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A multilevel approach for assessing business strategies on climate change

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ABSTRACT

The need for an interdisciplinary and integrative approach for doing research on business strategies and climate change is gaining increasing recognition. However, there is a consensus that such cross-fertilization is currently missing. Multilevel research methods by virtue of being interdisciplinary in nature may address this need. This paper proposes to advance the adoption of multilevel research approach in the context of business strategies and climate change. As a guide for conducting multilevel assessment, a flexible analytical framework is presented. The framework is developed through a process of structured literature review. The framework consists of thirteen contextual factors spread across five levels and identifies the key multilevel relationships that moderate organisational level climate change related strategy formulation. Level specificities of several theories across these five levels are also identified to facilitate application of the framework in building multilevel hypotheses for business strategies on climate change. In addition, a concise summary of the fundamental concepts of multilevel modelling techniques is provided to help researchers in selecting suitable multilevel models during the operationalization of the framework. The operationalization of the framework is demonstrated by building and testing a three level hypotheses on corporate lobbying activities on climate change issues. It is observed that irrespective of their locations, financially underperforming companies with a larger workforce and belonging to sectors with higher Green House Gas emission intensities particularly lobby intensely on climate change issues. In conclusion, the potential challenges and opportunities in applying the framework for building multilevel theories in the context of business strategies and climate change are discussed.

1. Introduction

"*Multilevel theory is an ideal of science.*"

Laszlo (1972).

The literature on the strategic response of business corporations to climate change is extensive (e.g., Hoffman, 2006; Kolk and Levy, 2001; Okereke and Kung, 2013). The primary focus of the existing research has been on developing classification for climate change strategies (e.g., Jeswani et al., 2008; Kolk and Pinkse, 2005; Lee, 2012), identifying drivers and barriers (e.g.; Bötcher and Müller, 2013; Okereke, 2007), assessing the "rent seeking" and reactionary behaviors (e.g.: Boiral, 2006; Levy and Kolk, 2002; Markussen and Svendsen, 2005), greenwashing (e.g.: Laufer, 2003; Lyon and Maxwell, 2006; Walker and Wan, 2012) and exploring the relationship between carbon performance and financial performance (e.g.: Alvarez, 2012; Brzobohatý and Janský, 2010; Busch and Hoffmann, 2011). More recently scholars have also looked at corporate adaptation strategies for climate change (Haigh and Griffiths, 2011; Linnenluecke et al., 2011, 2012; Winn et al., 2011).

Notwithstanding the important contribution of the existing literature, an important missing link seems to be a lack interdisciplinary approach (Schotter and Goodsite, 2013). Such an approach is considered to be essential for understanding complex problems (Klein, 2004) like the relationships between business strategies and

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climate change. An interdisciplinary understanding may demand the simultaneous application of multiple theoretical lenses. Multilevel approaches can reconcile various theories across different levels (Klein et al., 1999) and thus can be useful in this regard. Considering the multilevel nature of the impact of climate change (Levin et al., 2012) such an approach may be warranted to have a better understanding of business strategies and climate change. Indeed, literature on corporate climate change strategies supports this view (Hoffman and Jennings, 2012; Okereke et al., 2011; Sæverud and Skjærseth, 2007). However, at present explicit attempts in multilevel theorizing for explaining business strategies in climate change are rare in the literature (exception include Pinkse and Kolk, 2010; Slawinski et al., 2015). This paper aims towards formalizing this multilevel approach by providing a flexible multilevel framework to operationalize such investigations in a structured way. It is hoped that this framework will begin a process of multilevel theory building for business strategies in the context of climate change. This potential for beginning a new theory building process is the primary contribution of this paper.

The proposed flexible multilevel framework is developed through a process of structured literature review. The framework constitutes a list of factors spread across five different levels. A list like this can be considered as Weick (1995) has proposed the beginning of a theory building process, as it identifies the most critical factors within the context of which the theory building process can take place. However, Weick cautions that it would be a mistake to consider a list as the beginning of a theory unless the authors who propose a list can provide a clear future direction towards building the theory further. Following Weick's advice, the framework identifies the key multilevel relationships that can moderate organisational level climate change related strategy formulation. Also, an empirical example for the operationalisation of the framework is provided to demonstrate how the framework may be used to develop multilevel hypotheses for business strategies and climate change. This empirical example contributes the first global study to the literature on corporate lobbying related to climate change. The results indicate that irrespective of their location financially underperforming firms with a larger workforce and belonging sectors with higher GHG emission intensities particularly lobby hard on climate change related issues.

The rest of the paper is structured as follows. Section 2 provides the conceptual foundations for the framework presented in this paper. Section 3 presents the five levels found to be most relevant for the multilevel exploration of business strategies and climate change. Section 4 focuses on the process and the outcome of the literature review. Section 5 introduces some fundamental concepts of multilevel research methods. Section 6 demonstrates how the framework can be operationalized using multilevel research techniques with an empirical example. Finally, section 7 deliberates on the challenges and opportunities for multilevel theory building in the context of business strategies and climate change.

2. Conceptualization of a flexible multilevel assessment framework

Analytical frameworks are one of the elementary building blocks in social science research. Among others, the flexible frameworks are most suitable for exploring early stage ideas of a social phenomenon (Ragin and Amoroso, 2010). Ragin & Amoroso provide the following definition of a flexible analytical framework.

> "… *as a guide for research, showing which kinds of factors might be relevant in which contexts. A flexible frame is useful, for example, in studies that seek to explore diversity or advance theory. A flexible frame shows the researcher where to look and what kinds of factors to look for without making specific hypotheses about relationships among factors*".
>
> Ragin and Amoroso (2010).

The above definition of the flexible framework by Ragin & Amoroso is the core conceptual underpinning of the framework presented in this paper. The framework by itself will not present hypotheses. Instead, it is intended to act as a guide for investigating key contextual factors across multiple levels of interests in developing multilevel hypotheses for business strategies and climate change.

It is expected that the framework will help in responding to the following three basic questions about multilevel research in business strategies and climate change. Each of the three research questions is drafted by keeping in mind the intended core contribution of this paper that is to advance multilevel theory building in the context of business strategies and climate change. In doing so following the recommendation of Weick (1995), it is considered that theory building is a "process" and not a "product". The attempt to answer each of the three research questions in this paper can be seen as "interim struggles" in inching towards developing multilevel theories for business strategies and climate change. The relevance for each of them is briefly described below.

Research question 1. *how might multilevel research methods apply to business strategy and climate change specifically?*

Answering this research question demands justification for the applicability of multilevel research methods for business strategies on climate change. A detailed literature review (Section 4) led to the formulation of the multilevel framework and clearly established the multilevel nature of the business strategies on climate change. An empirical example for the operationalization of the framework is provided to demonstrate the application of multilevel research methods for assessing climate change strategies of business organizations (Section 6).

Research question 2. *which theories and contextual factors can help in identifying multilevel constructs and help in explaining the relationships between them for investigating business strategies and climate change?*

The quality of multilevel research rests on two aspects. The first is robust theoretical assumptions in explaining hypothesized interactions among various multilevel constructs. The second is the correct choice of multilevel models to enable empirical testing of these hypothesized relationships (Klein and Kozlowski, 2000). Hypothesized multilevel relationships can be built by defining the relationships among the various constructs situated across different levels. Morgeson and Hofmann (1999) define constructs as "… as conceptual notions whose existence must be inferred from more observable actions or features of an entity." The underlying constructs that can explain business strategies for climate change are numerous and are spread across multiple levels. It is argued in this paper that these constructs are primarily embedded across various levels identified within the multilevel framework presented in this paper (Section 4). Connecting these multilevel constructs would require reconciling between different theoretical approaches in different levels. Hence identifying the level specificities of the various theories applied in the context of business strategies and climate change are important to enable this reconciliation. Accordingly, the level specificities of a number of theories applied in the context of business strategies and climate change are also identified during literature review (Section 4).

Research question 3. *how might the multilevel approach work out regarding construct measurement, the level of analysis and data availability for investigating business strategies and climate change?*

A primary requirement for answering the research question 3 would demand a basic understanding of the different multilevel modelling techniques. To that extent, a brief overview of different multilevel modelling techniques is included in this paper (Section 5). At a more fundamental level the Question 3 raises those important practical issues which need to be negotiated for building multilevel theories on business strategies and climate change. Considering this paper is only an attempt at the beginning of such a theory building process a well-rounded response to this question cannot be provided within the premise of this paper. That will require several detailed multilevel expositions of a variety of practical examples of business strategies for climate change. However, the empirical example (Section 6) provided in this paper hopefully can be considered as an early contribution towards a comprehensive response to the research question 3.

The next section identifies the primary building blocks of the flexible multilevel framework whose conception is presented in this section.

3. Identification of levels

Some scholars have already made attempts in explicitly identifying various levels that are relevant in the context of business strategies and climate change (Hoffman and Jennings, 2012; Rickards et al., 2014; Sæverud and Skjærseth, 2007; Slawinski et al., 2015). Such an attempt can also be seen within the broader domain of corporate sustainability literature (Aguilera et al., 2007; Aguinis and Glavas, 2012; Lenssen et al., 2014). Table 1 below provides a summary of this literature.

A common theme across all the literature cited above may be deciphered as several attempts at explicitly identifying different strata of institutional structure within which a firm can be conceived to be embedded. Such attempts at unbundling of the term "institution" are essential in improving the clarity of multilevel investigation. Otherwise, the term institution which can "embody a complex web of beliefs, norms, rules, and structure" (Okereke et al., 2011) may confound a multilevel investigation.

