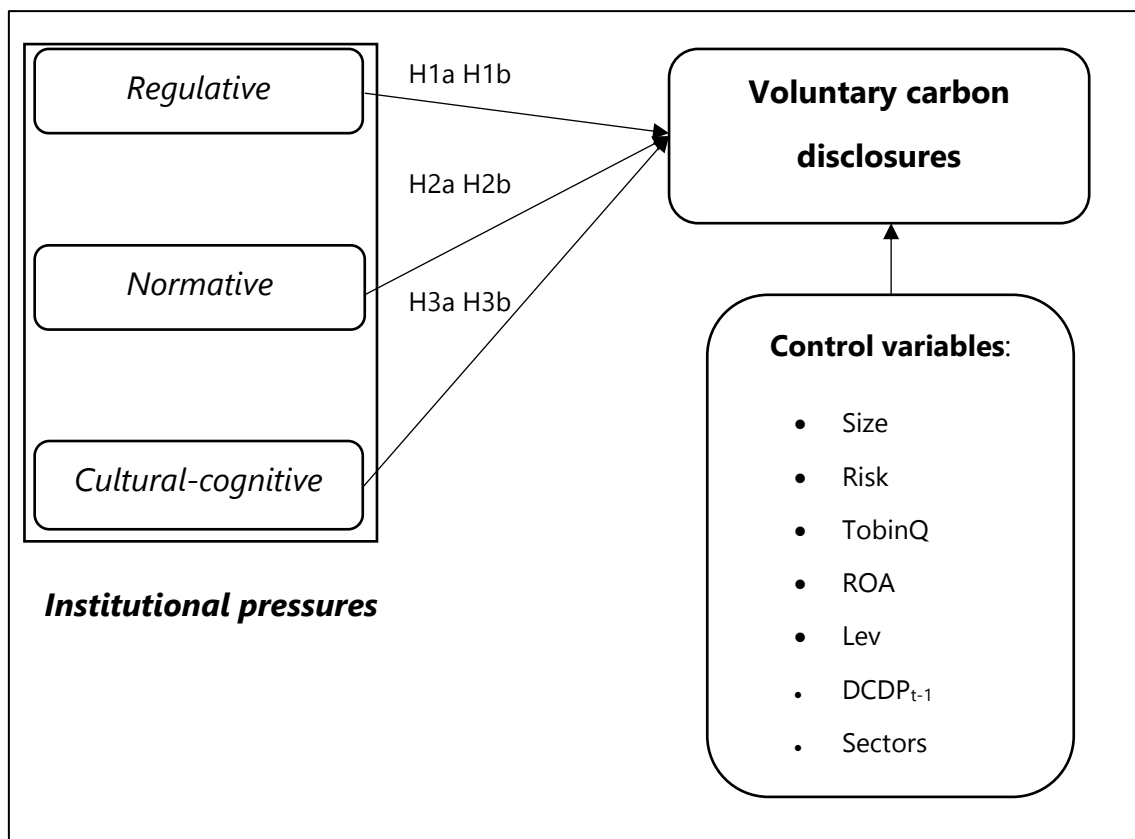
Regarding the components of countries' regulative pillar, data on climate-related rules was obtained from the study by Nachmany et al., (2015) which provides a review of climate change legislation around the world. Data regarding climate-related enforcement mechanisms and punishments was collected from the OECD database. More specifically, this study used the aforementioned EPSI index to measure the stringency of each country's environmental-related policies because it considers both climate-related monitoring systems and mechanisms that place a price on contamination. In order to measure the rewards component, this investigation used countries' clean energy investments which were obtained from the Bloomberg New Energy Finance (BNEF) database.

Financial data required to calculate the control variables was collected from Datastream database. Since the CDP requests companies to provide emissions and accounting data for the preceding year (Luo et al., 2012; Stanny, 2013), financial data was retrieved for the previous fiscal year.

3.3. Empirical models

The theoretical framework presented in Chapter 2 shows that companies' decisions to voluntarily disclose carbon information, as well as the quality of disclosures, is a function of a set of pressures (social, financial market and institutional). Figure 1 below presents the relationship between the three institutional pillars and voluntary carbon disclosures. According to NIS theory, companies' decisions to disclose carbon information, as well as the quality of disclosures may be affected by different institutional pressures. Scott (2014) breakdowns these pressures on regulative, normative and cultural-cognitive.

Figure 1. Relationship between the three institutional pillars and voluntary carbon disclosures



Based on these pressures, a two-step research approach is performed in order to examine the influence of countries' climate-related institutional context (regulative, normative and cultural-cognitive) on companies' decisions to voluntarily disclose carbon information, as well as on the quality of carbon

disclosures (the first objective of this thesis) (Bouten et al., 2012; Rankin et al., 2011). The initial econometric model considers the decision of companies to voluntarily disclose carbon information through the CDP climate survey, hence a binary-choice Probit model is used (1). This model is tested for the whole sample of 2,327 companies. In Model 1, the dependent variable (DCDP) is a dichotomous variable of CDP participation which is equal to 1 if the company voluntarily responded to the 2015 CDP questionnaire and made the response public, and 0 otherwise. Both responding and publication decisions are considered in the same model since the majority of sample firms that responded to the 2015 CDP climate survey made their response public. Model 1, which comprises a binary measure of the probability of participation, is as follows:

$$DCDP = \beta_0 + \beta_1 EPSI + \beta_2 Norm + \beta_3 Cultural + \beta_4 Size + \beta_5 Risk + \beta_6 TobinQ + \beta_7 ROA + \beta_8 Lev + \beta_9 DCDP_{t-1} + \beta_{10-17} Sector + \varepsilon \quad (1)$$

The second stage explores the relationship between climate-related institutional pillars and the quality of voluntary carbon disclosures (as measured by the 2015 CDP disclosure score). Hence, this model comprises a more complex measure of the dependent variable that captures the quality of the information reported to the CDP climate survey by those companies which voluntarily disclose their carbon data. The CDP disclosure score has been used in several previous studies to measure the quality of carbon information (Ben-Amar & McIlkenny, 2014; Lemma et al., 2019; Luo, 2019; Mateo-Márquez et al., 2020). It reflects the quality and comprehensiveness of carbon information reported by companies through the CDP climate survey (Ben-Amar & McIlkenny, 2014; Lemma et al., 2019).

The majority of companies in the sample that replied to the 2015 CDP climate questionnaire received a high CDP disclosure score. As shown in Table 1, more than 72 per cent of the responding firms (852 out of 1,170 firms) obtained a CDP score equal or greater than 85 points in the 2015 CDP climate program. Therefore,

it would appear that those companies that decided to respond to the CDP survey also decided to disclose high-quality carbon information. In this case, the 2015 CDP disclosure score is skewed to the right and does not illustrate a positive result for a normal distribution. Thus, instead of using an Ordinary Least Squares (OLS) regression, a Probit model is performed where the dependent variable is equal to 1 if the company obtained a CDP disclosure score greater than 93.5 (the median score of responding firms), and 0 otherwise (Tang & Luo, 2011).

Table 1. *Distribution of the 2015 CDP score of companies in the sample*

Range	N	Percent (%)	Mean	Min.	Median	Max.
0 < = 2015 CDP score < 30	31	2.65	16.48	2.00	11.00	28.00
30 < = 2015 CDP score < 50	50	4.27	39.26	30.00	38.00	49.00
50 < = 2015 CDP score < 70	87	7.44	61.06	50.00	61.00	69.00
70 < = 2015 CDP score < 85	150	12.82	77.66	70.00	78.00	84.00
2015 CDP score > = 85	852	72.82	95.26	85.00	96.00	100.00
Sample Total	1,170	100.00	85.98	2.00	93.50	100.00

The second model is based on a subsample of a total of 1,170 firms from across the sample countries that responded to and published the 2015 CDP climate report. If only firms which decided to participate in the 2015 CDP survey are considered, then sample selection bias may be introduced into the proposed model as a result of self-selection bias (Breen, 1996). In line with Heckman (1979), in order to correct for sample selection bias, this study calculates and includes the Heckman correction factor (Lambda) in Model 2. Therefore, Model 2 is as follows:

$$\begin{aligned}
 CDPscr = & \beta_0 + \beta_1 EPSI + \beta_2 Normative + \beta_3 Cultural + \beta_4 Size + \\
 & \beta_5 Risk + \beta_6 TobinQ + \beta_7 ROA + \beta_8 Lev + \beta_9 DCDP_{t-1} + \beta_{10} Lambda + \\
 & \beta_{11-18} Sector + \varepsilon \quad (2)
 \end{aligned}$$

Three country-level independent variables were included in Models 1 and 2, representing the different dimensions of countries' institutional context related to climate change. Specifically, EPSI, Normative and Cultural variables are

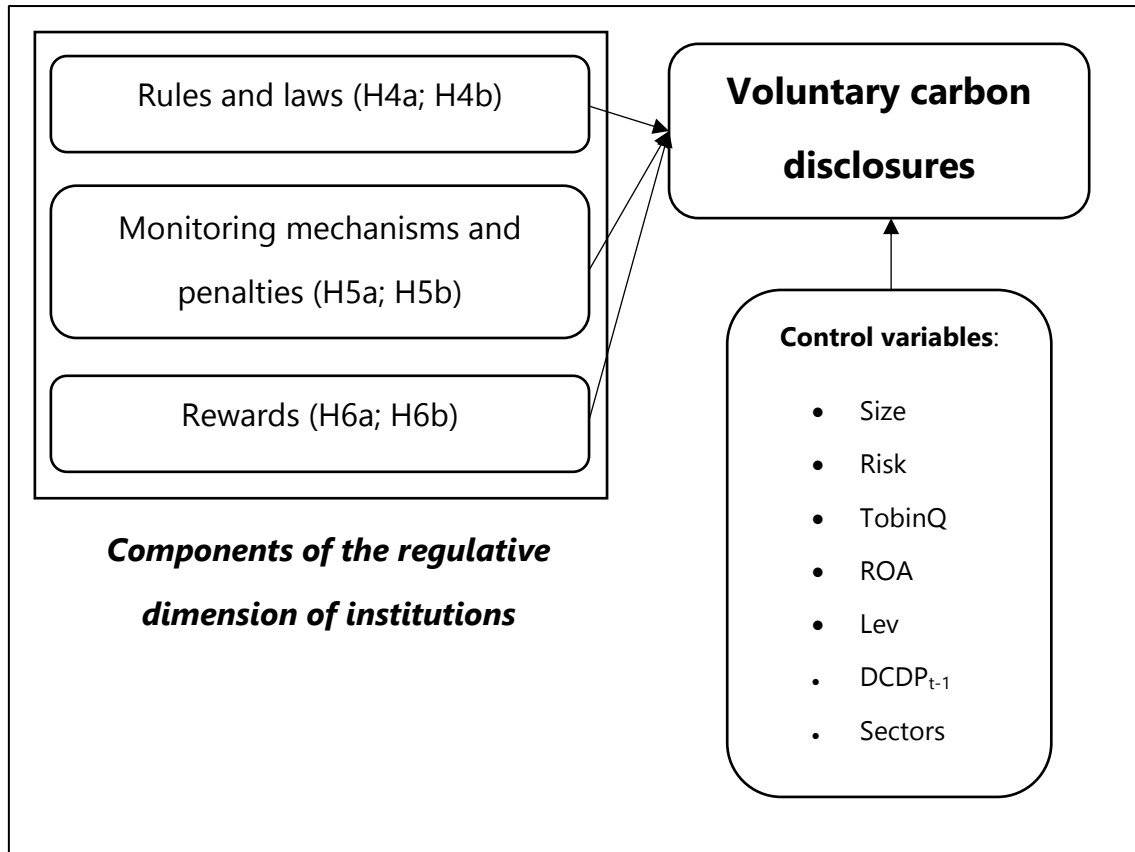
included as illustrative of the influence of countries' institutional pressures related to climate change. In addition, six firm-level control variables were also included in both models: Size, Risk, TobinQ, ROA, Lev and $DCDP_{t-1}$. These factors were introduced into the models since they have been found to be associated with voluntary carbon disclosure on the part of companies (Hahn et al., 2015; Stanny, 2013; Wegener et al., 2013). Furthermore, dummy variables for each sector GICS were introduced in order to control the fixed effects of each.

As mentioned in Chapter 2, voluntary carbon disclosures on the part of companies may be affected by the components of the regulative pillar of institutions. Figure 2 shows the theoretical foundations of Models 3 and 4, which test the influence of the components of the regulative pillar on the decisions of companies to voluntarily disclose carbon information (Model 3), as well as the quality of the information reported (Model 4). As previous models, these models include control variables of social pressures, financial/market pressures. In order to test whether the components of the climate-related regulative pillar influence companies' decisions to voluntarily disclose carbon information, as well as on the quality of disclosures (the second objective of the thesis), an additional two-step model is performed.

The first stage is based on a probit model where the dependent variable is $DCDP_{15}$, namely a dichotomous variable of voluntary carbon disclosure (Model 3). This variable equals 1 if the company answered the 2015 CDP climate questionnaire and made the response public, and zero otherwise. As in Model 1, companies' decisions both to respond and to publish are considered in the same regression because the majority of companies in the sample that did reply to the CDP survey also made their response public. The second model considers the quality of carbon disclosures, which is measured using the CDP disclosure score (Ben-Amar & McIlkenny, 2014). It encapsulates the quality and

comprehensiveness of the carbon information provided through the CDP climate survey (Lemma et al., 2019).

Figure 2. Influence of the components of the regulative dimension of institutions on voluntary carbon disclosures



Model 3, which test the influence of the components of the regulative dimension of intuitions on companies' decisions to voluntarily disclose carbon information, is as follows:

$$DCDP = \beta_0 + \beta_1Laws + \beta_2EPSI + \beta_3Rewards + \beta_4Size + \beta_5Risk + \beta_6TobinQ + \beta_7ROA + \beta_8Lev + \beta_9DCDP_{t-1} + \beta_{10-17}Sectors + \varepsilon \quad (3)$$

Due to the availability of data regarding the components of the regulative pillar, Model 3 was tested for a subsample of 2,176 firms (Turkish and South African companies were excluded). As mentioned before, the second step considers a sub-sample of firms that responded to the 2015 CDP climate survey and made their response public. Focusing solely on responding firms may introduce self-

selection bias into our analysis (Breen, 1996), hence to address this issue, the Heckman correction factor (Lambda) is calculated and included in the second model (Heckman, 1979). This factor represents the inverse Mill's ratio and deals with any selectivity bias in the sample. The inclusion of Lambda allows us to make the second model conditional on positive participation in the CDP climate survey (Rankin et al., 2011). Model 4, which examines the relationship between the components of climate-related regulation and the quality of carbon disclosures, is as follows (4):

$$CDPscr = \beta_0 + \beta_1Laws + \beta_2EPSI + \beta_3Rewards + \beta_4Size + \beta_5Risk + \beta_6TobinQ + \beta_7ROA + \beta_8Lev + \beta_9DCDP_{t-1} + \beta_{10}Lambda + \beta_{11-18}Sectors + \varepsilon \quad (4)$$

In Model 4, the dependent variable is CDPscr, which takes a value of 1 if the company obtained a CDP disclosure score no less than the median of the sample (93), and zero otherwise. In this model, the median of sample firms is different from Model 2 because two countries (Turkey and South Africa) were removed from the sample due to availability of data regarding regulative components.

In order to test the hypotheses proposed in this study, three country-level independent variables are included in Models 3 and 4: Laws, EPSI and Rewards. These variables measure each one of the different components of countries' regulative context (rules and laws; monitoring mechanisms and punishments; and rewards), which may influence voluntary corporate carbon disclosure on the part of companies.

As in Models 1 and 2, six firm-level control variables were also included in Models 3 and 4: Size, Risk, TobinQ, ROA, Lev and DCDP_{t-1}. In addition, Dummy variables for each sector GICS were also included in order to control the fixed effects of each.

3.4. Variables

This section summarises all variables included in this thesis. Table 2 reports the variables used in both statistical models, explaining how they are measured, as well as their predicted sign based on the hypotheses previously formulated.

3.4.1. Dependent variables

The dependent variables are DCDP (Models 1 and 3) and CDPscr (Models 2 and 4). DCDP is a dichotomous variable of CDP participation which is equal to 1 if the company voluntarily participates and publishes the 2015 CDP climate questionnaire, and 0 otherwise. CDPscr is an indicator variable that is equal to 1 if the company obtained a CDP disclosure score not lower than 93.5 points (Model 2) or 93 points (Model 4), and 0 otherwise. On an annual basis, the CDP sends a questionnaire to companies around the world requesting voluntary carbon information. The CDP subsequently assesses corporate carbon information and awards scores accordingly (Luo & Tang, 2014). The CDP then publishes a report, by country and by region, which includes companies' CDP score, as well as indicating those companies that either declined to respond or did not respond, as well as those that did not publish their response (CDP, 2017).

Table 2. Summary of variables

<i>Dependent variables</i>		
DCDP	A dichotomous variable of CDP participation which is equal to 1 if the firm answered the 2015 CDP questionnaire and made the response public, and 0 otherwise.	
CDPscr	An indicator variable that is equal to 1 if the firm obtained a CDP score not lower than the median score of responding companies, and 0 otherwise.	

<i>Independent variables</i>		
	<i>Description</i>	<i>References</i>
EPSI (+)	Index that measures the stringency of each country's specific environmental policy. It has a range of values from 0 (not stringent) to 6 (highest degree of stringency).	Botta and Koźluk (2014)
Norm (+)	Percentage of companies that responded to the CDP questionnaire in the previous year in a given country.	Stanny (2013)

Table 2. (Continued)

Cultural (+)	Index that reflects countries' climate change concern. It is ranked from 3 to 12, with 3 indicating the lowest level of concern with regard to climate change, and 12 the highest level of concern.	Stokes et al. (2015)
Laws	The number of climate-related laws of a country.	Nachmany et al. (2015)
Rewards	This variable represents the country's investments in clean energy. It is measured as a percentage of the Gross Domestic Product.	Bloomberg (2020)
<i>Control variables</i>		
Size	Natural logarithm of total revenues.	Cotter and Najah (2012), Matisoff (2013)
Risk	Beta (systematic risk).	González-González and Zamora-Ramírez (2016b), Luo et al. (2012), Tang and Luo (2011)
TobinQ	Proxy of TobinQ, calculated as the market capitalization of the company plus preferred shares, book value of long-term debt, and current liabilities, divided by book value of total assets at the end of fiscal year 2014.	P. M. Clarkson et al. (2008), Luo et al. (2012)
Lev	Total debt divided by total assets at the end of fiscal year 2014.	Luo et al. (2012), Stanny and Ely (2008)
ROA	Return on assets. Calculated by earnings before interest and taxes divided by total assets at the end of fiscal year 2014.	Penman (2007), Subramanyam and Wild, (2009)
DCDP _{t-1}	Dummy variable which is equal to 1 if firm disclosed the previous CDP, and 0 otherwise.	Stanny (2013), Stanny and Ely (2008)
Lambda	Heckman correction factor which accounts for selectivity bias in the sample.	Breen (1996), Heckman (1979)

Notes: Predicted sign of independent variables is indicated in parentheses.

The CDP disclosure score is ranked from 0 to 100, with 100 being the maximum value of the scale. It measures the quality, comprehensiveness, and completeness of the companies' response to the CDP questionnaire. In addition, it reflects the companies' internal management, carbon strategies and corporate transparency

with respect to climate change. Therefore, firms with high levels of transparency regarding their climate change-related strategies will have a higher CDP disclosure score than those companies with lower levels of transparency (Lemma *et al.*, 2019).

Responding companies must follow the CDP guidelines when reporting climate change information to the CDP, for example, managers must respond to the same questions and cannot modify the structure of the CDP questionnaire. Thus, CDP carbon information can be compared across companies, countries and sectors, since the information provided is consistent for all participating companies (Luo *et al.*, 2012, 2018). In recent years, several scholars have used the CDP disclosure score to measure firms' participation in voluntary carbon reporting (Cotter & Najah, 2012; Luo *et al.*, 2012; Stanny, 2013), as well as the quality of the information reported (Ben-Amar & McIlkenny, 2014; Lemma *et al.*, 2019; Luo, 2019; Mateo-Márquez *et al.*, 2020). In fact, apart from being of interest in recent empirical studies, the CDP disclosure score has high levels of credibility for sustainability experts (Luo, 2019). Hahn *et al.* (2015) point out that the CDP disclosure score provides a comprehensive measure of the quality of information reported by companies, as well as highlighting that it captures the quality of carbon information more objectively than self-created indices such as content analysis.

3.4.2. Independent variables

EPSI. This variable approximates the regulative pressure of countries. It is based on the EPSI index elaborated by the OECD, which measures the stringency of each country's specific environmental policy, thus allowing for comparison among them. In this way, it evaluates and incorporates a series of environmental policy instruments, primarily related to climate and air pollution (Botta and Koźluk, 2014). More specifically, stringency should be understood as the degree to which environmental policies place an explicit or implicit price on pollution or behaviour

that is damaging to the environment (OECD, 2019). This index adopts a range of values from 0 (not stringent) to 6 (highest degree of stringency). Given its consistency, EPSI has been widely used in previous studies to represent countries' environmental policies (Andersson, 2018; Rosati & Faria, 2019). More specifically, this index has been employed in previous studies on voluntary carbon disclosure in order to measure countries' climate-related regulative pressures (Mateo-Márquez et al., 2020). From the NIS perspective, it is expected that companies belonging to countries with strict regulations specifically related to climate change are more likely to participate in voluntary carbon reporting, as well as to disclose high quality carbon information. Given that the EPSI variable considers both climate-related monitoring systems and mechanisms that place a price on contamination, it has been also used to measure the monitoring mechanisms and punishment component of the regulative pillar. According to Scott (2014), it is expected that firms from countries with a stringent monitoring mechanism in place for their climate-related rules, along with a specific system of punishments for behaviour contrary to said rules, will be more likely to respond to the CDP survey, as well as to report higher-quality carbon information.

Norm. This variable has been introduced in the study as representative of countries' climate-related normative pressures. It has been included since the higher the percentage of companies participating in the CDP in a given country, the more widespread the CDP questionnaire will be in that country, and thus the greater the pressure on companies in that country to voluntarily respond to the CDP climate survey. Hence, firms may respond to the CDP because it is the morally right thing to do in that context (Scott, 2014), and also because their failure to participate can be made public, thereby damaging their legitimacy. This variable is measured by the response rate to the CDP climate questionnaire in the previous year in a given country.

Cultural. This indicator reflects the cultural-cognitive dimension of institutions. In order to measure countries' cultural influences related to climate change, this study uses a climate change concern index elaborated by the Pew Research Center, based on a global survey regarding levels of public concern about climate change. This index is ranked from 3 to 12, with 3 representing the lowest level of concern about climate change, and 12 the highest level of concern (Stokes et al., 2015). Data from the Pew Research Center has been used in previous studies to explain cross-national variations in climate change public opinion (Ergun & Rivas, 2019; Lewis et al., 2019). It is expected that firms in countries with higher levels of concern regarding climate change are more likely to voluntarily disclose carbon information, as well as to provide high quality carbon data.

Laws. It is the number of climate-related laws that a country has passed. This variable has been taken from the study by Nachmany et al. (2015), which classifies countries according to the number of climate change-related laws they have. Given that certain countries have broad and integrative laws while others have legislation of a narrower scope, the number of climate-related laws may not constitute a perfect measure of a country's response to climate change. Nonetheless, the number of climate-related laws may be a reliable measure for determining how committed a country is in its efforts to mitigate climate change (Townshend et al., 2013). According to NIS theory, it is expected that firms headquartered in countries with a greater number of climate-related laws will be under higher pressure to report their carbon emissions. Therefore, these firms will be more likely to participate in the CDP climate survey, as well as to disclose high-quality carbon information, given that these are the patterns that are followed in their context.

Rewards. This variable represents countries' new investments in clean energy, as obtained from the BNEF database. It is represented as a percentage of the Gross Domestic Product (GDP). This factor is used to measure the reward component of

the regulative pillar since, according to NIS theory, companies headquartered in countries with a rewards system in place for behaviour in line with climate-related regulation will be more likely to participate in the CDP questionnaire and to receive a higher CDP score. The greater the investments made by countries in clean energy, the greater the rewards that companies will receive. Therefore, rewards encourage companies to make new investments as well as to adopt measures to mitigate their carbon emissions, which may positively contribute to voluntary carbon disclosure and to the quality of the information disclosed.

3.4.3. Control variables

Size. Legitimacy theory argues that larger firms are subject to greater social pressure. Thus said firms will be willing to voluntarily disclose carbon information, as well as to provide high quality of carbon data in order to demonstrate their compliance with social expectations and to prevent their legitimacy from being threatened (Cho & Patten, 2007; Solomon & Lewis, 2002). Size has been used as a control variable in several previous studies related to environmental disclosure (Cormier et al., 2005; Liu and Anbumozhi, 2009; Martínez et al., 2015; Matisoff 2013), and they all agree that there is a positive and significant relationship between size and carbon reporting. It is therefore expected that company size will have a positive effect, both on the participation of companies in the CDP as well as on the score they obtain. Size is measured by the natural logarithm of total revenues (Cotter & Najah, 2012; Matisoff, 2013).

Risk. Previous studies confirm that there is a positive and significant relationship between a company's volatility or risk and environmental information disclosure (Cormier et al., 2005). According to stakeholder theory, firms with a higher level of business risk are more likely to participate in carbon reporting in order to allow investors and creditors to evaluate this information more accurately (Tang & Luo, 2011). This variable has been included in order to measure company risk, which is expected to be positively associated with voluntary carbon disclosure (Tang &

Luo, 2011). The Risk variable refers to a company's beta, which is based on 23 to 35 consecutive end-of-month price percentage changes and their relativity to the local market index.

TobinQ. According to Luo et al. (2012), this variable is introduced as an approximation of companies' future growth expectations. Firms with a higher TobinQ will be more likely to disclose more information in order to reduce information asymmetries. Thus, investors will better able to calculate the market value of these firms and their intangible assets (Stanny & Ely, 2008). The previous literature does not establish a conclusive relationship between environmental disclosure and TobinQ. Many studies do not find a significant relationship between both variables (González-González & Zamora-Ramírez, 2016b; Luo et al., 2012; Tang & Luo, 2011; Wegener et al., 2013). TobinQ is calculated as the sum of the company's market value plus preferred shares plus the book value of long-term debt and current liabilities, divided by the book value of the total assets (P. M. Clarkson et al., 2008). TobinQ is expected to have a positive and significant impact on companies' propensity to disclose voluntary carbon information (González-González & Zamora-Ramírez, 2016b), as well as on the quality of disclosures (Tang & Luo, 2011).

ROA. The previous literature on voluntary disclosure argues that the financial performance of companies may influence environmental disclosure. In this way, profitable companies may be better positioned to address the costs associated with reducing carbon emissions (Bewley & Li, 2000). However, for the most part, empirical studies do not demonstrate a conclusive relationship between company profitability and carbon reporting (Chu et al. , 2012; Luo et al., 2013; Rankin et al., 2011). In this thesis, it is assumed that company profitability will positively and significantly influence both companies' participation in voluntary carbon reporting (Luo et al., 2013) and the quality of the information reported (Tang & Luo, 2011). ROA (Return on Assets), as measured as earnings before interest and

taxes divided by total assets (Penman, 2007; Subramanyam & Wild, 2009), is used as an approximation of company profitability.

Lev. Firms with higher levels of leverage will be subject to greater pressure from their stakeholders. Hence these firms will be willing to participate in carbon reporting in order to respond to the demands of the aforementioned stakeholders and to improve their financial flexibility (Stanny & Ely, 2008). With regard to the influence of leverage on environmental disclosure, empirical studies have not achieved consistent results. Some authors have not found a significant relationship between companies' leverage and their level of environmental disclosure (e.g. Freedman and Jaggi, 2005; Prado-Lorenzo et al., 2009; Stanny and Ely, 2008). Andrikopoulos and Kriklani (2013) analysed the environmental disclosures of companies listed on the Copenhagen Stock Exchange and found a negative relationship between the level of leverage of these companies and their disclosure. On the contrary, Clarkson et al. (2008) observed a positive and significant relationship between leverage and environmental disclosure. Following Freedman and Jaggi (2005), it is assumed that leverage will positively and significantly influence response to the CDP questionnaire and the score obtained. Total debt to total assets ratio is used to measure the companies' leverage (Borghei and Leung, 2013).

$DCDP_{t-1}$. This indicator reflects firms' prior disclosure behaviour with respect to CDP participation. It has been included in the study because firms' prior CDP disclosure is the most significant factor influencing its future voluntary carbon disclosure behaviour (Stanny, 2013). $DCDP_{t-1}$ is a dummy variable which is equal to 1 if firm disclosed the previous CDP, and 0 otherwise.