Among the several multilevel formulations, the five-level conceptions of Lenssen et al. (2014) appear to be the most unambiguous and comprehensive in this respect. The conception of Aguilera et al. (2007) are closer but do not include sector as a separate level. Whereas sector characteristics are considered to be very important for business strategies (Porter, 1979). Hoffman and Jennings (2012) Slawinski et al. (2015) and Aguinis and Glavas (2012) keep the term institution within their framework thus requiring additional qualification for providing it with a context specific meaning. Sæverud & Skjærseth (2007) ignore the levels individual and sectorial. Individual-level characteristics are also important to understand their influence in shaping the collective level decision making. The level specification by Rickards et al. (2014) is rather diffuse and may not be very conducive for building multilevel hypotheses. Hence in this paper, it is decided to expand further the five level framework as proposed by Lenssen et al. (2014). However, to meet the aim of this paper, their framework needs to be contextualized within the context of business strategies and climate change. This contextualization is proposed to be done through a process of a literature review.

Additionally, for lexical purpose "supranational" level is proposed to be re-designated as "transnational" level. Considering "supranational" has a more restrictive meaning as compared to the term "transnational." Supranational "is typically used to identify a particular type of international organization that is empowered to exercise directly some of the functions otherwise reserved to states" (Helfer and Slaughter, 1997). Whereas, "transnational" may be interpreted as a more general term for describing any cross-border phenomena (Bieling and Deckwirth, 2008).

Hence the five levels that are chosen as the primary building blocks for developing the framework further are (i) individual; (ii) organizational; (iii) sectorial; (iv) national; and; (v) transnational.

The next section describes the literature review which uses these five levels as the structural dimensions for identifying level specific contextual factors for assessing business strategies on climate change. The literature review also identifies the level specificities of the various theories which are applied in the context of business strategies and climate change corresponding to these five levels.

4. Structured literature review

This section is divided into two sub-sections. The first sub-section describes the method of the literature review and the second sub-section presents the result from the literature review.

4.1. The method of the literature review

Guided by Mayring (as cited in Seuring and Müller, 2008, p. 1700), a three-step sequential and repetitive method is adopted. These three steps consist of material collection, material description, and material evaluation. Each of these three steps is briefly described below.

Material collection: This step involves defining and delimitating of the target material and also identifying the unit of the search. Only English language materials are considered for the literature review. The primary unit of the material collection are articles published in peer-reviewed journals. However, the scope of search also includes other relevant materials such as books, research papers, conference proceedings, dissertations and web documents. A search matrix is created with a combination of key terms such as, inter alia, "corporate/business/firm/company", "climate response", "climate inaction", "climate change strategy", "carbon strategy", "carbon management", "mitigation", "adaptation". Material search is carried out through electronic databases like Google Scholar, EBSCO (www.ebsco.com), Scopus (www.scopus.com), Metapress (www.metapress.com), Springer (www.springerlink.com), Wiley (www.wiley.com), Elsevier (www.sciencedirect.com), LexisNexis (http://www.lexisnexis.com) and Emerald (www.emeraldinsight.com). The temporal boundaries of the search are loosely set around the adoption of the Kyoto Protocol at 1997. As, academic interests on corporate response to climate change are seen to be growing from that time (Kolk and Levy, 2001). During the search procedure, the first relevant article is found from the year of 1995. Accordingly, the temporal boundary is set from January 1995 till December 2015. While the focus of the material search concentrated on strategic responses of corporations to climate change, but literature found from the broader domain of corporate sustainability is also included if it is thought to be of relevance in providing insights into climate change strategies for business organizations.

Material description: In this step formal aspects of the collected materials such as year of publication, different types of reviewed literature, varieties of methodological approaches, distribution of materials across journals and their academic genres are described.

Material evaluation: The material evaluation is at the core of the literature review process. The objective of this step is to arrive at the formal structure of the multilevel framework. The material evaluation begins with a screening process. The screening process involves the process of identifying primarily the literature that is of

Table 1
Summary of the key literature on multilevel exploration of business strategies in the context of climate change and corporate sustainability.

Authors	Focus of the paper	Identified Levels
Aguilera et al. (2007)	The authors propose a multilevel theory for exploring corporate social responsibility.	Individual Organizational National Transnational
Aguinis and Glavas (2012)	Based on a review of corporate social responsibility (CSR) literature the authors offer a multilevel and multidisciplinary theoretical framework.	Institutional Organizational Individual
Hoffman and Jennings (2012)	The authors explore "the social and psychological foundations" for organizational response to climate change from multiple levels.	Individual Organizational Institutional
Lenssen et al. (2014)	The authors present an integrated multilevel framework for managing business risks from sustainability-related challenges from a corporate governance perspective.	Organizational Individual Sectorial National Supranational
Rickards et al. (2014)	The authors identify several contextual factors across three different levels which influence the decision making on climate change by the senior managers in public and private organizations.	Macro Meso Micro
Sæverud & Skjærseth (2007)	The authors explain the divergence in strategic responses to climate change among the oil companies by using a multilevel approach.	Firm Regional International
Slawinski et al. (2015)	The authors present a multilevel theoretical framework for explaining organizational inaction for climate change.	Individual Organizational Institutional

relevance for business strategies and climate change. Multiple readings and critical interpretation of the texts of each article is performed to screen each article. After the screening, the literature is reviewed again to identify the contextual factors corresponding to each level and the level specificities of the applied theories. Additionally, for each of the identified contextual factors, examples of constructs are also identified.

The above three steps are repeated till contextual factors are assessed to be non-overlapping, and the identification of the level specificities of the various theories are judged to be consistent with reviewed literature.

The next section presents the findings of the literature review.

4.2. Findings from the literature review

Findings from the literature review are elaborated in the following two sub-sections. The first sub - section provides a descriptive overview. The second sub - section provides an analytical overview.

4.2.1. Descriptive overview

The initial search yielded 223 documents. However, after screening for the relevance, 131 documents are chosen for the final analysis. Papers which explored strategic aspects without explicit references to climate change such as, inter alia, exploring relationships between corporate governance and financial performance, change management are excluded.

Of the 131 documents, 116 are journal papers, eight are published in other research publication outlets such as working paper series, five are books and two dissertations of which one is doctoral, and the other is a master thesis. Fig. 1 represents the temporal distribution of all the analyzed materials.

Out of the 116 papers, 77 papers come from 18 journals. Rest of the 39 papers come from 39 journals. Distribution of the papers across these 18 journals each of which contributing at least two papers to the literature review is provided in Table 2 below.

Among all the materials studied methodologically, four broad categories are identified. These include case studies, concept developments, empirical modelling, and surveys. Distribution of the materials across these four broad categories of methodological application is provided in Fig. 2 below.

Among the journal papers, the interdisciplinary journals have the largest share, about 45%. Followed by journals from the domain of business & management (30%) and law (9%). Other subject areas include organizational behavior, social sciences, policy research and analysis, accounting and finance, cultural studies, ecology, geography, and psychology. These other subjects together accounted for 16% of the total journal paper analyzed. Fig. 3 below provides a distribution in percentage terms across different genres of the journals studied.

The next section introduces the analytical findings of the literature review.

4.2.2. Analytical overview

The analytical overview first presents a brief description of the corporate climate change strategy literature followed by the presentation of the framework and the description of the level specificities of various theories applied in the context of business strategy and climate change.

The literature review indicates that climate change has strategic importance for business organizations (Porter and Reinhardt, 2007; Trexler and Kosloff, 2012). Strategic responses of business organizations to climate change can be broadly differentiated into two perspectives, "inside −out" and "outside − in" (Porter and Kramer, 2006; Porter and Reinhardt, 2007). Inside-out perspective describes how a firm's activities affect climate change. GHG mitigation strategies like process improvement, new product development, emission compensation (e.g., Kolk and Pinkse, 2005; Lee, 2012; Sprengel and Busch, 2011) and corporate political strategies such as lobbying to influence climate change legislations (e.g., Banerjee, 2012; Levy and Egan, 2003; Levy and Kolk, 2002) may be explored from an "inside − out" perspectives. "Outside − in" perspective, on the other hand, explores how business responses are being influenced by the physical impact and the changes in the regulatory landscape owing to climate change. Examples include adaptation strategies (Linnenluecke et al., 2011, 2012; Winn et al., 2011) like efficient water management, weather resistant constructions, captive energy production (Nitkin et al., 2009). The "outside-in"

perspective also includes regulatory risk management strategies like carbon disclosure (Reid and Toffel, 2009; Stanny and Ely, 2008), voluntary emission reduction (Hoffman, 2004), emission trading (Hoffmann et al., 2008). Both "inside-out" and "outside-in" perspectives are interconnected, and one perspective cannot be fully understood in isolation from the other. In addition to this inside-out and outside −in perspective authors have also provided other classifications for corporate climate change strategies. Most of these classifications have focused on climate change mitigation strategies. The early studies have classified these strategies in a continuum like "resistant-avoidant-compliant-proactive" by Levy and Kolk (2002). Classifications by Dunn (2002) and Van den Hove et al. (2002) also fall into this category. Later studies have moved away from this continuum based classification toward typology based classifications. The typology based classification approach has identified strategies based on where lies a company's strategic focus on climate change. Some are considered focused internally within their operational boundaries (Kolk and Pinkse, 2005; Lee, 2012; Weinhofer and Hoffmann, 2010). Some companies employ their strategic focus across their entire supply chain (Kolk and Pinkse, 2005; Lee, 2012). Some focus on collaborating with other firms to strategically manage their climate change related risk and opportunities (Gasbarro et al., 2014; Pinkse and Kolk, 2007; Sprengel and Busch, 2011). Finally, there exist some companies that are focused toward integrating climate change within their overall strategic perspectives (Lee, 2012; Sprengel and Busch, 2011; Weinhofer and Hoffmann, 2010).

However barring few exceptions (e.g. Hoffman and Jennings, 2012; Pinkse and Kolk, 2010; Rickards et al., 2014; Slawinski et al., 2015) a multilevel exploration of business strategies and climate change are largely missing from the literature. Which can be argued as being necessary to generate a more holistic and interdisciplinary understanding of the nature of its complexity (Klein, 2004; Kozlowski and Klein, 2000; Schotter and Goodsite, 2013). The multilevel framework presented in the next subsection may facilitate in meeting this need.

4.2.2.1. The multilevel framework. Based on the literature review, 13 contextual factors spread across five different levels are identified as most relevant with respect to business strategies and climate change. Table 3 lists the references consulted for deriving the list of 13 contextual factors. Each of them is briefly described in the following paragraphs.

***Transnational level*:** Climate change is essentially a cross-border phenomenon. Hence transnational factors are important. Two contextual factors are identified to be most crucial. These are geopolitical factors and external stakeholders. Evidence seen for each of these two contextual factors are briefly described below.

Geopolitical factors: The negotiation rounds of the recently concluded Paris Agreement show how states contest with each other to secure their rightful share of the atmospheric space. Business organizations are also very much part of this geopolitics of climate change. They have high stakes in these negotiations. For example, adoption of the 2 °C target under Paris Agreement makes the prospect of fossil fuel industry being stranded with their fossil fuel assets as warned previously by the Bank of England Governor Mark Carney (Clark, 2015) more real. Emerging global governance structure for climate change will play a crucial role in deciding the outcome of such contested issues. Business organizations are already playing an important role in shaping this global governance structure (Jones and Levy, 2007; Kolk et al., 2008; Levy and Newell, 2005; Pinkse and Kolk, 2007). Understanding of businesses' transnational strategies on climate change thus would be crucial and may be further enhanced by exploring their strategic

Table 2
Distribution of the papers across the journals from which at least two papers are selected for the review.

Name of the Journal	Number of Articles
Business Strategy & Environment	14
Journal of Business Ethics	10
Academy of Management Journal	6
Global Environmental Change	5
Business and Society	5
European Management Journal	4
Global Environmental Politics	4
Corporate Governance	4
Climatic Change	3
Academy of Management Review	3
Corporate Social Responsibility and Environmental Management	3
Ecological Economics	3
Harvard Business Review	3
Journal of Management Studies	2
Strategic Management Journal	2
University of Pennsylvania Law Review	2
WIREs Climate Change	2
Management Decision	2

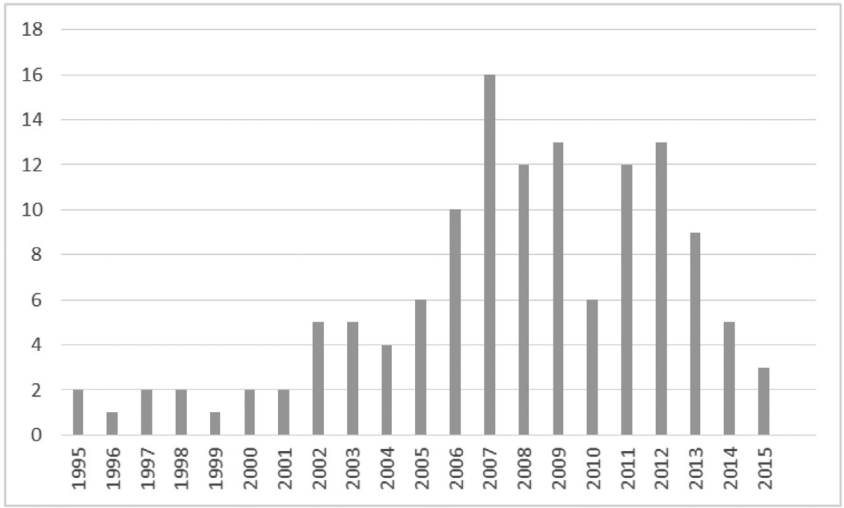

Fig. 1. Temporal distribution of the reviewed literature over selected period of study (1995–2015).

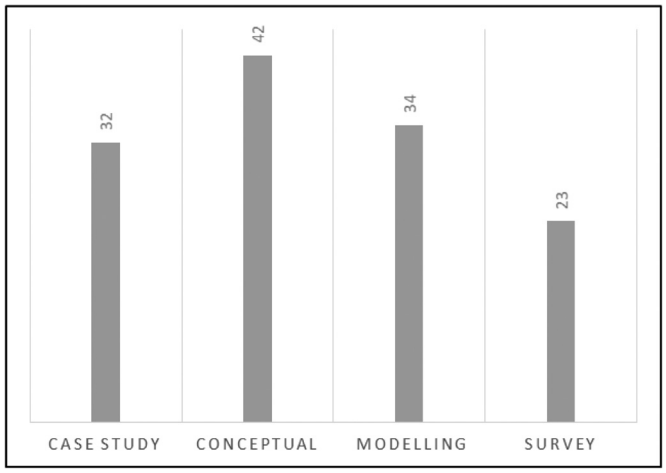

Fig. 2. Distribution of the applied research methodologies of the reviewed literature.

engagement through different dimensions of structure-agency relationships (Levy and Egan, 2003; Wijen and Ansari, 2007) and state-society relationships (Skjærseth and Skodvin, 2001) among others.

Transnational stakeholders: Transnational stakeholders act across sovereign state boundaries. In the absence of any global government, transnational stakeholders create a normative regulatory space within which transnational business organizations need to perform (Scott, 2004). Examples include international NGOs like Greenpeace, supranational governmental organizations like United Nations, European Union, transnational business associations like World Business Council for Sustainable Development. Ansari et al. (2011) have discussed the importance of transnational stakeholders in shaping businesses' competitive landscape in the issue arena of climate change. Sprengel and Busch (2011) in a transnational study across eight most energy-intensive sectors have found that the companies with higher emission intensities come under increasing stakeholder pressure. Kolk and Pinkse (2007) highlight the importance of strategic management of transnational stakeholders for businesses in dealing with climate change. Doh and Guay (2006) have empirically investigated the impact of transnational stakeholder activism for companies having headquarters in USA and EU on issues such as climate change. In a rather more radical piece, Haigh and Griffiths (2009) argue for including the natural environment as a transnational stakeholder using the example of climate change.

***National level*:** Among the five levels, the national level contains the most number of contextual factors. These factors are sociocultural, economic, legislative and judiciary framework, geophysical and national stakeholders. Each of them is briefly presented below.

Sociocultural: Society and culture are deeply ingrained with each other, and one cannot be conceptualized without the other. The ecological business models attach great importance to sociocultural factors in shaping organizational strategies (Astley and Fombrun, 1983). Adger et al. (2009) identify culture as a constraint for climate change adaptation strategies for private and public organizations. A number of authors have investigated strategic orientations of business organizations toward sustainability challenges like climate change using Hofstede's four national cultural dimensions of "power distance index", "individualism", "masculinity - femininity" and "uncertainty avoidance" (Ho et al., 2012; Husted, 2005; Ringov and Zollo, 2007). Their findings show that many of these cultural contexts influence the strategies and corporate social performances of business organizations. Livesey (2002) using a combination of "rhetorical analysis and "discourse analysis" shows the role of language in constructing social realities and its influence on corporate climate change communication strategies. McCright and Dunlap (2010) describe how debate surrounding climate

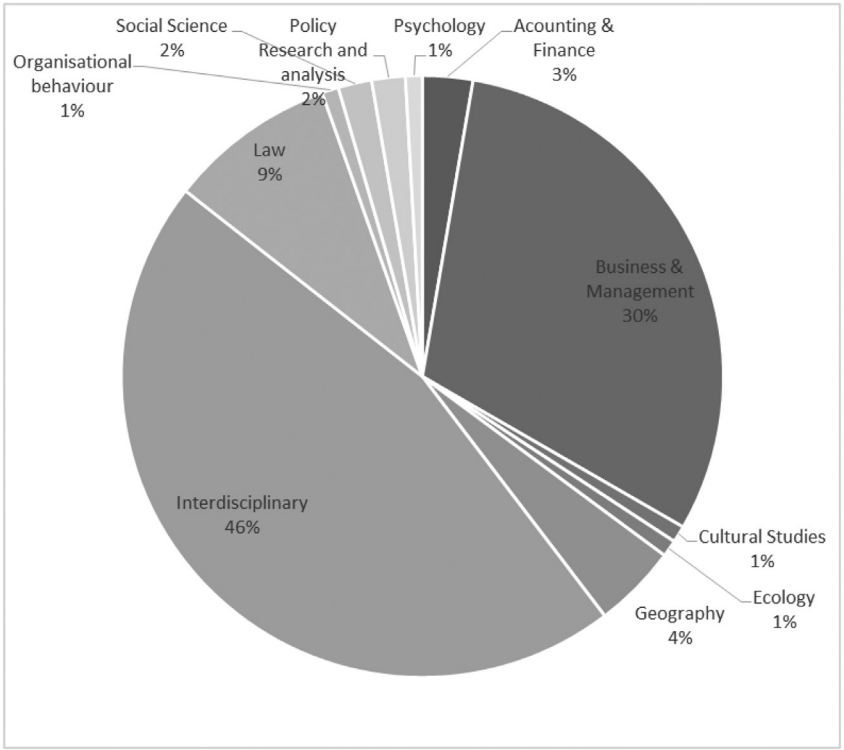

Fig. 3. Academic genres of all the journals that are subjected to the literature review.

change is shaped by opposing currents of social movements and the strategic role of business organizations in such social contests.

Economic: Country specific macroeconomic conditions influence the strategic decision making of companies on climate change (Laitner et al., 1998). Companies from countries with heavy dependence on fossil fuel based economies like Australia are seen to be successful in their strategies of stalling legislation on climate change (Rosewarne, 2007). Macroeconomic factors such as energy prices (Okereke, 2007; Reyers, 2009), the financial impact of national climate policy regimes (Ziegler et al., 2009) and access to capital and technologies (Pulver and Benney, 2013) influence companies' strategic decision-making on climate change. It is argued that traditional market forces fail to financially reward environmentally friendly companies (Hsu and Wang, 2013). Some scholars argue that this market failure may be turned into an opportunity for businesses through the creation of new markets for environmental products like emission permits and natural ecosystem services (Cohen and Winn, 2007; Winn and Pogutz, 2013). Industries also favor this argument (Dale, 2008). However, schemes such as European Union – Emission Trading Scheme created to correct this market failure are also criticized for being too lenient to be effective (Rogge et al., 2011).