Chapter 4. Results

Breakdown of climate-related institutional profile by country, descriptive statistics, correlation analysis, regression results, and robustness checks

This chapter presents a breakdown of the institutional profile related to climate change and companies by country, as well as a summary of firms by sector. It also provides an overview of the components of countries' climate-related regulative context, along with statistics corresponding to firms' participation in the CDP survey and the average CDP score by country. Finally, this chapter details the descriptive analyses, the empirical results, and the robustness checks.

4.1. Breakdown of climate-related institutional profile by country

Table 3 presents the distribution of countries' institutional profile related to climate change and companies by selected countries. This table also shows statistics corresponding to firms' responses to the CDP questionnaire as well as the proportion of the CDP disclosure score by country.

As shown in Table 3, Japanese firms constitute the largest group of the sample (397 out of 2,327, or 17.06%). The second largest group contains companies from the United States of America, followed by firms headquartered in the United Kingdom and France. Together they account for more than 50 per cent of the sample. Countries with a higher response rate to the 2015 CDP questionnaire are South Africa, the United Kingdom and the United States, with response rates of 83.87, 78.54 and 68.7 per cent respectively. In average terms, the 2015 CDP disclosure score is higher in South Korea, South Africa and India, all receiving a CDP disclosure score greater than 90 points. Although these countries do not have high levels of regulative pressures (as shown by the EPSI variable), they do present a significant degree of concern regarding climate change, as shown by the climate change index in the fourth column of Table 3.

In terms of climate-related regulative pressures, countries with higher levels of climate-related regulative stringency are the United Kingdom, France, Canada and Italy. These countries have an EPSI index greater than 3.25 points. It is of note

that they all have a carbon pricing instrument in place at the national or sub-national level (Kossoy et al., 2015).

Table 3. *Distribution of climate-related institutional profile and firms by country*

Country	EPSI	Norm	Cultural	N	%	R	%	CDP Score
Australia	3.17	39.00	8.75	179	7.69	63	35.20	81.48
Canada	3.28	59.50	9.45	134	5.76	79	58.96	84.56
France	3.58	39.20	9.94	210	9.02	77	36.67	86.73
Germany	3.06	44.08	9.49	144	6.19	76	52.78	74.83
India	1.82	29.50	10.77	142	6.10	30	21.13	93.07
Indonesia	1.08	20.00	9.21	40	1.72	4	10.00	53.00
Italy	3.28	53.00	10.12	69	2.97	36	52.17	86.00
Japan	3.17	46.60	10.11	397	17.06	206	51.89	89.23
South Africa	0.71	80.00	9.44	62	2.66	52	83.87	94.60
South Korea	3.07	34.80	10.03	207	8.90	45	21.74	94.62
Turkey	1.92	41.00	9.28	89	3.82	27	30.34	77.89
UK	3.83	70.86	8.78	261	11.22	205	78.54	84.49
USA	2.69	69.00	8.78	393	16.89	270	68.70	86.42
Total				2,327	100.00	1,170	50.28	85.98

Notes: N = total sample firms. R = number of firms that answered and made public the 2015 CDP questionnaire. CDP score is the average 2015 CDP disclosure score by country, which is calculated using the total CDP disclosure score of responding firms divided by total number of responding firms in the country. EPSI variable represents the stringency of each country's specific environmental policy. Norm reflects the percentage of companies that answered the CDP questionnaire in the previous year in a given country. Cultural is an index that reflects countries' climate change concern. UK = United Kingdom. US = the United States of America.

As shown in the third column of Table 3, more than 60 per cent of companies from South Africa, the United Kingdom and the United States of America participated in the CDP survey the previous year. This reflects the higher level of normative pressures with respect to climate change in these countries, especially in South Africa (80 per cent). In relation to the cultural-cognitive pillar of institutions, South Korea, Japan, Italy and India have a score greater than 10 points in the climate change concern survey, which would suggest that society in these countries believes global climate change to be a serious problem. It can be seen from the data in Table 3 that companies headquartered in countries with

high cultural-cognitive pressures are more likely to disclose high-quality carbon information, as evidenced by the high mean of their CDP disclosure scores.

Table 4 below presents an overview of the components of countries' climate-related regulative context, as well as the participation of companies in the 2015 CDP climate report by country, showing their respective CDP disclosure score.

Table 4. Breakdown of the components of the regulative pillar and firms by country

Countries	Laws	EPSI	Rewards	N	%	R	%	CDP score
Australia	9	3.17	0.18	179	8.23	63	35.20	81.48
Canada	3	3.28	0.25	134	6.16	79	58.96	84.56
France	9	3.58	0.15	210	9.65	77	36.67	86.73
Germany	15	3.13	0.50	144	6.62	76	52.78	74.83
India	11	1.82	0.39	142	6.53	30	21.13	93.07
Indonesia	19	1.08	0.03	40	1.84	4	10.00	53.00
Italy	22	3.28	0.12	69	3.17	36	52.17	86.00
Japan	9	3.17	0.96	397	18.24	206	51.89	89.23
South Korea	12	3.07	0.17	207	9.51	45	21.74	94.62
United Kingdom	23	3.83	0.83	261	11.99	205	78.54	84.49
United States	9	2.69	0.34	393	18.06	270	68.70	86.42
Total				2,176	100.00	1,091	50.14	85.77

Notes: N = total sample firms. CDP score is the average 2015 CDP disclosure score of responding firms, which is calculated as the total CDP score of responding firms divided by the total number of responding companies. R = number of firms that answered and made public the 2015 CDP questionnaire. Laws variable represents the number of climate-related laws of a country. EPSI is an index that measures the stringency of each country's specific environmental policy. Rewards variable reflects the country's investments in clean energy, which is represented as a percentage of the country's GDP.

As mentioned in Chapter 3, in the study of the components of countries' climate-related regulative pillar, companies from two countries (South Africa and Turkey) were removed from the sample due to the availability of data regarding the rewards component of the regulative context. Therefore, the countries under consideration are Australia, Canada, France, Germany, India, Indonesia, Italy, Japan, South Korea, the United Kingdom and the United States of America. Thus, the sample contains 11 countries, with Japan proportionally the largest (18.24 per cent of the total sample). The United States and the United Kingdom make up the

second and third largest groups in terms of the number of companies surveyed by the CDP, accounting for 18.06 and 11.99 per cent of the study sample respectively. As shown in Table 4, the countries with highest response rate to the CDP questionnaire are the United Kingdom, the United States and Canada, with values of 78.54, 68.70 and 58.96 per cent respectively. In terms of the quality of carbon disclosures, companies from India, Japan and South Korea display the highest levels of quality, as shown by their high average CDP disclosure score.

With regard to the rules component of the regulative pillar, it can be seen from the data in Table 4 that the United Kingdom, Italy and Indonesia are the sample countries with the highest number of climate change-related laws. For their part, the countries with the lowest number of climate change-related laws are Canada, Australia, France, Japan and the United States, all of which have less than ten pieces of regulation related to climate change.

The countries with the highest regulative stringency are the United Kingdom, France, Canada and Italy. They all have an EPSI index greater than 3.2 points. These countries have a carbon pricing instrument in place at the national or subnational level (Kossoy et al., 2015). In average terms, countries with stringent climate change-related regulation have a greater number of companies disclosing carbon information to the CDP. In addition, companies headquartered in these countries have, on average, a better CDP score, which means that they are disclosing high-quality information regarding their carbon emissions. It is of note that certain countries such as India, Indonesia, South Africa and Turkey, where there is no carbon pricing implemented, have less than 2 points in the EPSI index. The countries with the greatest level of climate-related rewards are Japan, the United Kingdom and Germany, which present values of 0.96, 0.83 and 0.50 respectively. Conversely, the countries with the lowest level of investments in clean energy are Indonesia, Italy and France.

Table 5 shows the breakdown of firms by sector. As shown in Table 5, Consumer discretionary, Industrials and Materials are the largest group in the 2015 CDP climate report. Utilities companies have the highest average CDP score (more than 93 points, on average). Such companies, for example, electric utilities are under higher regulative pressures that force them to control and report their carbon emissions (Kolk et al., 2008). Thus, these companies take advantage of the synergy to participate in voluntary carbon reporting, such as the CDP. Telecommunication companies have the highest response rate, followed by Information Technology and Material companies.

Table 5. *Distribution of firms by sector*

Sector	DCDP = 0		DCDP = 1		Total	Average CDP score
	Number of firms	Percentage (%)	Number of firms	Percentage (%)		
Consumer Discretionary	286	56.86	217	43.14	503	83.56
Consumer Staples	98	47.34	109	52.66	207	92.06
Energy	105	57.69	77	42.31	182	86.13
Health Care	124	62.31	75	37.69	199	81.43
Industrials	225	45.55	269	54.45	494	84.4
Information Technology	104	41.43	147	58.57	251	84.64
Materials	136	42.63	183	57.37	319	88.1
Telecommunication	17	32.69	35	67.31	52	85.89
Utilities	62	51.67	58	48.33	120	93.36
Total	1,157	49.72	1,170	50.28	2,327	85.98

Notes: The average CDP score is the sum of the total CDP disclosure score of sample companies that replied the CDP survey divided by total number of responding firms in the sector.

4.2. Descriptive statistics

Table 6 reports the descriptive statistics for both dependent and independent variables. More specifically, it details the mean, standard deviation, minimum, percentiles (25, 50 and 75) and maximum for each of the variables introduced in the study. In order to reduce the impact of extreme values on the results, all continuous independent variables were winsorised at 1 per cent in the upper and lower tails of the distribution.

Table 6. Descriptive statistics

Panel A: Whole sample (i.e., non-responding companies included as zeros)								
Variable	N	Mean	St Dev.	Min.	P25	P50	P75	Max.
DCDP	2,327	0.50	0.50	0.00	0.00	1.00	1.00	1.00
CDPscr	2,327	0.25	0.43	0.00	0.00	0.00	1.00	1.00
EPSI	2,327	2.96	0.69	0.71	2.69	3.17	3.28	3.83
Norm	2,327	0.51	0.15	0.20	0.39	0.47	0.69	0.80
Cultural	2,327	9.51	0.64	8.75	8.78	9.49	10.11	10.77
Size	2,327	14.72	1.81	7.94	13.69	14.81	15.91	18.60
Risk	2,327	0.91	0.42	0.05	0.64	0.87	1.13	2.31
TobinQ	2,327	1.89	1.56	0.48	0.99	1.37	2.15	9.81
ROA	2,327	0.08	0.09	-0.28	0.04	0.07	0.12	0.37
Lev	2,327	0.24	0.17	0.00	0.10	0.22	0.35	0.73
DCDP _{t-1}	2,327	0.45	0.50	0.00	0.00	0.00	1.00	1.00
Panel B: Responding firms								
DCDP	1,170	1.00	0.00	1.00	1.00	1.00	1.00	1.00
CDPscr	1,170	0.50	0.50	0.00	0.00	0.50	1.00	1.00
EPSI	1,170	3.02	0.70	0.71	2.69	3.17	3.28	3.83
Norm	1,170	0.56	0.14	0.20	0.44	0.60	0.69	0.80
Cultural	1,170	9.36	0.61	8.75	8.78	9.44	10.03	10.77
Size	1,170	15.45	1.58	7.94	14.46	15.51	16.55	18.60
Risk	1,170	0.96	0.41	0.05	0.67	0.92	1.18	2.31
TobinQ	1,170	1.74	1.25	0.48	1.02	1.34	2.03	9.81
ROA	1,170	0.08	0.08	-0.28	0.04	0.07	0.12	0.37
Lev	1,170	0.25	0.15	0.00	0.14	0.24	0.35	0.73
DCDP _{t-1}	1,170	0.83	0.38	0.00	1.00	1.00	1.00	1.00
Panel C: Non-responding firms								
DCDP	1,157	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDPscr	1,157	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPSI	1,157	2.90	0.67	0.71	2.69	3.17	3.17	3.83
Norm	1,157	0.45	0.13	0.20	0.35	0.41	0.47	0.80
Cultural	1,157	9.66	0.64	8.75	8.78	9.94	10.11	10.77
Size	1,157	13.99	1.73	7.94	13.11	14.11	15.04	18.60
Risk	1,157	0.86	0.42	0.05	0.60	0.82	1.07	2.31
TobinQ	1,157	2.05	1.82	0.48	0.98	1.41	2.32	9.81
ROA	1,157	0.08	0.10	-0.28	0.04	0.07	0.12	0.37
Lev	1,157	0.22	0.18	0.00	0.06	0.21	0.34	0.73
DCDP _{t-1}	1,157	0.07	0.25	0.00	0.00	0.00	0.00	1.00

Notes: N = Number of firms. P25 and P75 are the 25th and the 75th percentiles of the variables, respectively. All variables are described in Table 2.

Panel A shows the descriptive statistics for the whole sample, while Panels B and C report the same statistics for subsamples of responding and non-responding

companies respectively. Responding firms are those companies that answered and made public the 2015 CDP questionnaire. Non-responding firms are those that did not reply, declined to participate, or that did not publish the 2015 CDP survey.

As shown in Panel A of Table 6, Size and Risk show a mean of 14.72 and 0.91 respectively, which is similar to that found by González-González and Zamora-Ramírez (2016b) and Luo et al. (2012). TobinQ and Lev present a mean of 1.89 and 0.24 respectively, which is comparable to the findings of P. M. Clarkson et al. (2008) and Luo (2019). ROA shows a mean of 0.08, which is also similar to that found in P. M. Clarkson et al. (2008). In regards to regulative pressures, the mean of EPSI variable is 2.96. It should be emphasised that the maximum value in the stringency index of the countries included in the sample is 3.83, which is quite far below the maximum degree of stringency (6) (Botta & Koźluk, 2014). With regard to the Norm variable, the mean is 0.51 which demonstrates that, on average, more than 50 per cent of companies in the selected countries responded to and made public the CDP questionnaire in the previous year. Cultural-cognitive pressures related to climate change are rather high - over 9.49 points - for half of the sample firms. However, there is relatively little variation in this variable between each sample country, given that the minimum value is 8.75 and the maximum is 10.77.

After comparing the descriptive statistics reported in Panels B and C, it can be seen that those companies that did respond to the CDP questionnaire are, on average, of greater size and possess higher levels of risk and leverage as compared to those companies that did not respond, declined to participate, or did not publish the 2015 CDP questionnaire. Furthermore, those companies that did respond and did publish the CDP questionnaire belong to countries that have an EPSI index, which is slightly higher than the average of the companies included in the sample. In addition, responding companies are headquartered in countries that present higher levels of normative pressures than the average of sample

firms. On average 83 per cent of disclosing companies replied to and published their response to the CDP questionnaire in the previous year (see Panel B of Table 6).