Regulatory and judiciary framework: Jeswani et al. (2008) have shown that companies in the UK are strategically more proactive on climate change than companies in the Pakistan due to the comparatively advanced regulatory framework on climate change in the UK. Policy uncertainties on climate change have been identified as a major barrier to proactive climate change strategy formulation by businesses (Paulsson and Von Malmborg, 2004; Sullivan, 2009). Walker and Wan (2012) have observed among Canadian companies that climate change regulations are among the main factors of strategic importance for environmental issues like climate change. Reid and Toffel (2009) in a global study have identified that industries become strategically proactive under regulatory threats. Another interesting influencing factor is the route of litigation using the judiciary framework of a country (Hunter and Salzman, 2007; LaCroix, 2008). Climate change activists often take this route against business organizations (Newell, 2008; Wallace, 2009; Wiener, 2007). The potential efficacy for this option has been explored among other in countries like Australia and USA which lack regulations to address businesses' impact on climate change (Peel, 2007; Taylor, 2012; Wallace, 2008).

Geo-physical: Impacts of climate change are already being felt by companies in varying degrees depending on their location of operations. Companies are drawing up adaptation strategies to cope with the physical impacts of climate change. Adaptation strategies vary depending on the nature of the geo- physical impacts such as natural hazards, sea level rise, water scarcity among others (Bleda and Shackley, 2008; Linnenluecke et al., 2011; Winn et al., 2011). Gasbarro et al. (2014) show how some of the major energy and utility providers of the world are adapting to deal with climate change-induced water shortages. Linnenluecke et al., 2012 argue for anticipatory adaptation strategies for companies to improve their capacity to respond to the physical impacts of climate change. Geophysical impacts from climate change are prompting insurance sector to consider climate change as an important risk parameter

Table 3
List of literature which formed the basis for the identification of the level specific contextual factors.

Levels	Contextual Factors	References
Transnational	Geo-political	Beder (1999), Freedman and Jaggi (2005), Hoffmann et al. (2008), Jones and Levy (2007), Kolk et al. (2008), Levin et al. (2012),Levy and Egan (2003), Levy and Newell (2005); Pinkse and Kolk (2007), Raihani and Aitken (2011), Sæverud and Skjærseth (2007), Skjærseth and Skodvin (2001),Wijen and Ansari (2007), Ziegler et al. (2009)
	Transnational stakeholders	Aguilera et al. (2007), Ansari et al. (2011), Doh and Guay (2006), Haigh and Griffiths (2009), Kolk and Pinkse (2007), Lyon and Maxwell (2006), Sprengel and Busch (2011)
National	Sociocultural	Adger et al. (2009), Galbreath (2014), Ho et al. (2012), Husted (2005), Livesey (2002), McCright and Dunlap (2003, 2010), Ringov and Zollo (2007), Van den Hove et al. (2002)
	Economic	Cohen and Winn (2007), Dale (2008), Hsu and Wang (2013), Laitner et al. (1998), Okereke (2007), Pulver and Benney (2013), Reyers (2009), Rogge et al. (2011), Rosewarne (2007), Winn and Pogutz (2013), Ziegler et al. (2009).
	Regulatory & Judiciary Framework	Holmes (2009), Hunter and Salzman (2007), Jeswani et al. (2008), LaCroix (2008), Newell (2008), Okereke (2007), Paulsson and Von Malmborg (2004), Peel (2007), Reid and Toffel (2009), Sullivan (2009), Taylor (2012), Walker and Wan (2012), Wallace (2008, 2009), Wiener (2007)
	Geo-physical	Bleda and Shackley (2008), Gasbarro et al. (2014) Haigh and Griffiths (2009), Linnenluecke et al. (2011), Linnenluecke et al. (2012), Scott et al. (2007), Tucker (1997), Winn et al. (2011)
	National stakeholders	Bötcher and Müller (2013), Hall and Taplin (2007), Herremans et al. (2009), Jeswani et al. (2008), Martínez-del-Río & Céspedes-Lorente (2014), Sprengel and Busch (2011), Walker and Wan (2012)
Sectorial	Product processes and services	Aragón-Correa and Sharma (2003), Dunn (2002), Galbreath (2014), Hart (1995), Hoffman (2004, 2006), Kolk and Pinkse (2005), Lash and Wellington (2007), Lee (2012), Le Menestrel et al. (2002), Markussen and Svendsen (2005), Martínez-del-Río & Céspedes-Lorente (2014), Okereke (2007), Pinkse (2007), Pinkse and Kolk (2010), Porter and Linde (1995), Porter and Reinhardt (2007), Weinhofer and Busch (2013)
Organizational	Organizational culture, structure and processes	Ansari et al. (2011), Benn et al. (2014), Berkhout et al. (2006), Boasson (2009), Boiral, 2006, Chinoda (2013), Evans and Steven (2009), Furrer et al. (2012), Galbreath (2010), Herremans et al. (2009), Hoffman and Jennings (2012), Hoffmann et al. (2009), Kolk and Levy (2001), Lee and Klassen (2015), Le Menestrel et al. (2002), Levy and Kolk (2002), Mahoney and Thorn (2006), McGuire et al. (2003), Okereke et al. (2011), Rankin et al. (2011), Reyers, 2009, Sæverud and Skjærseth (2007), Sharma (2000), Slawinski et al. (2015), Taylor & Kay (2011), Trexler and Kosloff (2012), Waldman et al. (2006), Wallace (2008), Weinhofer and Busch (2013), Wittneben (2009), Zsoka, 2008
	Resources and capabilities	Aragón-Correa (1998), Aragón-Correa and Sharma (2003), Boasson (2009), Christmann (2000), Freedman and Jaggi (2005), Hart and Ahuja (1996), Herremans et al. (2009), Hoffmann et al. (2009), Lee (2012), Lee and Klassen (2015), Lee and Rhee (2007), Prado-Lorenzo et al. (2009), Russo and Fouts (1997), Sharma and Vredenburg (1998), Stanny and Ely (2008), Weinhofer and Hoffmann (2010), Ziegler (2012)
	Organizational stakeholders	Cosman (2008), Harmes (2011), Healy and Tapick (2004), Herremans et al. (2009), Kolk et al. (2008), LaCroix (2008), Okereke (2007), Okereke and Kung (2013), Reid and Toffel (2009), Rindfleisch (2008), Rothenberg and Levy (2012)
Individual	Disciplinary background and training	Rickards et al. (2014)
	Norms and Values	Barry et al. (2013), Cripps (2011), De Boer et al. (2010), Gardiner (2006), Gifford (2011), Hoffman (2010), Scruggs and Benegal (2012), Vitell and Paolillo (2004)

(Tucker, 1997). For certain sectors like ski industries, the physical impact of climate change like variability in natural snow formation is prompting banks to revise their credit policies for new ski resort construction projects (Scott et al., 2007).

National stakeholders: National stakeholders operates within the boundary of a country. They could be among others national NGOs, regulators, customers and suppliers, national industry associations and national media outlets. In two separate studies, Walker and Wan (2012) in Canada and Martínez-del-Río & Céspedes-Lorente (2014) in Spain find that stakeholder pressures influence environmental strategies of organizations. Jeswani et al. (2008) find that companies from both the UK and the Pakistan consider regulatory agencies as the most influential external stakeholders in relation to climate change. Herremans et al. (2009) find oil companies in Canada respond differently on environmental issues like climate change due to differential stakeholder pressures depending on their position in the oil and gas supply chain. Hall and Taplin (2007) explored the campaign strategies of NGOs in Australia for making government and businesses accountable to climate change. Bötcher and Müller (2013) have found that stakeholder pressures are among the key factors that govern the climate change strategies of German automotive suppliers.

***Sectorial level*:** Porter (1979) notes that the competitive strategies of a company are largely determined by the industry in which it operates. The literature shows that the same is also applicable to environmental issues (Porter and Linde, 1995). Product processes and services are the primary contextual factor identified at the industrial level. Its relevance for corporate climate change strategies is further described below.

Products, processes, and services (PPS): A company's risk and opportunity management strategies related to environmental issues like climate change are influenced by the unique characteristics of the PPS of its sector (Hart, 1995; Lash and Wellington, 2007; Weinhofer and Busch, 2013). For example, companies from the GHG-intensive industries are particularly vulnerable to climate change legislations (Hoffman, 2006). The intensive lobbying by GHG-intensive industries during the setting up of the EU-ETS scheme (Markussen and Svendsen, 2005) concur with Hoffman's observation. In a global study on corporate climate change strategies, Kolk and Pinkse (2005) show how differences in PPS lead to different strategic choices across different sectors. Lee (2012) has found that Korean companies from energy and carbon intensive sectors are most advanced in their climate change strategy formulation. Pinkse and Kolk (2010) have explained how PPS among other factors determine corporate innovation strategies for climate change. PPS characteristics also have critical influences on business strategies toward ethical dilemma that may arise from the conflict of profit versus environment (Le Menestrel et al., 2002).

***Organizational level*:** Various within firm characteristics that have an influence on the climate change strategies of business organizations are distilled into three contextual factors. These are organizational culture, structure and processes, resources and capabilities and organizational stakeholders. Each of them is briefly described below.

Organizational culture, structure and processes (OCSP): Characteristics of OCSP such as ethical work climates (Victor and Cullen, 1988) and corporate identity (Sharma, 2000) are seen to be important in shaping top management's commitment toward issues pertaining to corporate environmental and social performances (Logsdon and Yuthas, 1997). The importance of top management's strategic commitment to make corporate climate action effective is also noted in the literature (e.g., Benn et al., 2014; Evans and Steven, 2009; Wittneben, 2009). Some authors place OCSP as central to a deeper understanding of business strategies on climate change (Okereke et al., 2011; Rankin et al., 2011; Boasson, 2009). The organizational process model proposed by March (1994) also supports this view. Among others, several corporate governance issues such as ratio of independent versus salaried directors, role separation between CEO and Chairman, linking CEO compensation to environmental performances, appointment of climate experts in the company boards are seen to be influential from an OCSP perspective (Galbreath, 2010; McGuire et al., 2003; Rankin et al., 2011; Taylor and Kay, 2011).

Resources and capabilities: From the resource-based view of the firm it follows that a firm's competitive strategies are determined by its available resources and capabilities (Barney, 1991; Dierickx and Cool, 1989). This also apply for corporate environmental strategies (Aragón-Correa, 1998; Christmann, 2000; Hart and Ahuja, 1996; Lee and Klassen, 2015; Sharma and Vredenburg, 1998). Russo and Fouts (1997) contend that a firm's environmental strategies are guided by its resource base. Ziegler (2012) proposes stakeholder management as an important strategic capability which is determined by a firm's resource base. Resources and capabilities are seen to influence climate change strategies of firms (Hoffmann et al., 2009; Lee, 2012; Lee and Rhee, 2007; Weinhofer and Hoffmann, 2010). Larger firms with more resources are seen to be capable of implementing advanced climate change strategies (Lee, 2012; Weinhofer and Hoffmann, 2010). These superior capabilities of the larger firms are attributed to their availability of slack resources (Lee and Rhee, 2007). Hoffmann et al. (2009) have noticed firm's resources and capabilities are crucial in developing effective climate change adaptation strategies.

Organizational stakeholder: In this paper, organizational stakeholders are defined as employees, management, and shareholders. Some institutional investors exert stakeholder pressure by requesting firms to disclose their climate change performance results (Kolk et al., 2008; Okereke, 2007). The rationale being that market will reward the better performers. Some other forms of shareholder activism include legal action by shareholders using tools like “shareholder's proposal,” “shareholder derivative suits” (Cosman, 2008; Healy and Tapick, 2004; Rindfleisch, 2008). Reid and Toffel (2009) have found empirical evidence that shareholders' activism complements regulatory actions in enhancing strategic importance of climate change for business organizations. In addition to the shareholders, the role of management in a company is crucial (Okereke and Kung, 2013; Rothenberg and Levy, 2012). Management being at the boundary of a company's internal and external world play an important role in interpreting the outside world in the internal strategy formulation process of a company. For this reason, they are termed as “boundary spanners.”

***Individual level*:** Compared to other levels the empirical investigation of the influence of individual factors is rather limited. The review led to the identification of two contextual factors; these are disciplinary backgrounds and training received by the managers and their personal norms and values. Both these factors are briefly described below.

Disciplinary backgrounds and training: Education and training help in building managerial competencies. Managerial competencies are characterized by dimensions such as skills and knowledge, the efficiency of work execution, problem-solving abilities (Chen et al., 2004). Typically business leaders are educated and trained in subjects like economics, law and business administrations. This traditional education and training teach business leaders to think in short term economic perspectives and to heavily discount future economic impacts (Marechal and Lazaric, 2010). This short-termism may result in corporate climate change inaction (Slawinski et al., 2015). Resolving this dichotomy between the long-term strategic imperative of climate change and the short-term strategic corporate objective of profit maximization is often the most challenging aspect for managers dealing with climate change

issues. Another aspect is a lack of natural science training for most managers. This lack of natural science training may lead them to believe erroneously that uncertainty figures in climate change science make its impact less serious (Oreskes, 2004).

Norms & values: Norms & values are one of the central tenets of managerial decision making noted by Cyert & March (1992) as "decisions by artifacts." "Decision by artifacts" see decision making as a symbolic exercise of meaning making by managers guided by their interpretation of life based on their individual behavioral and ethical considerations. It has been claimed that individuals with conservative values and ideals discount the risk of climate change significantly (Cripps, 2011). Norms and values define the identities of individuals and greatly influence their reasoning in dealing with ethical conflicts arising from environmental issues like climate change (Gardiner, 2006; Hoffman, 2010; Vitell and Paolillo, 2004). Norms and values influence the way environmental, and climate change issues are framed in the minds of the senior managers (De Boer et al., 2010; Gifford, 2011; Scruggs and Benegal, 2012) and consequently influence their strategic thinking concerning climate change. Climate change due to its impersonable nature may also create a "value – action" gap among individuals (Barry et al., 2013). A "value-action" gap can inhibit individuals from acting against climate change.

Thus, in summary, it can be said that not only organizational level contextual factors but also contextual factors from other levels influence organizational level business strategies on climate change. The multilevel framework presented in Fig. 4 below captures these higher and lower level effects on the organisational level business strategy formulation on climate change.

The contextual factors in Fig. 4 are numbered under each of their corresponding levels. Some exemplary constructs are also identified within each of the contextual factors (in brackets). The essential distinction between contextual factors and exemplary constructs is that contextual factors are considered as conceptually belonging to higher levels within which several constructs can be embedded. Hence the list of constructs only serves an exemplary purpose and are not exhaustive in nature. The framework in Fig. 4 also identifies the four basic types of multilevel relationships. Section 5 provides more details on these basic forms of multilevel relationships. Investigating these relationships would require identification of the reciprocities among different theories across multiple levels. The next section introduces some of these theories and their level specificities based on the observations from the literature.

4.2.2.2. Theories across multiple levels. Identification of the theories across different levels is important for developing multilevel hypotheses. Multilevel theory building can reconcile between different theoretical approaches in different levels. In literature, some these theories are seen to be applied across different levels in explaining business strategies for climate change. Some of these theories are seen to be having an integrative role, that is they are applied across two or more levels. Examples include stakeholder theory (Galbreath, 2014; Kolk and Pinkse, 2007; Pava and Krausz, 1996) and institutional theory (Herremans et al., 2009; Kolk et al., 2008; Walker and Wan, 2012) among others. Application of many theories is seen to be level specific. Such as global governance theory at the transnational level (Jones and Levy, 2007; Kolk et al., 2008; Pinkse and Kolk, 2007) and the resource-based view of the firm (Aragón-Correa and Sharma, 2003; Furrer et al., 2012; Hart, 1995) at the organizational level. A full exposition of all these theories identified is not attempted in this paper. Instead, a list of identified theories and their level specificities is provided in Table 4 below. The motivation behind providing this list is to highlight the potential for application of different theories across different levels for assessing business strategies on climate change. It is expected a list like this may invigorate interdisciplinary dialogue on the application of these theories in building multilevel hypotheses for business strategies on climate change. Which hopefully may facilitate building multilevel theories for business strategies and climate change.

It needs to be mentioned that the level specificities mentioned in Table 4 below are purely descriptive in nature based on evidence from the literature. Hence no restrictive claim is being made on the level specificities or integrative applicability for any of these theories. It neither precludes nor excludes the application of any of the theories mentioned in one or more levels. This list is also not exhaustive. Additionally, for the sake of clarity of classification, only those theories that describe within firm characteristics are considered as organizational theories.

The theories identified in Table 4 may facilitate building multilevel hypotheses connecting two or more levels as identified in the framework presented in Fig. 4. However testing these hypotheses empirically would require the techniques of multilevel modelling. Methodologically there can be two approaches to multilevel modelling. One based on agent-based modelling, which very much suits the public-good nature of GHG emissions (e.g., Perc et al., 2013; Perc and Szolnoki, 2010) and the other based on statistical modelling. This paper adopts the statistical modelling approach. The next section introduces some of the basic and commonly used multilevel models which may be useful for operationalization of the framework presented in this paper.

5. A primer on the basic types of multilevel models

Fig. 5 illustrates four basic types of multilevel hypotheses: (a) bottom-up effects, (b) top-down effects, (c) cross-level moderation effects, and (d) lower-level effects. Also, the figure shows a higher-level effect that requires no multilevel methods (e). This basic framework is simplified and does not include more complex types of effects (e.g., across more than two levels, mediation effects across levels, the interaction between two higher-order predictors). However, more complex multilevel effects are typically only combinations of the basic effects illustrated in Fig. 5, and the figure thus provides basic insights into the problems that typical multilevel research seeks to answer. These effects are described further in the following sections.

5.1. Bottom-up effects/decision on the appropriate level of analysis

Multilevel-research typically starts by developing hypotheses on the appropriate level of analysis for each variable. Matching theoretical constructs to their appropriate level of analysis is the original motivation for conducting multilevel research. Both theory and empirical analyses can show that an aggregated construct (e.g., average work hours or average firm well-being) is commonly a different construct than its namesake at the lower level of analysis (Bliese, 2000; Klein et al., 1994; Klein and Kozlowski, 2000). When researchers measure a construct of interest at a level of analysis that is different from the level of analysis of interest for the theory, the atomistic fallacy or the ecological fallacy follow (Diez-Roux, 1998, 2002). Choosing the appropriate level of analysis is a theoretical question and aggregation to a higher level can sometimes be justified on the basis of a strong theory (Chan, 1998). However, in many situations, it can make sense to check whether the theoretical ideas are in line with the empirical data. These types of analyses are typically referred to as bottom-up analyses ("a" in Fig. 5) in the multilevel literature. Frequently, one would expect that lower-level units within a higher-level unit show increased similarity or consensus before one would conclude that a higher-level construct