4.3. Correlation analysis

Table 7 shows Pearson and Spearman's correlation coefficients. As it may be seen, there are no high or significant correlations between pairs of independent variables that could imply multicollinearity problems. In addition, the variance inflation factor (VIF) of each independent variable is less than 3, which indicates that multicollinearity should not be an issue.

Table 7. Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	
1. DCDP	1	0.58***	0.09***	0.38***	-	0.17***	0.43***	0.13***	-0.03	0.01	0.10***	0.76***
2. CDPscr	0.58***	1	0.01	0.21***	-0.01	0.45***	0.08***	-0.04**	-0.02	0.12***	0.53***	
3. EPSI	0.08***	-0.01	1	0.22***	-0.05**	-	-	-	-	-0.05**	0.03	
4. Norm	0.37***	0.21***	0.11***	1	-	0.42***	0.29***	0.02	0.12***	0.10***	0.05**	0.30***
5. Cultural	-	-0.05**	-	-	1	-0.02	-0.01	-	-	-	-	-
6. Size	0.40***	0.42***	0.01	0.29***	-0.06**	1	0.24***	-	-0.02	0.25***	0.43***	
7. Risk	0.11***	0.07***	-0.06**	0.06***	-0.04*	0.17***	1	-	0.08***	0.06***	0.06**	0.13***
8. TobinQ	-	-	-	0.04*	-0.04	-	-0.06**	1	0.62***	-	-0.19***	-0.03
9. ROA	0.02	-0.01	-	0.12***	-0.04*	0.12***	-0.07**	0.47***	1	-	0.25***	0.01
10. Lev	0.07***	0.10***	-0.04*	0.05**	-	0.08***	0.22***	0.07**	-	1	0.11***	
11. DCDP _{t-1}	0.76***	0.53***	0.04*	0.30***	-	0.40***	0.11**	-	0.19***	0.20***	1	

Notes: Pearson (Spearman) correlation coefficients are presented below (above) the diagonal. *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). All variables are defined in Table 2.

These results are largely consistent with the arguments of NIS theory. By way of example, both the Pearson and Spearman correlation coefficients for EPSI variable and DCDP are positive and significant ($p < 0.01$), indicating that firms headquartered in countries characterized by higher levels of climate-related regulative stringency are more likely to participate in voluntary carbon disclosure.

This is consistent with Luo et al. (2012), who found that regulative pressures are significantly and positively associated with companies' decisions to voluntarily disclose carbon information. The Norm variable is significantly and positively related to DCDP, suggesting that companies' response to the CDP climate survey is influenced by normative pressures established in their country's institutional context related to climate change. In addition, firms headquartered in countries with higher levels of normative pressures related to climate change are more likely to provide high-quality carbon information, as evidenced by the positive and significant correlation coefficient for Norm variable and CDPscr (Person and Spearman coefficient 0.21; both of which are significant at .01 level). However, contrary to our initial expectations, both Pearson and Spearman correlation coefficients for Cultural and DCDP are negative and significant (Person coefficient -0.22 and Spearman coefficient -0.17; both of which are significant at .01 level). This could be to the fact that the cultural-cognitive dimension of institutions is based on those more subtle aspects of social reality (Scott, 2014). Society and organizations take longer to internalize and incorporate them into their behaviour and, therefore, to be able to put pressure on firms' behaviour regarding responding the CDP questionnaire.

Regarding control variables, both the Pearson and Spearman correlation coefficients for Size and DCDP are positive and significant, which suggests that larger firms are more likely to voluntarily disclose carbon information to the CDP. This is consistent with previous studies on voluntary carbon disclosure (González-González & Zamora-Ramírez, 2016b; Lemma et al., 2019; Luo et al., 2012). Size is also significantly and positively related to CDPscr, suggesting that larger companies tend to disclose high-quality carbon information (Person coefficient 0.42 and Spearman coefficient 0.45; both of which are significant at the maximum level). Similarly, Risk variable is significantly and positively associated with the decision to provide carbon information, implying that companies with higher

levels of business risk tend to voluntarily respond to the CDP questionnaire. This variable is also significantly and positively related to the quality of carbon information reported to CDP (Person coefficient 0.07 and Spearman coefficient 0.08; both of which are significant at the maximum level).

In line with our expectations, the coefficients for DCDP and Lev are positive and significant, which suggest that highly leveraged firms are more likely to voluntarily disclose carbon information in order to respond to the pressures from their investors and creditors and to improve their financial flexibility (Stanny & Ely, 2008). In addition, companies with higher levels of leverage tend to disclose high-quality carbon information to CDP, as demonstrated by the positive and significant correlation coefficient for Lev variable and CDPscr (Person coefficient 0.10 and Spearman coefficient 0.12; both of which are significant at .01 level). ROA variable is not significantly correlated with either DCDP or CDPscr. Meanwhile, the parametric and nonparametric correlation coefficients for DCDP and TobinQ are negative and significant. It is to be expected that the higher a company's TobinQ, the greater the likelihood of responding to the CDP. However, previous studies have not obtained conclusive results (González-González and Zamora-Ramírez, 2016; Tang and Luo, 2016). Consistent with Stanny (2013), $DCDP_{t-1}$ is significantly and positively associated with both DCDP and CDPscr, which shows that firms that did respond to the CDP questionnaire in year t-1 are more likely to disclose carbon information to the CDP in year t, as well as to provide high-quality carbon data. In general, cross-correlations among these factors do not imply any serious problems with multicollinearity.

4.4. Regression results

Table 8 shows the results for both the response decision model (Model 1) and the disclosure quality model (Model 2). These models examine the influence of the three institutional pillars on companies' decision to respond to the CDP questionnaire (Model 1), as well as on the quality of the information provided

(Model 2). The likelihood ratio chi-square of Model 1 is 1,758.28, significant at $p < .01$, which indicates that the model as a whole fits significantly (see the bottom part of Table 8). As mentioned in Chapter 3, Model 1 is applied to the whole sample of 2,327 firms and was able to distinguish those sample firms that voluntarily reported carbon data through the CDP from those that did not. Table 8 also reports that this model correctly predicted the outcome of the response decision for more than 88 % of sample firms.

Table 8. Probit regressions (Models 1 and 2)

Variables	Model 1 - Response decision				Model 2 - Disclosure quality			
	Predicted sign	Coeff.	z-stat	ME	Predicted sign	Coeff.	z-stat	ME
EPSI	+	0.15**	2.54	0.06**	+	-0.03	-0.54	-0.01
Norm	+	2.18***	6.42	0.86***	+	1.84***	3.45	0.73***
Cultural	+	-0.11	-1.49	-0.04	+	0.57***	5.73	0.22***
Size		0.14***	5.54	0.05***		0.38***	10.4	0.15***
Risk		0.01	0.04	0.01		-0.14	-1.36	-0.05
TobinQ		-0.02	-0.78	0.01		0.07*	1.71	0.03*
ROA		0.17	0.34	0.06		-0.98	-1.46	-0.39
Lev		-0.16	-0.69	-0.06		0.36	1.32	0.14
DCDP _{t-1}		2.27***	28.44	0.73***		1.24**	2.37	0.42**
Lambda		-	-	-		0.64	1.49	0.25
Constant		-3.56***	-3.96	-		-13.64***	-7.79	-
Chi-square		1,758.28***				281.32***		
Log likelihood		-733.77				-670.32		
Pseudo R2		0.545				0.173		
% Correctly predicted		88.10%				69.66%		
Number of observations		2,327				1,170		
Control of sector effects		yes				yes		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

Model 2 examines the quality of carbon disclosures and is applied to a subsample of firms that responded the CDP climate report and made their response public (1,170 companies). This model is significant overall (Chi-square = 281.32, $p < .01$). As shown in Table 8, Model 2 correctly predicted the outcome of disclosure quality for 69.66 % of the companies in the sample. The Lambda variable, which

represents the inverse Mill's ratio, is introduced as an additional independent variable in Model 2 to account for selectivity bias in the sample. As shown in Model 2 of Table 8, the estimated coefficient of Lambda variable is not significant, suggesting that there is no noteworthy sample selection problem. Dummy variables to control for sector-fixed effects were included in both models.

The EPSI variable, which represents countries' regulative context related to climate change, shows a positive and significant relationship with companies' decisions to voluntarily disclose carbon information (0.15, $p < .05$; Model 1). This result supports Hypothesis H1a, thus indicating that countries' climate change-related regulative context positively influences companies' decisions to voluntarily participate in the CDP questionnaire in said countries. Thus, firms headquartered in countries characterized by having strict climate-related regulations are more likely to voluntarily disclose carbon information. On average, the EPSI variable has an impact consisting of a 6 per cent increase in the probability of responding for each unit increase in the value of this variable. The results of the EPSI variable are consistent with previous studies (Freedman & Jaggi, 2005; Jira & Toffel, 2013; Luo et al., 2012), despite being focused on generic environmental regulations.

Contrary to initial expectations (as regards H1b), I find that countries' regulative pressures are not significantly associated with the quality of disclosures (see Model 2 of Table 8). Although climate-related regulations are established in most of the sample countries (Kossoy et al., 2015; Nachmany et al., 2015), they are not proving effective enough to motivate companies to voluntarily disclose high-quality carbon information. Therefore, the regulative pillar of institutions is not motivating organizations to make an "extra effort" (González-González & Zamora-Ramírez, 2016a; Hess & Warren, 2008) in order to disclose high-quality and comprehensive carbon information through a voluntary mechanism. This could be because this pillar is based on coercive mechanisms which reinforce

regulative rules, which in turn have a lower impact as regards motivating companies to disclose high-quality carbon information through the CDP survey.

The estimated coefficient of the Norm variable is significantly positive at the maximum level for the response decision (2.18, $p < .01$; Model 1), as well as for the disclosure quality (1.84, $p < .01$; Model 2). This finding supports both hypotheses H2a and H2b, indicating that firms' propensity to disclose and the quality of the information reported both increase in line with countries' climate-related normative pressures. Therefore, the greater the dissemination of the CDP questionnaire in a given country, as evidenced by the number of responding companies, the greater the normative pressure on companies to both participate in the CDP and report high-quality carbon information. Consistent with NIS theory, these companies will disclose carbon information to the CDP because they believe that it is the morally right thing to do in this context, which in turn helps them to protect their legitimacy (Scott, 2014).

The Cultural variable is not significantly associated with firms' decisions to participate in the CDP survey (see Model 1 of Table 8). This result does not support the hypothesis that countries' climate-related cultural contexts positively influence companies' decisions to voluntarily disclose carbon data (H3a). This could be affected by the fact that the cultural-cognitive pillar is based on those more subtle aspects of social reality (Scott, 2014). People and organizations take longer to internalize and incorporate them into their behaviour and, therefore, to be able to put pressure on the behaviour of companies regarding responding the CDP questionnaire.

In the disclosure quality model (Model 2), the coefficient of the Cultural variable is positive and significant at the maximum level (0.57, $p < .01$). This result provides support for hypothesis H3b, which states that countries' cultural-cognitive pressures positive and significantly influence the quality of the information

disclosed. Therefore, firms headquartered in countries with high levels of climate change awareness will be more likely to voluntarily disclose high-quality information, given that such are the patterns followed in these countries (Scott, 2014). Thus, the greater the concern regarding climate change in a given country, the more internalized the problem of climate change in said country's society will be. Therefore, cognitive schemes related to climate change in said country's society will be more widespread and shared to a greater degree in order to obtain improved consideration and interpretation as regards the problem of climate change. This in turn leads to greater cultural-cognitive pressures on companies in said country to adopt measures to address climate change which, in this case, implies greater pressure for them to provide high-quality carbon information to the CDP.

Taken together, the results suggest that the significant factors related to the response decision differ from the significant factors related to disclosure quality. Therefore, this study provides evidence against analysing companies' decisions to voluntarily disclose carbon information and the quality of their disclosures together. This is in contrast to the prior literature on voluntary carbon disclosure which uses a Tobit model in order to explain both aspects (e.g. González-González and Zamora-Ramírez, 2016b; Guenther, Guenther, Schiemann, and Weber, 2016; Mateo-Márquez et al., 2020).

Regarding the control variables, consistent with prior studies (e.g. Luo, 2019; Rankin et al., 2011; Stanny, 2013), the coefficient for Size variable is positive and significant both in Models 1 and 2, suggesting that larger firms tend to respond to the CDP questionnaire, as well as to provide high-quality carbon data. According to legitimacy and stakeholder theories, these firms are more likely to voluntarily disclose carbon information owing to demands from their stakeholders, as well as from the general public (Luo et al., 2012; Patten, 2002). In

addition, these companies have more resources to disclose high-quality carbon information (Ben-Amar & McIlkenny, 2014).

TobinQ also presents a positive and significant coefficient in Model 2, which indicates that companies with high future growth expectations tend to disclose high-quality carbon information to allow investors and creditors to better determine their value. However, TobinQ is not associated with firms' decisions to voluntarily disclose carbon data. Previous studies on firms' response to the CDP survey have also reported no significant coefficients for this variable (Luo et al., 2012; Stanny & Ely, 2008). In addition, responding to the CDP questionnaire in year $t-1$ (measured by the variable $DCDP_{t-1}$) positively and significantly influences both firms' decisions to respond to the CDP in year t and the quality of the information reported in that year. This is consistent with the findings of Stanny (2013), who suggests that firms' prior CDP disclosure is the most significant factor influencing its future voluntary carbon disclosure behaviour. The coefficients for Risk, ROA and Lev are not significant for either Model 1 or Model 2.

Table 9 presents the probit regressions of Models 3 and 4. These models examine the influence of the components of the regulative dimension of institutions on the decisions of firms to answer the CDP questionnaire (Model 3), as well as on the quality of their disclosures (Model 4).

As shown in Model 3 of Table 9, the chi-square value of 1,665.21 is significant at the maximum level, indicating that the model was able to distinguish those sample companies that voluntarily disclosed carbon information via the CDP from those that did not.

Table 9 also shows that Model 3 correctly predicted the outcome of the disclosure decision for more than 80 per cent of the companies in the sample. The pseudo- R^2 of the Model 3 is 0.552, which is comparable to previous voluntary disclosure literature (Rankin et al., 2011; Stanny & Ely, 2008).