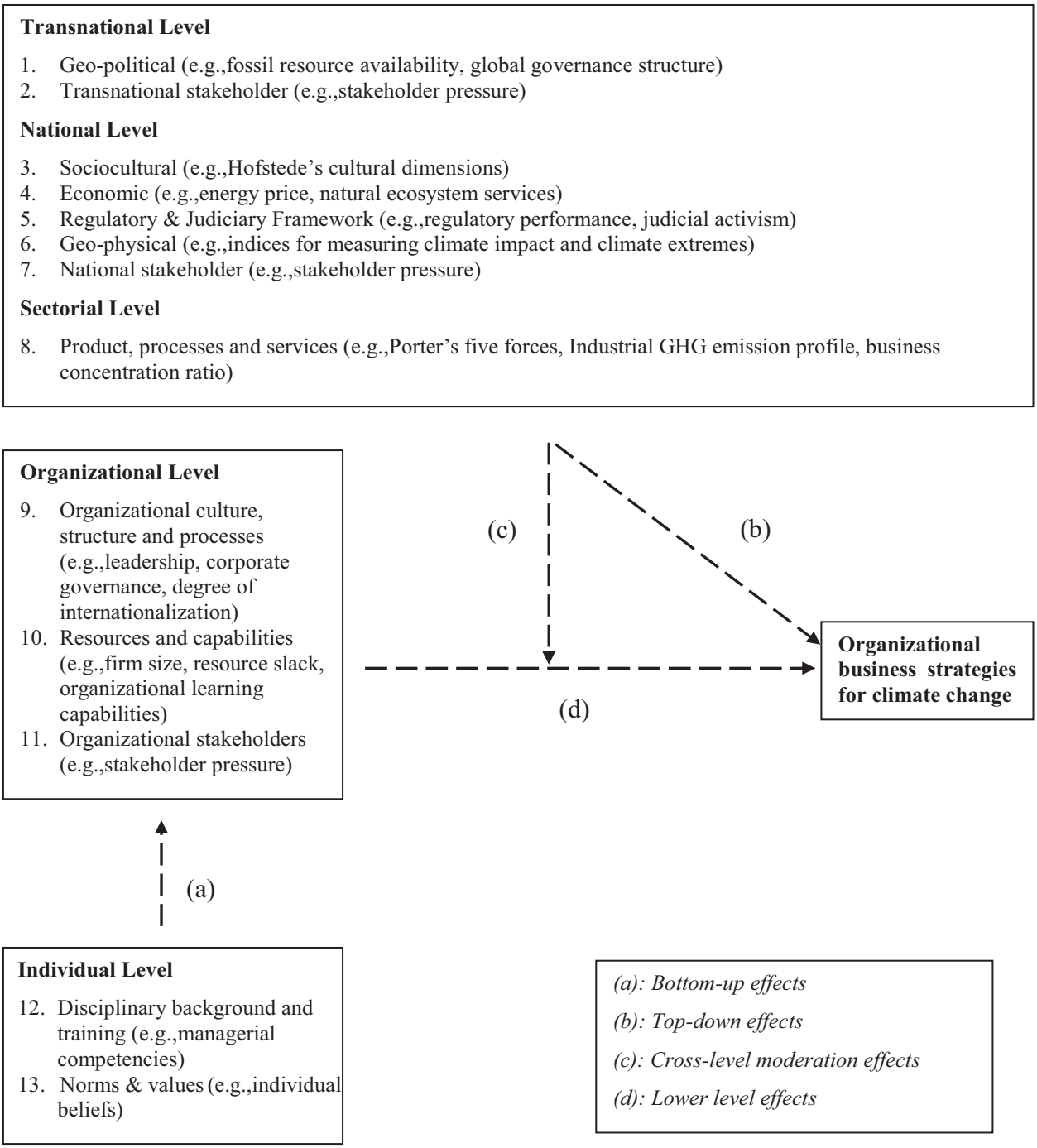

Fig. 4. Flexible multilevel framework for assessing business strategies on climate change.

exists. A classic example is opinions or perceptions of group members working together in work groups. A substantial bottom-up effect would imply that the people who work together have opinions that are similar to each other and thus have reached some consensus or group-specific climate. One approach for testing bottom-up hypotheses is calculating intraclass correlation coefficients (for more advanced strategies see Lang and Bliese, in press). The most basic form of the intraclass correlation coefficient is the type 1 coefficient (ICC1).

The ICC1 can be estimated using a basic random coefficient model that describes the response *Yjk* for lower-level unit j in higher-level unit *k* as a function of a common intercept γ00, the higher-level unit-specific deviation from the intercept *u0k*, and the residual error *ejk*.

$$\text{Level-1: } Y_{jk} = \beta_{0k} + e_{jk} \quad (1)$$

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + u_{0k} \quad (2)$$

Where $e_{jk} \sim N(0, \sigma_e^2)$; $u_{0k} \sim N(0, \sigma_{\beta 0}^2)$.

The ICC1 is the amount of variance that the higher-level unit membership explains in the overall variance and can thus be estimated using the variance $\sigma_{\beta 0}^2$ between higher-level units and the residual variance σ_e^2.

Table 4
Level specificities of the theories applied for assessing business strategies on climate change.

Levels	Applicable theories	Applicable theories with integrative nature across transnational, national, sectorial and organizational levels	Applicable theories with integrative nature across transnational, national and sectorial levels
Transnational	Global governance theory (Jones and Levy, 2007; Kolk et al., 2008; Pinkse and Kolk, 2007), location theory (Galbreath, 2014; Linnenluecke et al., 2011), Regime theory (Wijen and Ansari, 2007)	Institutional theory (Herremans et al., 2009; Kolk et al., 2008; Walker and Wan, 2012), stakeholder theory (Galbreath, 2014; Kolk and Pinkse, 2007; Pava and Krausz, 1996), Chaos theory of complex adaptive systems (Winn et al., 2011)	Theory of organizational adaptation (Gasbarro et al., 2014), evolutionary theory of economic change (Berkhout et al., 2006; Bleda and Shackley, 2008), neo- Gramscian theory (Levy and Egan, 2003), legitimacy theories (Freedman and Jaggi, 2005; Laufer, 2003; Prado-Lorenzo et al., 2009)
National	financial theory (Harmes, 2011; Tucker, 1997), business cycle theory (Sheldon, 2013), culture theories (Ho et al., 2012; Ringov and Zollo, 2007; Vitell and Paolillo, 2004), social movement theory (Hall and Taplin, 2007; Levy and Egan, 2003; Reid and Toffel, 2009), reflexive modernism theory, risk society theory, ecological modernization theories (McCright and Dunlap, 2003, 2010)		
Sectorial	theory of economic regulation (Holmes, 2009), theory of proprietary cost (Prado-Lorenzo et al., 2009), Foucauldian theory of discourse analysis, Burke's theory of language (Livesey, 2002)		
Organizational	Resource-based view of the firm (Aragón-Correa and Sharma, 2003; Furrer et al., 2012; Hart, 1995), leadership theories (Benn et al., 2014; Waldman et al., 2006), theories of organizational knowledge creation and learning (Berkhout et al., 2006; Zsoka, 2008), decision theories (Chinoda, 2013; McGuire et al., 2003), behavioural theory of firm (Berkhout et al., 2006; Bleda and Shackley, 2008), theory of the firm (Galbreath, 2011; Mahoney and Thorn, 2006)		
Individual	transaction cognition theory (Cohen and Winn, 2007), prospect theory (Raihani and Aitken, 2011; Walker and Wan, 2012), stewardship theory (McGuire et al., 2003), theory of moral error (Pölzler, 2015)		

$$ICC1 = \sigma^2_{\beta 0} / (\sigma^2_{\beta 0} + \sigma^2_{\hat{e}}) \quad (3)$$

ICC1 values higher around 0.10 are typically considered to be substantial (Bliese, 2000; Klein and Kozlowski, 2000). In addition to the ICC1, other statistical procedures can be used to conduct bottom-up analyses. The most common of these statistics is the r_{wg} index (James et al., 1993) and several related indices (Bliese, 2000). While agreement indices are built on a different rationale than the ICC1, it is common for researchers to report both indices and in practice the two types of measures often provide similar results.

Bottom-up effects and analytical approaches for checking whether it is justified to aggregate to a higher level seem important for climate research for several reasons. First, climate research occasionally adopts group, organization, or country-level variables that capture a shared belief within the group. For instance, in countries like the US or Brazil, a common belief may develop that climate change has limited or a strong influence on the living situation. Interactions within the country may foster and solidify this belief. The common approach for measuring the belief in climate research may be survey data in the business or general population, but the substantial level of interest for running analysis may be the country level such that researchers need to run bottom-up analyses on the entire dataset. In a similar vein, certain assumptions and beliefs are sometimes shared within a particular organization, and bottom-up analyses should then be conducted before further analyses are justified.

5.2. Top-down effects

Most multilevel research starts by examining bottom-up effects in a first step unless the variables are already measured at their theoretical level. Depending on the results of the bottom-up analyses and theory, lower-level measurements can be aggregated.

When theory and a bottom-up analysis indicates that all variables of interest in the analysis are at the highest level in a dataset, standard statistical methods like Ordinary Least Square (OLS) regression analysis can be used. When the variables of interest are at different levels or at lower levels, more advanced statistical methods are required that can account for the fact that lower-level units are nested in higher-level units and that variables of interest are measured at different levels of analysis. The most commonly used methods to conduct these multilevel analyses are random coefficient models (Bliese and Jex, 2002) that are also known as linear mixed-effects models (Pinheiro and Bates, 2000), hierarchical linear models (Bryk and Raudenbush, 1987), or simply as multilevel models.

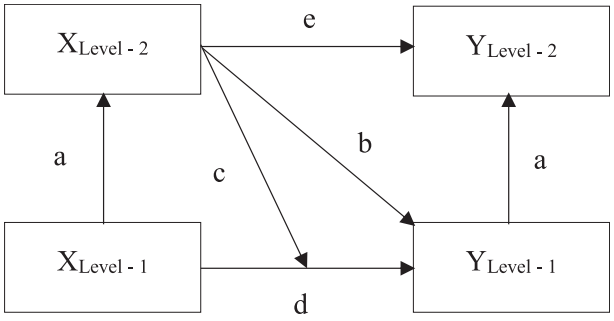

Fig. 5. Illustration of the basic types of multilevel hypotheses.

Top-down effects ("b" in Fig. 5) are relationships between a higher-level variable and a lower-level variable. It is important to analyze these relationships using a random coefficient model because the standard errors are otherwise anti-conservative (Bliese and Hanges, 2004). A basic model of this type just adds a level-2 predictor to the intercept-only model shown above (for estimating the ICC1).