Table 9. Probit regressions (Models 3 and 4)

Variables	Model 3 - Response decision				Model 4 - Disclosure quality			
	Predicted sign	Coeff.	z-stat	ME	Predicted sign	Coeff.	z-stat	ME
Laws	+	0.01*	1.69	0.01*	+	0.01*	1.92	0.01*
EPSI	+	0.47***	5.29	0.18***	+	0.03	0.28	0.01
Rewards	+	0.41***	3.19	0.16***	+	0.39**	2.44	0.15**
Size		0.17***	6.41	0.07***		0.43***	9.77	0.17***
Risk		0.03	0.31	0.01		-0.15	-1.32	-0.05
TobinQ		-0.01	-0.45	-0.01		0.03	0.75	0.01
ROA		1.40**	2.06	0.55**		-0.62	-0.68	-0.25
Lev		0.13	0.55	0.05		0.60**	2.01	0.23**
DCDPt-1		2.37***	28.06	0.75***		1.01*	1.68	0.35*
Lambda		-	-	-		0.49	1.03	0.19
Constant		-5.67***	-10.32	-		-8.44***	-5.46	-
Chi-square		1,665.21***				282.82***		
Log likelihood		-675.67				-631.74		
Pseudo R2		0.552				0.164		
% Correctly predicted		88.79%				69.20%		
Number of observations		2,176				1,091		
Control of sector effects		yes				yes		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

Model 4 is based on a sub-sample of 1,091 companies which both responded to the 2015 CDP climate survey and made their response public. The dependent variable is an indicator variable equal to 1 if the company obtained a CDP disclosure score greater than 93 (the median CDP score of responding companies), and zero otherwise. The likelihood-ratio chi-square value of 282.82 is significant at $p < .01$, which indicates that our model as a whole fits significantly. Table 9 also shows that the Model 4 correctly predicted the outcome of disclosure quality for 69 per cent of the companies in the sample. As in Model 2, the inverse Mills ratio was included at this stage as an additional independent variable (Lambda), so as to account for sample selection bias. As can be seen, the Lambda coefficient is not significant, indicating that there is no selectivity bias of any note in the sample. As mentioned in Chapter 3, Models 3 and 4 do not consider South

African and Turkish companies due to the availability of data regarding the reward component of regulative pillar for these countries.

As shown in Model 3 of Table 9, the rules component of the regulative pillar related to climate change (as represented by the Laws variable) shows a positive and significant relationship with companies' decisions to voluntarily disclose carbon information (0.01, p -value < .10). On average, however, its impact on the probability of responding to the CDP questionnaire is quite limited since this variable has an impact of 0.5 per cent increase in the probability of responding for each unit increase in the value of this factor. This result is consistent with the hypothesis H4a, which suggests that the number of climate change-related laws of countries does influence the level of participation of firms in said countries in the CDP survey. This supports the NIS idea that climate-related laws, apart from placing pressure on target companies, contribute to the generation of social expectations concerning companies' environmental behaviour which may affect the behaviour of companies both subject and not to said laws. Thus, companies will voluntarily disclose carbon-related information in order to adapt themselves to the social expectations prevalent in their institutional context (Scott, 2014). The result for this regulative component is consistent with prior studies (Freedman & Jaggi, 2005; Luo et al., 2012), despite their being based on generic environmental regulations.

Regarding the quality of disclosures (see Model 4 of Table 9), the estimated coefficient of Laws is significantly positive (0.01, p < .10), indicating that the number of climate-related laws enacted by a country positively influences the quality of firms' carbon disclosure. This provides support for hypothesis H4b which suggests that the quality of carbon information disclosed by companies increases with the number of climate-related laws of the country in which they operate.

Pressures originating from monitoring mechanisms and punishments are measured by the EPSI variable, which reflects countries' climate change-related regulative stringency. This variable is positively and significantly associated with firms' participation in the CDP questionnaire. More specifically, the estimated coefficient of EPSI is 0.47 which is significant at the maximum level (see Model 3 of Table 9), indicating that monitoring mechanisms and punishments related to climate change positively and significantly affect companies' voluntary carbon disclosure behaviour. This supports hypothesis H5a, namely that companies in countries with stringent monitoring mechanisms and punishments related to its climate laws are more likely to voluntarily participate in the CDP survey.

Contrary to initial predictions, monitoring mechanisms and punishments (as measured by the EPSI variable) are not significantly associated with the quality of carbon disclosures. Thus the empirical evidence is not fully consistent with my predictions as made in H5b. This result could occur because in spite of the fact that monitoring mechanisms and punishments have been implemented in the majority of the sample countries, they are not effective enough to encourage firms to voluntarily disclose high-quality carbon information. Organizations gain legitimacy by participating in the CDP. Higher levels of quality in carbon information requires an "extra effort" on the part of organizations (González-González & Zamora-Ramírez, 2016a; Hess & Warren, 2008), an effort which for its part is not influenced by monitoring mechanisms and penalties, since these serve rather to reinforce the coercive character of regulation. This in turn exerts less pressure on those organizations participating in the CDP, given that the CDP is in fact a vehicle for the voluntary disclosure of information.

The rewards component of regulative pillar is measured by the Rewards variable, which is based on an index representing countries' investments in clean energy. The estimated coefficient of the Rewards variable is also found to be positive and significant at the maximum level (0.41, p -value < .01), which provides support for

hypothesis H6a and suggests that companies' propensity to voluntarily report carbon data increases in line with countries' reward mechanisms related to climate change (see Model 3 of Table 9). This finding supports the argument of NIS theory that companies headquartered in countries which have implemented a rewards system for behaviour in line with established climate change regulation will be more likely to disclose carbon information. Consistent with hypothesis H6b, the Rewards coefficient (0.39, $p < .05$) is significant with a predicted positive sign showing that climate-related reward mechanisms encourage firms to disclose high quality carbon information (see Model 4 of Table 9). Therefore, companies in countries with a rewards system for behaviour in line with established climate change regulation are more likely to provide high quality carbon information.

With respect to the control variables included in Models 3 and 4, Size is positively related to firms' propensity to disclose carbon information, with a significant coefficient at the 1 per cent level. This finding is consistent with previous studies (Luo et al., 2012; Patten, 2002), and suggests that larger firms are more likely to voluntarily participate in the CDP survey. In Model 4 of Table 9, the estimated coefficient of Size is also significantly positive (0.43, $p < .01$), which indicates that larger companies are more likely to disclose high-quality carbon information in order to legitimize their operations in response to their social exposure (Chu et al., 2012; Liu & Anbumozhi, 2009; Luo et al., 2012). This finding is similar to that found in Models 1 and 2 for this variable.

Similarly, the ROA variable positively and significantly impacts on companies' participation in the CDP survey (1.40, $p < .05$; Model 3). This result is also consistent with the previous literature which indicates that highly profitable firms are more likely to voluntarily disclose carbon-related information since they may have more resources with which to afford the costs related to voluntary carbon

disclosures (Bewley & Li, 2000). However, this variable does not seem to be significantly related to the quality of carbon disclosures (see Model 4 of Table 9).

In addition, responding to the CDP questionnaire in year $t-1$ positively and significantly influences both firms' decisions to respond to the CDP in year t and the quality of the information reported in that year. This is consistent with the findings of Stanny (2013), who suggests that firms' prior CDP disclosure is the most significant factor influencing its future voluntary carbon disclosure behaviour. As in Models 1 and 2, disclosing carbon information to the CDP in year $t-1$ (measured by $DCDP_{t-1}$) positively and significantly influences both firms' decisions to respond to the CDP in year t and the quality of the information reported in that year. More precisely, the predicted probability of responding to the CDP survey in year t is 0.75 greater for those firms that disclosed carbon information to the CDP in year $t-1$ (see Model 3 of Table 9).

Firm leverage is also positive and significantly related to the quality of carbon disclosure (0.60, $p < .05$; Model 4). This shows that highly leveraged firms are more likely to report high-quality carbon information so as to allow their investors and creditors to evaluate their environmental behaviour (Lemma et al., 2019; Luo, 2019). However, firm leverage is not significantly related to companies' decisions to participate in the CDP questionnaire. On the other hand, the coefficients for Risk and TobinQ are not significantly associated with either firms' propensity to voluntarily disclose carbon data or the quality of disclosures.

4.5. Robustness checks

With regard to the study of the influence of three institutional pillars on voluntary carbon disclosures, five additional sensitivity checks were carried out in order to ascertain whether the results of this thesis are valid. Firstly, in Models 1 and 2, the variable that measures countries' regulative pressures (EPSI variable) was replaced by a variable taken from the study carried out by Nachmany et al. (2015), which

considers the number of climate-related laws that a country has enacted (Laws variable). The results are presented in Table 10.

Table 10. Robust tests considering the number of laws

Variables	Model (1) - Response decision				Model (2) - Disclosure quality			
	Predicted sign	Coeff.	z-stat	ME	Predicted sign	Coeff.	z-stat	ME
Laws	+	0.06**	2.23	0.02**	+	0.08***	2.67	0.03***
Norm	+	2.17***	6.39	0.86***	+	2.05***	4.03	0.81***
Cultural	+	-0.11	-1.46	-0.04	+	0.66***	6.57	0.26***
Size		0.14***	5.59	0.05***		0.39***	10.75	0.15***
Risk		0.01	0.19	0.01		-0.10	-0.94	-0.04
TobinQ		-0.03	-1.21	-0.01		0.083*	1.9	0.03*
ROA		0.01	0.03	0.01		-0.89	-1.34	-0.35
Lev		-0.20	-0.87	-0.08		0.39	1.4	0.156
DCDP _{t-1}		2.26***	28.43	0.73***		1.36***	2.62	0.45***
Lambda		-	-	-		0.74*	1.73	0.29*
Constant		-3.33***	-3.82	-		-15.36***	-9.28	-
Chi-square		1,756.82***				286.20***		
Log likelihood		-734.50				-667.882		
Pseudo R2		0.544				0.176		
% Correctly predicted		88.10%				69.23%		
Number of observations		2,327				1,170		
Control of sector effects		yes				yes		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

The results of Model 1 in Table 10 suggest that the inferences are quantitatively unchanged and comparable to the data reported in Model 1 of Table 8. As shown in Table 10, the variables included in the model presented similar signs and significance as those reported in Model 1 of Table 8. With regard to the disclosure quality (Model 2), the results are also very similar to those presented in Model 2 of Table 8, except for Laws variable, which shows a coefficient of a different sign and significance level. This could be because Laws variable only captures the number of climate change-related laws of a country and therefore does not consider other climate-related mechanisms, as the EPSI variable does. However, the results for Laws variable are similar to Model 4 of Table 9, which included this variable.

Secondly, in order to test whether our results are robust to winsorisation (which resulted in a change of 2 per cent as regards the original observations), Models 1 and 2 were reran using unwinsorised data. Table 11 presents the results of these models. Both models presented in Table 11 are significant at the maximum level, indicating that they were able to distinguish those firms that answered the CDP questionnaire form those that did not (Model 1 of Table 11), as well as those that did reported high-quality carbon information (Model 2 of Table 11).

Table 11. Robust regressions using unwinsorised data (Models 1 and 2)

Variables	Model (1) - Response decision				Model (2) - Disclosure quality			
	Predicted sign	Coeff.	z-stat	ME	Predicted sign	Coeff.	z-stat	ME
EPSI	+	0.17***	2.99	0.07***	+	-0.03	-0.49	-0.01
Norm	+	2.14***	6.35	0.85***	+	1.87***	3.52	0.74***
Cultural	+	-0.11	-1.44	-0.04	+	0.57***	5.74	0.22***
Size		0.13***	5.61	0.05***		0.36***	10.38	0.14***
Risk		0.02	0.18	0.01		-0.08	-0.91	-0.03
TobinQ		0.01	0.85	0.01		0.04	1.38	0.01
ROA		-0.02	-0.05	-0.01		-0.56	-1.15	-0.22
Lev		-0.15	-0.71	-0.06		0.34	1.28	0.13
DCDP _{t-1}		2.29***	28.72	0.73***		1.29**	2.4	0.44**
Lambda		-	-	-		0.67	1.54	0.26
Constant		-3.56***	-4.01	-		-13.51***	-7.79	-
Chi-square		1,755.63***				277.98***		
Log likelihood		-735.09				-671.99		
Pseudo R2		0.544				0.171		
% Correctly predicted		88.23%				69.32%		
Number of observations		2,327				1,170		
Control of sector effects		yes				yes		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

As shown in Table 11, the statistic results are consistent with the findings shown in Table 8. The significance and the signs of both independent and control variables are largely similar to those shown in Models 1 and 2 of Table 8. Similarly, the coefficients do not present significant value variations. These results serve to reinforce the findings of this study, and to confirm the influence of countries'

institutional pressures (regulative, normative and cultural) on the decisions of firms to disclose carbon information, as well as on the quality of the information disclosed.

Thirdly, instead of using eight sector dummies to control for sector effects, both Model 1 and Model 2 were performed considering only one single dummy variable to control for carbon-intensive industries (see Table 12). Therefore, Carbon-int variable is included in both models, with a value equal to 1 if a company operates in the Materials, Energy or Utilities sectors, and 0 otherwise (Luo et al., 2012; Tang & Luo, 2011).

Table 12. Robust regressions (one sector dummy)

Variables	Model (1) - Response decision				Model (2) - Disclosure quality			
	Predicted sign	Coeff.	z-stat	ME	Predicted sign	Coeff.	z-stat	ME
EPSI	+	0.15**	2.60	0.06***	+	-0.06	-0.89	-0.02
Norm	+	2.14***	6.39	0.85***	+	1.55***	2.75	0.61***
Cultural	+	-0.09	-1.22	-0.03	+	0.58***	5.88	0.23***
Size		0.12***	5.11	0.05***		0.35***	9.89	0.14***
Risk		0.05	0.66	0.02		-0.23**	-2.3	-0.09**
TobinQ		-0.02	-0.94	-0.01		0.06	1.55	0.02
ROA		0.26	0.52	0.10		-0.85	-1.29	-0.33
Lev		-0.29	-1.27	-0.11		0.47*	1.75	0.18*
DCDP _{t-1}		2.28***	29.06	0.73***		0.90	1.44	0.33
Carbon-int		0	0	0		0.17*	1.81	0.06*
Lambda		-	-	-		0.32	0.64	0.12
Constant		-3.43***	-3.89	-		-12.59***	-6.76	-
Chi-square		1726.06***				260.11***		
Log likelihood		-749.88				-680.927		
Pseudo R2		0.535				0.1604		
% Correctly predicted		87.88%				69.40%		
Number of observations		2,327				1,170		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

The significance and the signs of independent variables are similar to those reported in Table 8. Similarly, coefficients of control variables do not present significant value variations except for Risk, TobinQ, Lev and DCDP_{t-1}. Additionally,

the results in Table 12 suggest that firms in carbon-intensive sectors are more likely to disclose high-quality carbon information, possibly because these firms are more exposed to address future carbon-related costs and liabilities (Tang & Luo, 2011).

The influence of the three institutional pillars on voluntary carbon disclosures (Model 1 and 2) was also examined for subsamples of carbon-intensive and non-carbon-intensive firms. According to Luo et al. (2012) and Tang and Luo (2011), firms operating in Materials, Energy or Utilities sector were coded as carbon-intensive and firms operating in other sectors were classified as non-carbon-intensive. Table 13 shows the results of regressions for firms in carbon-intensive sectors (Panel A) as well as for companies operating in non-carbon-intensive industries (Panel B). As shown in Table 13, the three pillars of institutions affect voluntary carbon disclosures of carbon-intensive firms and non-carbon-intensive firms differently.

Both regulative pillar (measured by EPSI variable) and normative pillar (measured by Norm variable) positively and significantly affect the propensity to voluntarily disclose carbon information of companies operating in carbon-intensive sectors. In the case of the regulative pillar, this result could be due to the fact that carbon-intensive companies are subject to stricter carbon regulation, which can force them to make heavily investments to reduce their carbon footprint. According to NIS theory, this stricter regulation applied to carbon-intensive sectors can contribute to generating social expectations about the appropriate behaviour of companies in these sectors. This can lead them to voluntarily disclose their carbon emissions in order to show their compliance with social expectations generated by stricter regulations. In addition, firms in carbon-intensive industries are subject to greater normative pressures because they tend to proactively participate in the CDP questionnaire and disclose high-quality carbon information.

Table 13. Robust analysis considering carbon-intensive versus non-carbon-intensive firms

Panel A: Subsample of carbon-intensive firms						
Variables	Model (1) - Response decision			Model (2) - Disclosure quality		
	Coeff.	z-stat	ME	Coeff.	z-stat	ME
EPSI	0.31***	3.09	0.12***	-0.15	-0.99	-0.05
Norm	1.42**	2.41	0.56**	1.37	1.58	0.54
Cultural	0.03	0.3	0.01	0.52***	2.96	0.2***
Size	0.12**	2.32	0.04**	0.43***	5.15	0.17***
Risk	-0.03	-0.21	-0.01	0.12	0.78	0.05
TobinQ	-0.02	-0.43	-0.01	-0.09	-0.90	-0.03
ROA	0.58	0.69	0.23	-0.68	-0.60	-0.27
Lev	-0.40	-0.88	-0.16	1.45**	2.36	0.58**
DisCDP _{t-1}	2.31***	15.05	0.74***	0.35	0.26	0.13
Lambda	-	-	-	0.15	0.15	0.06
Constant	-3.88***	-2.68	-	-10.21***	-2.90	-
Chi-square	457.96***			92.03***		
Log likelihood	-201.28			-173.89		
Pseudo R2	0.532			0.209		
% Correctly predicted	88.41%			71.38%		
Number of observations	621			318		
Panel B: Subsample of non-carbon-intensive firms						
EPSI	0.09	1.27	0.03	-0.01	-0.14	0.00
Norm	2.70***	6.41	1.07***	2.29***	3.38	0.91***
Cultural	-0.07	-0.82	-0.03	0.74***	5.88	0.29***
Size	0.12***	3.53	0.04***	0.36***	9.00	0.14***
Risk	0.09	0.68	0.03	-0.32**	-2.1	-0.12**
TobinQ	-0.09**	-2.51	-0.03**	-0.06	-1.25	-0.02
ROA	0.08	0.14	0.03	-1.44*	-1.75	-0.57*
Lev	0.02	0.1	0.01	0.46	1.45	0.18
DisCDP _{t-1}	2.28***	23.81	0.73***	1.58***	2.86	0.5***
Lambda	-	-	-	0.93**	2.04	0.37**
Constant	-2.86**	-2.55	-	-12.73***	-6.49	-
Chi-square	1,299.5***			186.31***		
Log likelihood	-532.75			-497.21		
Pseudo R2	0.549			0.157		
% Correctly predicted	88.04%			66.90%		
Number of observations	1,706			852		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

However, cultural-cognitive pressures do not significantly influence the propensity of carbon-intensive companies to voluntarily disclose carbon

information. This may be due to the fact that society already knows that carbon-intensive companies are subject to greater regulatory pressure, therefore, exerting less pressure on them. According to NIS theory, an additional explanation for this result may be that the cultural-cognitive pillar is underpinned on those more subtle aspects of social reality (Scott, 2014). Therefore, people and organizations take longer to internalize and incorporate them into their behaviour and, therefore, to be able to put pressure on the behaviour of companies regarding disclosing their carbon emissions.

Regarding the quality of disclosures, EPSI and Norm variables do not significantly influence the quality of the information reported by companies in carbon-intensive sectors. This indicates that regulative and normative pillars of institutions do not impact on the quality of voluntary carbon disclosures of firms in carbon-intensive industries. However, consistent with previous Table 8, the cultural-cognitive pillar positively and significantly influences the quality of the information disclosed by companies in carbon-intensive sectors.

With regard to firms operating in non-carbon-intensive industries, EPSI variable is not significantly related either to firms' propensity to voluntarily disclose carbon information and to the quality of disclosures. This implies that the regulative pillar of institutions related to climate change does not influence voluntary carbon disclosures of companies in non-carbon-intensive sectors.

On the contrary, consistent with Table 8, the estimated coefficient of Norm variable is significantly positive at the maximum level for the response decision model (1.42, $p < .01$; Model 1), as well as for the disclosure quality model (1.37, $p < .01$; Model 2). This indicates that both the propensity to disclose and the quality of the information reported of firms operating in non-carbon-intensive industries both increase in line with countries' climate-related normative pressures. As in Panel A of Table 13 and Table 8 (Model 1), countries' cultural-cognitive pressures

do not influence the decision of companies in non-carbon-intensive sectors to respond to the CDP questionnaire. However, consistent with previous Table 8 and firms operating in carbon-intensive sectors, the quality of carbon information reported by firms in non-carbon-intensive sectors is positive and significantly affected by their country's cultural-cognitive pressures related to climate change. Finally, an additional Tobit model was formulated in order to analyse whether the three institutional pillars impact on corporate voluntary carbon disclosure. Tobit regression is used because the CDP disclosure score has a restricted range of values (the score received by the companies that responded to the 2015 CDP questionnaire ranged in value from 0 to 100). Thus, Tobit regression provides a model that predicts the dependent variable to be within the restricted range (0-100) (Luo, 2019). Tobit model regressions were estimated according to maximum likelihood, since the use of linear models was not appropriate in this case because the coefficients would have been biased and inconsistent (Wooldridge, 2016). The Tobit regression has been used in several previous studies to analyse factors that influence companies' carbon reporting (e.g. P. M. Clarkson et al., 2008; Cormier et al., 2005; González-González and Zamora-Ramírez, 2016b; Luo, 2019). Table 14 displays the results of the Tobit model.

Tobit regression presented in Table 14 is based on Model 1 but the dependent variable in this model is equal to the score obtained in the CDP questionnaire if the company in question answered the questionnaire and published the score. On the contrary, i.e. in the case of a company that did not respond to the questionnaire, declined to participate, or did not publish the questionnaire, the dependent variable CDP takes a value of zero. The first two columns of Table 14 show the variables under examination and the signs expected for each of them. The following column shows the coefficients of the Tobit regression for each of the independent variables.

Table 14. Tobit regression results

	Predicted sign	Tobit regression coefficients	Marginal effects on observable variable, given uncensored	Marginal effects on probability of being uncensored
EPSI	+	5.13***(2.69)	2.27***(2.69)	0.03***(2.69)
Norm	+	83.37***(7.03)	36.95***(7.09)	0.63***(7)
Cultural	+	3.51(1.27)	1.55(1.27)	0.02(1.27)
Size		7.92***(9.28)	3.51***(9.35)	0.06***(9.23)
Risk		1.13(0.37)	0.5(0.37)	0(0.37)
TobinQ		-1.28(-1.14)	-0.57(-1.14)	0(-1.14)
ROA		5.38(0.29)	2.38(0.29)	0.04(0.29)
Lev		-2.98(-0.38)	-1.32(-0.38)	-0.02(-0.38)
DCDPt-1		101.61***(34.47)	49.15***(34.06)	0.64***(45.26)
Carbon-int		2.66(0.91)	1.18(0.9)	0.02(0.91)
Constant		-235.65***(-7.02)	-	-
Total obs		2,327	2,327	2,327
Left-censored obs at cdp==0		1,157	1,157	1,157
Uncensored		1,050	1,050	1,050
Right-censored obs at cdp>=100		120	120	120
<i>Log likelihood</i>		-6,209.51		
<i>LR Chi2</i>		1,985.14***		
<i>Pseudo R2</i>		0.139		

Notes: *** = significant $p < 0.01$, ** = significant $p < 0.05$, * = significant $p < 0.10$. Coefficients of the Tobit regression are estimated by maximum likelihood method. T-values (Tobit regression coefficients) and z-statistics (marginal effects) are reported in parentheses. Obs = observations. All variables are described in Table 2.

The Tobit regression coefficients in particular should not be interpreted as if they were linear regression estimates. Hence they must be broken down in order to assess the magnitude of the regressor in each of the two effects: on the one hand, the effect on the score obtained by the companies that did respond to and publish the CDP questionnaire; on the other, the effect on the probability of participation in the questionnaire on those companies that did not respond, declined to participate, or did not publish the questionnaire. The marginal effects

for each of the independent variables are presented in the last two columns of Table 14.

As shown in Table 14, the EPSI variable, which represents countries' climate-related regulative pressures, shows a positive and significant relationship at the maximum level with both companies' propensity to respond to the CDP questionnaire and the quality of disclosures (5.13, $p < 0.1$). This result is similar to that reported in the response decision model reported in Table 8. However, it differs from the disclosure quality model shown in Table 8. This could be because the Tobit model does not assume the disclosure quality model conditional on positive participation in the CDP questionnaire.

The estimated coefficient of Norm variable is significantly positive (83.37, $p < .01$), which indicates that firms in countries with high levels of normative pressures are more likely to voluntarily respond the CDP questionnaire, as well as to disclose high-quality carbon information. This result is largely consistent with those reported in Models 1 and 2 of Table 8. The estimated coefficient for cultural-cognitive pressures is not significantly related to voluntary carbon disclosures. This is consistent with Model 2 of Table 8 but not with Model 1. This could be because of the fact that Tobit estimation assumes that a single mechanism determines both the decision to answer the CDP questionnaire and the level of quality of the information reported (Bouten et al., 2012). Thus, it may be not appropriate to use the Tobit model in this case since it conflates two decisions in a single measure. That is, the company first decides whether to answer the CDP climate questionnaire.

Second, if the company decides to respond, it must decide how much information to disclose. Thus, a concern is that, in the first step, companies that choose to respond to the CDP questionnaire are fundamentally different from the firms that do not respond. Thus, in Tobit model, there may be self-selection bias. This is why

a Heckman two-stage approach (used in Models 1 and 2) would be a better approach since it allow the initial response decision to be separate from the disclosure quality decision (Wooldridge, 2016). In the Heckman two-stage model, self-selection bias is controlled by Lambda variable (the inverse Mills ratio). Thus, the inclusion of Lambda variable allows to make the disclosure quality model conditional on positive participation in the CDP questionnaire (Rankin et al., 2011).

Consistent with Bouten et al. (2012), this study provides evidence against analysing companies' decisions to voluntarily disclose carbon information and the quality of their disclosures together. This is in contrast to the prior literature on voluntary carbon disclosure which uses a Tobit model in order to explain both aspects (e.g. González-González & Zamora-Ramírez, 2016b; Guenther, Guenther, Schiemann, & Weber, 2016; Mateo-Márquez et al., 2020).

As this study demonstrates, different determinants may be associated with the decision to answer the CDP questionnaire and the disclosure level. Thus, a Heckman two-stage model may be a better approach since it assumes that the decision to disclose and the level of quality of the information disclosed are independent from each other (Bouten et al., 2012).

Regarding the components of the regulative pillar of institutions, four additional analyses were carried out in order to examine whether the results of this study are valid. First, additional probit analyses were performed to examine whether the results were sensitive to the winsorisation operation. Thus, Models 3 and 4 were estimated using unwinsorised data. The results are reported in Table 15.

In general, statistic results for both the response decision model (Model 3) and disclosure quality model (Model 4) were largely similar to those presented in Table 9. The signs and significance of both independent and control variables presented in Table 15 are broadly similar to those reported in Table 9.

Table 15. Robust regressions using unwinsorised data (Models 3 and 4)

Variables	Model 3 - Response decision				Model 4 - Disclosure quality			
	Predicted sign	Coeff.	z-stat	ME	Predicted sign	Coeff.	z-stat	ME
Laws	+	0.01*	1.70	0.01*	+	0.01*	1.92	0.01*
EPSI	+	0.46***	5.20	0.18***	+	0.01	0.13	0.00
Rewards	+	0.43***	3.37	0.17***	+	0.37**	2.3	0.14**
Size		0.15***	6.28	0.06***		0.40***	9.75	0.16***
Risk		0.03	0.34	0.01		-0.09	-0.98	-0.03
TobinQ		-0.01	-0.09	0.00		0.00	0.17	0.00
ROA		0.92*	1.74	0.36*		-0.2	-0.3	-0.08
Lev		0.10	0.44	0.04		0.58**	2.05	0.23**
DCDPt-1		2.39***	28.43	0.75***		0.89	1.43	0.32
Lambda		-	-	-		0.39	0.79	0.15
Constant		-5.33***	-10.32	-		-7.91***	-5.17	-
Chi-square		1,659.44***				245.15***		
Log likelihood		-678.56				-633.57		
Pseudo R2		0.55				0.162		
% Correctly predicted		88.60%				69.75%		
Number of observations		2,176				1,091		
Control of sector effects		yes				yes		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

Second, as in Models 1 and 2, Models 3 and 4 were tested using a single dummy variable, Carbonint (instead of eight sector dummy variables to control for the systematic industry differences). As mentioned earlier, Carbonint variable equals one if a company operates in Energy, Materials or Utility sectors and zero otherwise (Luo et al., 2012; Tang & Luo, 2011). Thus, a Heckman-two stage model was performed which included Carbonint variable. The results of these models are presented in Table 16. The findings are largely consistent with those reported in Table 9. The coefficients of the independent variables presented similar signs and significance, except for EPSI variable which showed a negative coefficient. However, the coefficient of this variable is not significant. Also, the coefficients of these variables were consistent with those shown in Table 9. In addition, the

coefficients of control variables presented similar signs and significance as those reported in previous Table 9, except for Lev, Risk and DCDP_{t-1}.