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + \gamma_{01}(\text{Predictor}_k) + u_{0k}. \quad (4)$$

5.3. Lower-level effects and centering

While adding top-down effects to a model is relatively simple and straightforward, the addition of lower-level effects ("d" in Fig. 5) is typically more complex. The reason is that lower-level effects can either be conceptualized as what the literature as referred to as frog-pond effects, or unit-mean centered effects (Aguinis et al., 2013; Bliese and Jex, 2002) or as grand-mean centered or raw effects.

The term frog-pond is derived from the idea that one can define the standing of an individual within a group either by the absolute scale or by the standing within the group. The term frog pond refers to the idea that the frogs in the pond may only look at their relative size and the relative size ultimately determines their behavior. For instance, an individual with a height of 1.90 cm may be tall on the overall scale. When the individual is seen in the context of a professional basketball team, he or she may well be small. When the average size of the players in the team is 2m, the frog-pond (or group-mean centered effect) for the 1,90m player would be −0.10m.

Grand-mean centered, or raw effects simply add the predictor in its original unit or centered at the sample mean (both yielding identical effects but different intercepts).

$$\text{Level-1: } Y_{jk} = \beta_{0k} + \beta_{1k}\text{Predictor}_{jk} + e_{jk} \quad (5)$$

or

$$\text{Level-1: } Y_{jk} = \beta_{0k} + \beta_{1k}[\text{Predictor}_{jk} - M(\text{Predictor}_{jk})] + e_{jk} \quad (6)$$

With

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + u_{0k};\ \beta_{1k} = \gamma_{10} + u_{1k} \quad (7)$$

Estimates for grand-mean/raw lower-level effects are typically very similar to the same effects estimated using simple OLS regression (ignoring the higher-level). Nevertheless, it typically makes sense to use random coefficient models to control for the nested nature of the data. Although the estimates of the effects itself typically do not differ, the standard-errors may be overly conservative using OLS (Bliese and Hanges, 2004).

Unit-mean centered effects (or frog pond effects) subtract the unit-mean from each observation and thereby divide the variance between the predictor into a lower-level (level-1) and a higher-level (level-2) part. These two variables are uncorrelated but define the predictor-scale for each level-1 observation relative to the unit-mean. In contrast, grand-mean or raw effects preserve the original scale of the predictor but confound the variance between level-1 and level-2. The decision on whether a predictor is better conceptualized as a frog-pond effect or a grand-mean centered effect is typically a theoretical one (Aguinis et al., 2013; Bliese and Jex, 2002). However, social-science researchers prefer the estimation of frog-pond effects because of the decomposition of the variance into variance attributed to specific levels (Aguinis et al., 2013; Curran et al., 2014). In contrast, biological researchers and medical researchers typically use raw or grand-mean centered effects (e.g., Pinheiro and Bates, 2000).

Importantly and somewhat counterintuitive, unit-mean centered effects can either be estimated in random-effects models by directly subtracting the unit-mean (M_k) from the predictors or by adding the unit-mean as another (level-2) predictor to a model. Accordingly, the following model can be formed.

$$\text{Level-1: } Y_{jk} = \beta_{0k} + \beta_{1k}[\text{Predictor}_{jk} - M_k(\text{Predictor}_{jk})] + e_{jk} \quad (8)$$

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + u_{0k};\ \beta_{1k} = \gamma_{10} + u_{1k} \quad (9)$$

This model normally yields a nearly identical estimate for β_{1k} as the following model;

$$\text{Level-1: } Y_{jk} = \beta_{0k} + \beta_{1k}(\text{Predictor}_{jk}) + e_{jk} \quad (10)$$

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + \gamma_{01}[M_k(\text{Predictor}_{jk})] + u_{0k};\ \beta_{1k} = \gamma_{10} + u_{1k} \quad (11)$$

In the second model, γ_{01} additionally captures how the effect at level-2 differs from the effect at level-1 which can be of interest for testing the theoretical idea that an effect differs across levels. When one is interested in a direct estimate of the level-2 effect, one can combine a unit-mean centered lower-level predictor with the unit-mean in the same model (Equations (8) and (11)).

5.4. Cross-level moderation effects

Cross-level moderation effects ("c" in Fig. 5) above are a straightforward extension of top-down and lower-level effects and simply represent an interaction between a top-down and a lower-level effect. Cross-level effects are typically of special interest for research because they demonstrate how higher-level characteristics of the environment shape processes that occur at lower levels. Most researchers prefer to estimate cross-level interaction effects with unit-mean centered lower-level effects (Aguinis et al., 2013). A typical random-coefficient model with a cross-level interaction effect and with unit mean centering would accordingly be the following model.

$$\text{Level-1: } Y_{jk} = \beta_{0k} + \beta_{1k}[\text{Predictor}_{jk} - M_k(\text{Predictor}_{jk})] + e_{jk} \quad (12)$$

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + \gamma_{01}(\text{Moderator}_k) + u_{0k};\ \beta_{1k} = \gamma_{10} + \gamma_{11}(\text{Moderator}_k) + u_{1k} \quad (13)$$

The examples discussed so far in the paper all include only two levels of nesting. However, the framework presented in this paper, more than two levels are included. Hence a brief entry is presented in the section below to show how to model multilevel interactions across more than two levels.

5.5. More than two hierarchical levels

In general, the multilevel mixed-effects model can easily be expanded to include more than two levels. As an example, a model with three levels and a raw-metric predictor at each of these three different levels is shown below:

$$\text{Level-1: } Y_{jkl} = \beta_{0kl} + \beta_{1kl}(\text{Predictor}_{jkl}) + e_{jkl} \quad (14)$$

$$\text{Level-2: } \beta_{0kl} = \gamma_{00l} + \gamma_{01l}(\text{Predictor}_{kl}) + u_{0kl};\ \beta_{1kl} = \gamma_{10l} + u_{1kl} \quad (15)$$

$$\text{Level-3: } \gamma_{00l} = \delta_{000} + \delta_{001}(\text{Predictor}_l) + v_{00l};\ \gamma_{01l} = \delta_{010} + v_{01l};\ \gamma_{10l} = \delta_{100} + v_{10l} \quad (16)$$

In specifying multilevel models, it is important to strike a balance between model complexity and model simplicity. Some levels may exist in theory, but after the other models are accounted for, there is almost no variance on a particular level in practice so that modeling a particular level that plays no practical role makes the model overly complex. An example where this frequently happens is in military datasets where certain formally existing levels like the fire team (3–4 soldiers) or a corps (20,000–40,000) may only formally exist but do not affect soldiers in practice.

The models discussed so far all are hierarchical models in which each unit is nested in a higher level unit. However, it is also possible that a dataset has a cross-classified structure. The section below briefly describes how such structure may be manipulated using multilevel modelling techniques.

5.6. Cross-nested models

In a hierarchical structure, every lower-level unit (firm) is nested in a specific higher-level unit (country/sector) that in turn is nested in a specific top-level unit (country). In contrast, in a cross-classified structure, a firm may be nested in a sector but simultaneously may also be nested in a country. The sectors may span across various countries so that the variance in the sector competes with the variance in the country. This type of structure is somewhat similar to an ANOVA design with more than one factor (e.g., a 2×2 design where the treatments are crossed). A simple cross-classified model can be formally written as follows. In this specification, Level-2 includes not only one (as in the two-level models discussed previously) but two random-effects that are cross-classified.

$$\text{Level-1: } Y_{jkl} = \beta_{0kl} + \beta_{1kl}(\text{Predictor}_{jkl}) + e_{jkl} \tag{17}$$

$$\text{Level-2: } \beta_{0kl} = \gamma_{00l} + \gamma_{01l}(\text{Predictor}_{kl}) + u_{0kl} + v_{0kl};\quad \beta_{1kl} = \gamma_{10l} + u_{1kl} + v_{1kl} \tag{18}$$

Although, most mixed-effects software can in principle estimate cross-classified models, the estimation of these types of models is commonly statistically more challenging. However, statisticians have recently developed software programs that can perform these tasks increasingly faster. One software, for instance, that has been specially developed for estimating cross-classified models is the lme4 software (Bates et al., 2015 also see Doran et al., 2007).

One critical point to note is that the strength of any multilevel framework depends on its hierarchical integrity. The hierarchical integrity of a multilevel framework needs to be supported by theory-driven robust empirical evidence (Rousseau, 1985). To exhaustively test the hierarchical integrity of the proposed framework would require the framework to be operationalized several times using empirical multilevel modelling. Such a comprehensive test is beyond the scope of this paper. Instead, the empirical example provided in Section 6 to demonstrate the operationalization of the framework may be taken as a step in that direction.

6. An example for the operationalization of the framework

In this section, an example for the operationalization of the framework is demonstrated by developing and testing of multilevel hypotheses. First, the operationalization procedure is presented below as a combination of 6 steps, followed by a discussion of the results.

6.1. Operationalization procedure

Step 1: *Select a specific business strategy type as an outcome variable for multilevel investigation related to climate change*

Corporate lobbying on climate change issues is chosen as a specific strategic response for analysis. Organizations use lobbying strategies to influence various social and institutional domains (e.g., media, academics, communities, policy arena) to further their interest (Miller and Harkins, 2010). Previous studies on corporate lobbying for climate change indicate that primarily corporations use three different lobbying strategies of information campaign, direct lobbying with policy makers and lobbying through trade associations (Boiral, 2006; Levy and Kolk, 2002; Markussen and Svendsen, 2005; Sprengel and Busch, 2011). Delmas et al. (2016) have conducted the only inferential study on corporate climate change lobbying with a sample of USA based firms. Their result shows a U-shaped relationship between GHG emissions and lobbying expenditures. From this relationship, they conclude that both fossil fuel industries and clean industries lobby about climate change.