Table 16. Robust regressions using a single sector dummy variable (Models 3 and 4).

Variables	Model (3) - Response decision			Model (4) - Disclosure quality		
	Coeff.	z-stat	ME	Coefficients	z-stat	ME
Laws	0.01*	1.74	0.01*	0.01*	1.93	0.01*
EPSI	0.47***	5.33	0.18***	-0.04	-0.30	-0.01
Rewards	0.39***	3.13	0.15***	0.36**	2.27	0.14**
Size	0.15***	5.93	0.06***	0.38***	8.88	0.15***
Risk	0.13	1.38	0.05	-0.21**	-2.01	-0.08**
TobinQ	-0.01	-0.48	0	0.01	0.28	0
ROA	1.46**	2.19	0.58**	-0.39	-0.44	-0.15
Lev	-0.02	-0.10	0	0.65**	2.32	0.26**
DisCDP _{t-1}	2.36***	28.60	0.75***	0.56	0.81	0.21
Carbon-int	0.15	1.63	0.05	0.17*	1.77	0.07*
Lambda	-	-	-	0.11	0.20	0.04
Constant	-5.32***	-9.99	-	-6.81***	-4.05	-
Chi-square	1,633.63***			224.18***		
Log likelihood	-691.46			-644.05		
Pseudo R2	0.541			0.148		
% Correctly predicted	88.79%			69.11%		
Number of observations	2,176			1,091		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

Third, Model 3 and 4 were also estimated for subsamples of firms operating in carbon-intensive and non-carbon-intensive industries. Table 17 presents the results of regressions for firms in carbon-intensive sectors (Panel A) as well as for companies operating in non-carbon-intensive industries (Panel B). It can be seen from the data in Table 17 that different determinants influence the decision to answer the CDP questionnaire and the disclosure quality, in both firms in carbon-intensive and in non-carbon-intensive sectors. More specifically, the components of the regulative pillar affect voluntary carbon reporting of carbon-intensive firms and non-carbon-intensive firms differently.

Table 17. Robust regressions for subsamples of carbon-intensive and non-carbon-intensive sectors

Panel A: Subsample of carbon-intensive industries						
Variables	Model (3) - Response decision			Model (4) - Disclosure quality		
	Coeff.	z-stat	ME	Coeff.	z-stat	ME
Laws	-0.01	-0.29	0.01	0.02*	1.89	0.01*
EPSI	0.45***	3.05	0.17***	-0.22	-0.89	-0.09
Rewards	0.50*	1.74	0.20*	-0.35	-1.06	-0.14
Size	0.08*	1.95	0.03*	0.4***	5.35	0.16***
Risk	-0.19	-1.18	-0.07	0.09	0.50	0.03
TobinQ	-0.26**	-2.10	-0.10**	0.07	0.46	0.03
ROA	2.01	1.60	0.79	0.4	0.23	0.16
Lev	-0.41	-0.79	-0.16	1.71**	2.45	0.68**
DisCDP _{t-1}	2.63***	14.79	0.8***	-1.78	-1.24	-0.54
Lambda	-	-	-	-1.82	-1.60	-0.72
Constant	-3.56***	-3.96	-	-4.85*	-1.78	-
Chi-square	462.77***			103.97***		
Log likelihood	-163.53			-150.24		
Pseudo R2	0.586			0.2571		
% Correctly predicted	90.00%			77.40%		
Number of observations	570			292		
Panel B: Subsample of non-carbon-intensive industries						
Laws	0.02**	2.13	0**	0.01	1.55	0.01
EPSI	0.48***	4.01	0.19***	0.05	0.32	0.02
Rewards	0.40***	2.77	0.16***	0.60***	3.27	0.24***
Size	0.23***	6.53	0.09***	0.47***	8.31	0.18***
Risk	0.10	0.72	0.04	-0.26*	-1.70	-0.10*
TobinQ	0.01	0.24	0.01	0.06	1.16	0.02
ROA	1.42*	1.74	0.56*	-1.11	-0.99	-0.44
Lev	0.32	1.12	0.13	0.53	1.56	0.21
DisCDP _{t-1}	2.28***	23.13	0.73***	1.6***	2.66	0.5***
Lambda	-	-	-	1.04**	2.08	0.41**
Constant	-6.79***	-9.53	-	-9.8***	-5.41	-
Chi-square	1,220.60***			159.30***		
Log likelihood	-502.87			-473.84		
Pseudo R2	0.548			0.143		
% Correctly predicted	88.42%			67.83%		
Number of observations	1,606			799		

Notes: *, **, *** represent coefficients significant at the 0.1, 0.05 and 0.01 levels respectively (two-tailed). ME = Marginal effects. All variables are described in Table 2.

With regard to companies operating in carbon-intensive sectors, the EPSI and Rewards variables positively and significantly affect the participation of

companies in the CDP questionnaire (see Panel A of Table 17). This indicates that both rewards and monitoring mechanisms (and sanctions) positively and significantly influence the decision of companies to respond the CDP questionnaire. This result is consistent with Model 3 of Table 9. Furthermore, the sign and coefficient of the EPSI variable is very similar to that presented in Table 13. However, the Laws variable, which measures the number of climate change-related laws, does not significantly influence the propensity of firms operating in carbon-intensive sectors to disclose information through the CDP questionnaire.

Regarding the quality of disclosures, the variable Laws presents a positive and significant coefficient (0.02; $p < 0.1$), which indicates that laws related to climate change positively and significantly affect the quality of disclosures by companies in carbon-intensive sectors. However, its influence is minimal on the level of quality of the information reported. EPSI and Rewards variables do not significantly impact on the disclosure quality of firms in carbon-intensive industries. In sum, the components of the regulative pillar do not appear to exert a high influence on the quality of disclosures of firms operating in carbon-intensive sectors. There is a positive and significant relationship between all the components of the regulative pillar and the propensity of firms operating in non-carbon-intensive industries to respond to the CDP questionnaire. This result is consistent with the findings of Model 3 presented in Table 9. Regarding the quality of disclosures, it is found that the reward component of the regulative pillar positively and significantly influences the quality of disclosures of firms in non-carbon-intensive sectors. However, neither Laws nor EPSI variable affect the quality of disclosures of these companies. This result is similar to Model 4 reported in Table 9, although in this model the Laws variable is positive and significant, however its influence is minimal on the quality of the disclosure.

Four, an additional Tobit model was performed in order to analyse the influence of the components of regulative pillar on corporate voluntary carbon disclosure.

As mentioned before, Tobit model has been widely used in carbon accounting literature. Although it has some drawbacks (mentioned earlier), it may be used as a robustness of the results of this study. Table 18 presents Tobit regression results.

Table 18. Tobit regression results

Variables	Predicted sign	Tobit regression coefficients	Marginal effects on observable variable, given uncensored	Marginal effects on probability of being uncensored
Laws	+	0.19(0.76)	0.08(2.69)	0.01(2.69)
EPSI	+	16.37***(5.37)	7.26***(7.09)	0.12***(7)
Rewards	+	14.78***(3.41)	6.56***(1.27)	0.11***(1.27)
Size		9.48***(10.53)	4.2***(9.35)	0.07***(9.23)
Risk		1.76(0.56)	0.78(0.37)	0.01(0.37)
TobinQ		-0.79(-0.66)	-0.35(-1.14)	-0.01(-1.14)
ROA		13.41**(1.13)	5.94**(0.29)	0.1**(0.29)
Lev		3.19(0.39)	1.41(-0.38)	0.02(-0.38)
DCDPt-1		104.05***(34.21)	50.68***(34.06)	0.66***(45.26)
Carbon-int		5.18*(1.71)	2.33*(0.9)	0.03*(0.91)
Constant		-233.01***(-12.79)	-	-
Total observations		2,176	2,176	2,176
Left-censored obs at cdp=0		1,085	1,085	1,085
Uncensored		975	975	975
Right-censored obs at cdp>=100		116	116	116
<i>Log likelihood</i>		-5,745.92		
<i>LR Chi2</i>		1,912.47***		
Pseudo R2		0.1427		

Notes: *** = significant $p < 0.01$, ** = significant $p < 0.05$, * = significant $p < 0.10$. Coefficients of the Tobit regression are estimated by maximum likelihood method. T-values (Tobit regression coefficients) and z-statistics (marginal effects) are reported in parentheses. Obs = observations. All variables are described in Table 2.

The dependent variable in this Tobit model equals to the score obtained in the CDP questionnaire if the company in question answered the questionnaire and made public the score and zero otherwise i.e. if a company that did not respond to the questionnaire, declined to participate, or did not publish the questionnaire. As shown in Table 18, the results obtained were similar to those presented in

Table 9. The significance and the signs of the variables are similar to those shown in Model 3 of Table 9. Similarly, the coefficients do not present significant value variations. These results serve to reinforce the findings of this study, and to confirm the relationship between the components of countries' regulative context and voluntary carbon reporting on the part of companies headquartered in those countries. In addition, the data was analysed using ordinary least squares regression. The results (not tabulated) are qualitatively similar and do not change the inferences of the study.

Chapter 5. Conclusions

Key findings and main contributions of
the thesis, implications for practice,
limitations, and future research
directions

5.1. Key findings and main contributions of the thesis

The purpose of this thesis is twofold. First, it examines whether country-level institutional pillars (regulative, normative and cultural-cognitive) affect corporate incentives to voluntarily disclose carbon information, as well as the quality of the information disclosed. Second, given the importance of the regulative pillar of institutions, it investigates whether the different components of the climate-related regulative pillar of countries (rules and laws; monitoring mechanisms and punishments; and rewards) influence on companies' decisions to voluntarily disclose carbon information, as well as on the quality of disclosures. This thesis has relied on NIS theory in order to analyse the pressure exerted by different climate-related institutional factors in 13 different countries on the response of companies to the demands of carbon reporting. As regards research methodology, this thesis has used the standard Heckman two-stage approach to analyse the data collected from CDP climate reports and to examine the effects on the score obtained in the CDP questionnaire, as well as the effects on the probability of responding to the questionnaire in the case of those companies that did not respond, declined to respond or did not publish the CDP questionnaire.

Regarding the response decision, this study finds that the climate-related regulative pillar positively influences companies' propensity to voluntarily disclose carbon information. Therefore, this finding shows that apart from imposing binding rules on target companies, climate-related regulations further the creation of social expectations regarding corporate voluntary carbon disclosure behaviour, which may affect both target and non-target companies. Hence, climate-related regulations may create stimulus that influence companies to voluntarily disclose carbon information. This result is consistent with previous studies on voluntary carbon disclosures, albeit based on generic environmental regulations (Freedman & Jaggi, 2005; Jira & Toffel, 2013; Luo et al., 2012).

Similarly, firms' decisions to voluntarily disclose carbon information are positively affected by their country's climate-related normative pressures. Therefore, firms in countries with a higher degree of climate change-related normative pressures are more likely to participate in voluntary carbon reporting. These results are consistent with NIS theory. However, contrary to initial expectations, the results show that climate-related cultural-cognitive pressures are not significantly related to firms' decisions to voluntarily disclose carbon information. This could be because the cultural-cognitive dimension of institutions is underpinned on those more subtle aspects of social reality (Scott, 2014). People and organizations take longer to internalize and incorporate them into their behaviour and, therefore, to be able to put pressure on the behaviour of companies regarding disclosing their carbon information through a voluntary instrument such as the CDP questionnaire.

The results of this thesis also show that the quality of disclosures is positively influenced by the normative and cultural pillars related to climate change. Therefore, companies in countries with a higher degree of climate change-related normative pressures tend to participate in voluntary carbon reporting, disclosing high-quality carbon information. Similarly, this study demonstrates that companies headquartered in countries characterized by higher levels of concern regarding climate change are more likely to provide high-quality information. However, it also finds that countries' climate-related regulative pillar is not significantly associated with the quality of disclosures. Hence, this pillar is not motivating organizations to make an "extra effort" (González-González and Zamora-Ramírez, 2016a; Hess and Warren, 2008) in order to provide high-quality and comprehensive carbon information through CDP. This could be due to the fact that the regulative dimension of institutions is based on coercive mechanisms which reinforce regulative rules, which in turn have a lower impact as regards

motivating companies to disclose high-quality carbon information through the CDP survey.

Given the importance of climate-related regulations in promoting corporate carbon disclosures, this thesis identified and analysed the influence of the components of countries' regulative pillar on the probability of companies' voluntarily disclosing carbon data as well as the quality of the information disclosed. The results obtained reveal that the probability of voluntary carbon reporting is explained by the components of countries' regulative pressures (rules; monitoring mechanisms and punishment; rewards). Therefore, companies headquartered in countries where (1) specific climate change-related regulation exists; (2) monitoring mechanisms for compliance have been implemented, and punishments exist for non-compliance with the regulation; and (3) rewards exist for behaviour in line with the regulation will be more likely to voluntarily disclose carbon information. These findings are consistent with NIS theory as regards the regulative dimension, which provides explanations for the impact of the different components of climate-related regulations on voluntary carbon disclosure (DiMaggio & Powell, 1983; Meyer & Rowan, 1977; Scott, 2014).

As regards the quality of disclosures, this study finds that climate-related rules and rewards do positively influence the quality of carbon information disclosed by companies. However, neither climate-related monitoring mechanisms nor punishments are significantly related to the quality of carbon information. This could be due to the fact that monitoring mechanisms and punishments reinforce the coercive character of regulation, and therefore are not as effective in encouraging companies to voluntarily disclose high quality carbon information.

Furthermore, and consistent with prior studies, this thesis finds that companies that disclose better quality carbon information are larger and more leveraged than companies that only respond to the CDP questionnaire. Larger firms are

more likely to report high quality carbon information because they are more visible and have more resources with which to account for and disclose carbon emissions (Ben-Amar & McIlkenny, 2014; Luo, 2019). Additionally, leveraged companies are also more likely to voluntarily report high quality carbon information due to pressures from their investors and creditors to evaluate their carbon-related risks (Lemma et al., 2019; Luo, 2019).

The findings reported here shed new light on the relationship between the three institutional pillars (regulative, normative and cultural-cognitive) related to climate change and voluntary carbon disclosures. The main theoretical implication of this thesis relates to the filling in of the knowledge gap as regards the influence of climate-related institutional pillars on voluntary carbon disclosures. In particular, this research contributes to the previous literature in several ways: it links countries' institutional contexts to the decision of firms that operate in said countries to voluntarily disclose carbon information (Grauel & Gotthardt, 2016); it uses specific climate-related measurements for the regulative, normative and cultural-cognitive dimensions of countries' institutional context (Kostova, 1997; Scott, 2014); it is the first to consider the three institutional pillars related to climate change in the same regression; and it provides empirical evidence that companies' decisions to voluntarily disclose carbon information and the quality of the information disclosed should be examined separately because it is possible that they are influenced by different factors.

In addition, this thesis provides the first comprehensive assessment of the components of the climate-related regulative pillar of institutions and their influence on both companies' response to the CDP questionnaire as well as on the quality of the information disclosed. Thus, this thesis makes several contributions to the existing literature. Firstly, it has taken the innovative approach of investigating the different components of countries' regulative pillars as highlighted by Scott (2014) and specifically related to climate change, which

previous studies in the field of voluntary carbon disclosure have neglected (Jira & Toffel, 2013; Luo et al., 2012; Mateo-Márquez et al., 2020; Prado-Lorenzo et al., 2009). Secondly, it demonstrates which countries present greater levels of pressure from these regulative dimensions. Thirdly, unlike previous studies on voluntary carbon reporting which focus on larger companies (Freedman & Jaggi, 2005; Luo et al., 2012; Prado-Lorenzo et al., 2009) or those listed on specific indices (Eleftheriadis & Anagnostopoulou, 2015; Lemma et al., 2019), this study takes into account all the firms included in the 2015 CDP climate report for each of the sample countries. Finally, as opposed to considering generic climate change-related regulations (Freedman & Jaggi, 2005; Jira & Toffel, 2013; Prado-Lorenzo et al., 2009), this paper focuses on specific climate-related regulations and disaggregates them in order to identify the different individual components.

5.2. Implications for practice

The findings of this cross-country comparative research have several practical implications. Firstly, the results suggest that countries' climate-related institutional profile serves to significantly explain companies' carbon disclosure behaviour, implying that managers cater to national conceptions (rules, norms and cultural expectations) when making their carbon reporting decisions. For example, in the case of multinational companies, managers may analyse the institutional context of the country to better support the management and reporting decisions of their strategies and actions related to the fight against climate change.

Secondly, the results are of use to regulators so as to better understand the effects of climate change-related rules on voluntary corporate carbon disclosure, as well as to develop policies aimed at supporting corporate carbon disclosure. The findings of this thesis provide evidence that countries' regulatory pressures play an important role in promoting voluntary carbon disclosures on the part of companies. Therefore, the policy implications of this thesis are that regulators and

policymakers should carry out more actions to encourage firms to reduce their carbon footprint as well as to make carbon disclosure as a strategic priority. These actions could include the implementation of stricter regulation along with a more effective monitoring mechanism to achieve the goal (Luo et al., 2012).

Thirdly, investors, shareholders and other stakeholders can benefit from this research as it demonstrates which climate change-related institutional context exerts more pressure on companies to voluntarily disclose carbon information, as firms in those countries will be more likely to participate in the CDP climate program, as well as to disclose high-quality carbon information. This will help them to develop country-specific disclosure strategies and investment plans. The results of this thesis are of use to investors and other stakeholders so as to find out whether a company is managing the risks of climate change well, given the characteristics of the context in which it operates, and thus better assess whether it may constitute a good investment opportunity. In addition, the findings of this thesis are of use to non-governmental organisations and other activists so as to analyse to what extent the company is contributing to the fight against climate change and to be able to scrutinise their climate actions, considering the institutional characteristics of the country in which the company operates.

Finally, this thesis provides scholars and practitioners specific climate-related measures for the three dimensions of institutions as well as for the components of the regulative pillar, and helps them to accumulate and apply knowledge regarding the development of the NIS perspective in the study of voluntary corporate carbon disclosure.

5.3. Limitations and future research directions

This research is subject to certain limitations. First of all, it only considered countries' institutional profiles related to climate change, thus caution should be exercised when generalizing the findings to other institutional profiles related to

other environmental issues (Kostova, 1997). Second, the study period was relatively short compared with previous studies on voluntary carbon disclosures (Lemma et al., 2019; Liesen et al., 2015; Luo, 2019; Stanny, 2013); however, the multinational design, with 13 countries including 2,327 companies operating in different sectors, helped compensate for this limitation. In this regard, a further study could assess both the effects of countries' institutional context and the components of the regulative dimension of institutions using more years of data in the analysis. Third, it examined country-level institutional factors related to climate change separately, thus it would be interesting to investigate the way in which the interaction between formal and informal institutions affects corporate carbon reporting. In this sense, it would be also interesting analysing the interplay between each institutional pillar and/or the components of the regulative dimension of institutions. Furthermore, in relation to normative pressures, companies may adopt voluntary initiatives such as the TCFD (Task Force on Climate-Related Financial Disclosures) guidelines (TCFD, 2019) not because they are imposed by regulations, but rather because they believe it is morally the right thing to do (Scott, 2014). Hence further research could explore how normative pressures may affect voluntary corporate carbon disclosure.

In recent years, many companies are engaging in greenwashing, misleading their stakeholders regarding their carbon performance and/or the environmental advantages of their products or services (Delmas & Burbano, 2011). The Volkswagen emissions scandal in September 2015 is a clear example of corporate greenwashing behaviour (Siano et al., 2017; Yang et al., 2018). Before the scandal, the firm claimed that its vehicles had an injection system that reduces emissions. These low-emissions cars allowed the firm to obtain some rewards, such as green car subsidies and tax exemptions in the USA (Yang et al., 2018). However, the Environmental Protection Agency (EPA) found that many Volkswagen cars being sold in the USA were cheating emission tests by using a "defeat device" (Hotten,

2015). According to Delmas and Burbano (2011), corporate greenwashing behaviour may be influenced by the institutional context in which the firm operates. In this line, further research may explore the role of institutional pillars on corporate greenwashing behaviour.

Climate change is seen by many stakeholders as a significant risk for companies, particularly in industries such as oil and gas. However, the lack of disclosure and the inability to determine company climate risk continues to be a concern for such groups as BlackRock and The Vanguard Group (Chasan & Massa, 2019; Mooney, 2020). However, contradictions are also apparent since these big investors groups such as BlackRock and The Vanguard Group showed thin support of climate-related shareholder proposals (Chasan & Massa, 2019). According to a survey carried out by Ernst and Young, climate change is among the most common topics requested by stockholders (Ernst and Young, 2014). Investors increasingly use shareholder resolutions as a mean to elicit greater climate change-related disclosures and to induce companies to manage better the challenges and opportunities that arise from climate change. Based on institutional theory, it would be interesting how institutional factors affect climate-related shareholder resolutions. This leads to the following questions: Do institutional factors influence firms to be targeted by climate-related shareholder resolutions? Do institutional factors help determine whether climate-related resolutions will be proposed, voted on and adopted? As climate-related shareholder resolutions are increasing over time it would be interesting to analyse whether the institutional profile of countries affect the outcome these types of shareholder resolutions.

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Appendices

Appendix A – Example of overall disclosers in Italy

List of disclosing firms in Italy. Source: CDP Climate Change Report 2015, Italian edition.

Organization	Answer: Public/ Not Public	Final Score	Scope 1 (million metric tonnes CO ₂ e)	Scope 2 (million metric tonnes CO ₂ e)
Consumer Discretionary				
Brembo SpA	Not public	98B	-	-
Fiat Chrysler Automobiles NV	Public	98A	1203290	3079279
GTECH S.p.A.	Public	95C	24919.21	17527.98
Mediaset	Public	15	-	31324
Piaggio & C SpA	Public	98B	19033	41969
Pirelli	Public	100B	267895	869985
YOOX SpA	Public	99A	365	364
MARR SpA	Not public	17	-	-
Energy				
Eni SpA	Public	100B	42925895.4	672295
Saipem	Not public	92B	-	-
Financials				
Banca Monte dei Paschi di Siena Group	Public	97D	19582	163
Banca Popolare dell'Emilia Romagna	Public	14	-	-
Banco Popolare Societa Cooperativa	Not public	68E	-	-
Beni Stabili Spa SIQ	Not public	87D	-	-
Credito Valtellinese	Public	91D	4153	208
Fincredbank	SA	N/A	-	-
Immobiliare Grande Distribuzione SpA	Public	77E	1825	19749
Intesa Sanpaolo S.p.A	Public	100A	45276.82	46206.82
Mediobanca	Public	93C	384	0
UBI Banca	Public	97D	11410	155
UniCredit	Public	99C	67459	280975
Unipol Gruppo	Public	97C	1921	21499
UnipolSai	SA	N/A	-	-
Health Care				
Disorin SpA	Public	89D	607	9459
Industrials				
Ansaldo STS	Public	94C	2837	7765
Atlantia	Public	94C	140623	96355
CNH Industrial NV	Public	100A	192440	264936
Daniel & C Officine Meccaniche S.p.A.	Public	87C	246094	365084
Finmeccanica	Public	86C	245102	116643
IMA SpA	Public	90C	4369.09	4578.78
Maire Tecnimont SpA	Not public	14	-	-
Prysmian SpA	Public	94B	189464	474948
Salini Impregilo S.p.A.	Public	100B	473619	47520
SAVE - Aeroporto di Venezia Marco Polo S.p.A.	Not public	97C	-	-

Organization	Answer: Public/ Not Public	Final Score	Scope 1 (million metric tonnes CO ₂ e)	Scope 2 (million metric tonnes CO ₂ e)
Information Technology				
Datagis SpA	Not public	39	-	-
REPLY S.p.A	Not public	91B	-	-
STMicroelectronics Nv	Public	96B	626024	777772
Materials				
Buzzi Unicem	Public	100B	21729710	1431924
Cementir Holding SpA	Public	65D	2310393	4388144
Italcementi	Public	99B	28953185	2149515
Zignago Vetro SpA	Public	73D	143288	0
Telecommunication Services				
Telecom Italia	Public	100B	140651	79006
Utilities				
A2A	Public	96C	5893038	148780
ACEA SpA	Public	99B	272178	452100
Enel Green Power SpA	SA	N/A	-	-
ENEL SpA	Public	100B	115479798	635830
Hera	Public	98B	1095581	150718
Iren SpA	Public	97C	2389951	119448
Snam S.P.A	Public	100B	1978000	31500
Terna	Public	96C	75280	66323

It should be noted that Sofidel SpA is disclosing to CDP voluntarily as part of the Mittelstand initiative and achieved a score of 98C

List of non-responding companies in Italy. Source: CDP Climate Change Report 2015, Italian edition.

Company	Response Status
Consumer Discretionary	
World Duty Free SpA	Declined to Participate
Mondler	Declined to Participate
Saffio Group SpA	No Response
Salvatore Ferragamo SpA	No Response
TOD'S	Declined to Participate
Luxottica Group	Declined to Participate
RCS MediaGroup SpA	No Response
DeLonghi SpA	Declined to Participate
Geox	Declined to Participate
Gruppo Editoriale L'Espresso	Declined to Participate
Autogrill SpA	No Response
Brunello Cucinelli SpA	Declined to Participate
Caio Communication SpA	No Response
Consumer Staples	
Farnalat SpA	No Response
Davide Campari-Milano SpA	Declined to Participate
Energy	
Saras SpA	No Response
Tenaris SA	No Response
ERG SpA	Declined to Participate
Financials	
Anima Holding	Declined to Participate
Cerved Information Solutions	Declined to Participate
Tamburi Investment Partners SpA	No Response
Vittoria Assicurazioni ISpA	Declined to Participate
Mediolanum SpA	Declined to Participate
Credito Emiliano	Declined to Participate
Dea Capital SpA	Declined to Participate
Exor SpA	Declined to Participate
Assicurazioni Generali Spa	Declined to Participate
Azmut Holding	No Response
Banca Carige	Declined to Participate
Banca General SpA	No Response
Banca IFS SpA	No Response
Banca Intermobiliare di Investimenti e Gestioni SpA	No Response
Banca Popolare di Milano	Declined to Participate
Banca Popolare di Sondrio	No Response
Cattolica Assicurazioni	Declined to Participate

Company	Response Status
Health Care	
Recordati SpA	Declined to Participate
Sorin SpA	Declined to Participate
Amplifon SpA	Declined to Participate
Industrials	
Fincantieri	Declined to Participate
SIAS	Declined to Participate
Trevi-Finanziaria Industriale SpA	No Response
Interpump Group SpA	No Response
Astaldi SpA	No Response
Autostrada Torino-Milano SpA	Declined to Participate
CR SpA	No Response
Information Technology	
EI Towers SpA	Declined to Participate
Engineering Ingegneria Informatica SpA	Declined to Participate
Materials	
SolSpa	No Response
Italmobiliare	No Response
Utilities	
Ascopiave SpA	No Response

Appendix B – List of publications

Mateo-Márquez, A.J., González-González, J.M. & Zamora-Ramírez, C. (2020). Countries' regulative context and voluntary carbon disclosures. *Sustainability Accounting, Management and Policy Journal*, 11(2), 383-408. <https://doi.org/10.1108/SAMPJ-11-2018-0302>

Sustainability Accounting, Management and Policy Journal is indexed in Thomson Reuters Journal Citation Reports (JCR) (2019), category: Business, Finance (37/108), Quartile Q2, impact factor: 2.056. This journal is also indexed in SCOPUS (SJR) (2019), category: Business, Management and Accounting (miscellaneous), Q1 (68/355). SJR index: 0.672.

Mateo-Márquez, A.J., González-González, J.M. & Zamora-Ramírez, C. (2020). Climate change-related laws and voluntary carbon reporting in the European context [Leyes de cambio climático e informes voluntarias de carbono en el contexto europeo]. *Studies of Applied Economics [Estudios de Economía Aplicada]*, 38(2), 1-13. <https://doi.org/10.25115/eea.v38i2.3106>

Studies of Applied Economics is indexed in SCOPUS SJR (2019). This journal will appear on Scopus website during the next page refresh. Link to my Scopus profile: <https://www.scopus.com/authid/detail.uri?authorId=57211712675>