Lobbying assumes, in particular, a special significance at a global level in light of the recently concluded Paris Agreement which came into force on 4th November 2016[1]. The implementation mechanism of the agreement is now under discussion, and it is expected that fossil fuel industries will intensify their lobbying efforts to safeguard their economic interests. Hence in all likelihood, corporate lobbying will significantly influence the likelihood of meeting the 2° C target of the Paris Agreement. Despite this potential importance, currently, there exist no inferential study on corporate lobbying on climate change at a global level. This paper aims at addressing this empirical research gap by conducting a global inferential study on corporate lobbying strategies for climate change. Lobbying intensity has been chosen as an outcome variable to measure corporate lobbying strategies on climate change.

Step 2: *Select organizational level as the default level of analysis*

Organizational level is the default level of analysis for operationalization of the framework. As the goal of the framework is to identify how constructs from other levels influence organizational-level constructs in moderating the strategic choices made at the organizational level. Specific to the example of lobbying the aim is to identify how the influence of organizational-level constructs is being moderated by higher level constructs in moderating the lobbying strategies at the organizational level.

Step 3: *Use appropriate theoretical considerations to identify from which of the three organizational level contextual factors constructs are to be drawn to formulate organizational level hypotheses*

To capture the within firm characteristics of lobbying at the organizational level the theory of "resource-based view" of the firm is used. At the organizational level constructs are drawn from the contextual factor "resources and capabilities." From the resource base view of the firm, it follows that firms with higher resources can have better capabilities to have deeper engagement with policy makers (Weymouth, 2012). Firm size is recognized as a good proxy for available resources to the firm (Hillman et al., 2004; Macher and Mayo, 2015; Macher et al., 2011). Particularly with respect to lobbying, it is widely evidenced that firm size increases its political power which is necessary for effective lobbying (e.g. Chong and Gradstein, 2010; Kerr et al., 2011; Salamon and Siegfried, 1977). Hence at the organizational level following hypothesis is formed with firm size as the predictor variable and lobbying intensity as the outcome variable.

Hypothesis 1A (H1A). *The higher the size of a firm the higher will be*

[1] http://unfccc.int/paris_agreement/items/9444.php.

its lobbying intensity.

Step 4: *Use appropriate theoretical considerations to identify constructs from the contextual factors belonging to levels other than the organizational level of the framework and formulate hypotheses for capturing their moderating influence on the organizational level of analysis.*

To capture the moderating influence of higher level constructs in the lobbying intensity of a firm the "Neo- Gramscian" theory as proposed by Levy and Egan (2003) is used. Levy & Egan state that – "The influence of business extends beyond the control of material resources and the intertwining of political and economic élites. State managers are likely to protect business interests not just because of their structural dependence on business for tax revenues, employment, and investment but also because state managers have internalized the goal of promoting 'competitiveness." "Neo- Gramscian" theory posits that the political and the corporate managers by taking care of their mutual interests over time form the so-called "transnational historical bloc." This "transnational historical bloc" use their economic and political clout to maintain their hegemonic position in the market. This hegemony is not stable, but rather the "transnational historical bloc" need to constantly maneuver themselves to maintain this hegemony through a form of social struggle called by Gramsci as a "war of positions." With respect to climate change, fossil fuel dependent industries together with their political patrons and other supporting institutions form this "transnational historical block" (Banerjee, 2012; Levy and Egan, 2003). Large fossil fuel dependent multinationals from the rich countries of the world are seen to be the typical members of such "transnational historical bloc" owing to the history of fossil fuel dependent economic growth in wealthy national economies. The lobby power of these groups is enormous. A case in point is the "Global Climate Coalition" a US lobby group formed soon after the adoption of Kyoto Protocol who stalled the US Government's ratification of the Kyoto Protocol (Banerjee, 2012). This pattern of fossil fuel dependent companies from richer economies actively lobbying in the various Conference of the Parties meetings under United Nations Framework Convention on Climate Change is also noted in the literature (Beder, 1999; Banerjee, 2012).

Hence from this theoretical discussion, it follows that the "sector level" contextual factor "product processes and services" may be useful for assessing the differences in climate change related lobbying intensities of companies based on their fossil fuel dependencies. Further the "economic" contextual factor at the "national level" can be useful in comparing the lobbying intensities of companies belonging to countries with different levels of economic wealth.

From the sectorial level, GHG emission profile is considered a suitable construct within the identified contextual factor of "product processes and services" that can capture fossil fuel dependence of a given industrial sector. At the national level, the economic wealth of a country is considered a suitable construct to measure the relative wealth of the nations within the "economic" contextual factor. The following two hypotheses are formed.

Hypothesis 1B (H1B). *The relationship between firm size and lobbying intensity will be moderated by industry level GHG emissions profile.*

Hypothesis 1C (H1C). *Firms headquartered in economically wealthier countries will lobby with higher intensities.*

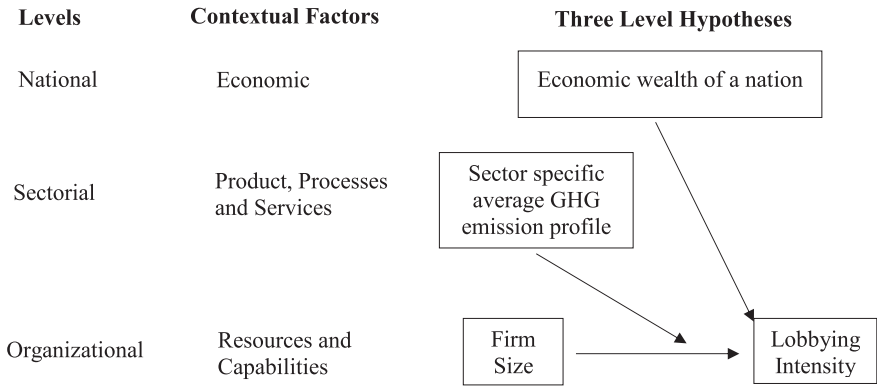

Fig. 6. Three level hypotheses showing the relationships between constructs that influences corporate lobbying intensity on climate change issues.

Fig. 6 below represents a pictorial description of the three level hypotheses thus formulated.

Step 5: Develop and implement measurement strategies for each of the identified constructs across all levels

For measuring the level specific constructs at the organizational and at the sectorial level, the database of carbon disclosure project (CDP)[2] is used as the primary source of information. World Bank database of "World Development Indicators"[3] is used for measuring the national level construct. Data at all the levels corresponds to the year 2013. In total 981 companies from 123 sectors spread across 30 countries are included in the analysis.

Gross Domestic Product/capita is considered a suitable indicator to measure the relative economic wealth of a nation. Particularly considering that in the context of climate change GDP/capita is strongly correlated with GHG emissions/capita (UNEP GEO Data Portal, 2005).

Industry specific GHG emission profiles are estimated by averaging the reported emission intensities expressed in tonnes of CO_2/full time employee of the corresponding companies from each sector. Since not all companies report Scope III emissions only Scope I and Scope II emissions are included.

The number of employees of each company is estimated by multiplying their reported respective total GHG emissions by their corresponding reported emission intensities expressed in tonnes of CO_2/full time employee. Employee number is considered a suitable indicator representing firm size in assessing corporate lobbying as

[2] https://www.cdp.net/en-US/Pages/HomePage.aspx.
[3] http://data.worldbank.org/indicator/NY.GDP.PCAP.CD.

Table 5
Descriptive statistics for the independent variables included in the analysis.

Contextual Factor	Independent Variable	Mean	Max	Min	SD
	Level 1(Organizational, N = 981)				
Resources and capabilities	Employees (Numbers)	40,350	561,849	28	76,476
	ROA (%)	4.68	48.77	−36.4	6.31
	Level 2 (Sectorial, N = 123)				
Product, Processes and Services	GHG emission profile (tonnes of CO2/employee)	276.63	7588.78	0.66	726.48
	Level 3 (National, N = 30)				
Economic	Economic wealth of a nation (GDP/Capita)	43,235	102,910	1456	18,527

it is seen to be directly influencing their ability for political constituency building capabilities by giving them higher leverage with the policy makers (Alt et al., 1999; Hillman, 2003; Keim and Baysinger, 1988).

In addition to number of employees, performance measures such as management efficiency in utilization of a firm's available resources can also influence the lobbying intensity of a firm. This characteristic is typically representative of the sector to which they belong. From the theory of economic regulation, it follows that typically underperforming firms tend to lobby more to incentivize policy makers to secure favorable policy outcome to safeguard their competitive interests (Stigler, 1971; Peltzman, 1976). Return on Asset (ROA) calculated by dividing net profit with the total asset of a company may be used to capture such a performance measure (Anbar and Alper, 2011). Accordingly, ROA is added as a control variable to the analysis. Values for calculating ROA are compiled manually from the annual financial reports of the companies included in the analysis.

Table 5 below presents some basic descriptive statistics for all the independent variables used in the analysis.

The dependent variable lobbying intensity is measured by constructing a five-point Likert scale considering the precedent of Holyoke (2003) and Hillman (2003). This scale is constructed by collecting responses to the following questions from the CDP database.

Do you engage in activities that could either directly or indirectly influence public policy on climate change through any of the following?

The response choices given are the following.

- *No*
- *Direct engagement with policy makers*
- *Trade associations*
- *Funding of research organizations*
- *Other*

The responses of the reporting companies are then scored based on the five-point Likert scale presented in Table 6 below.

Table 6
Likert scale for measuring lobbying intensity.

Score	Description
0	No lobbying
1	Lobbying through trade association or direct funding of research
2	Direct lobbying with policy makers
3	A combination of any two of the following; • lobbying through trade association, • funding of research organizations • direct lobbying with policy makers
4	All the following three forms of lobbying are simultaneously implemented; • lobbying through trade association, • funding of research organizations • direct lobbying with policy makers

Step 6: Construct and run appropriate multilevel models to test the hypotheses constructed.

At first bottom-up analyses is conducted using ICC1 values (equation (3)) for the predictor variables. The goal of these analyses is to examine whether it is appropriate to aggregate firm size and ROA from the firm-level to the sector level and treat these variables as sector-level variables. Bottom-up analyses for both ROA and number of employees further revealed ICC1 values of 0.27 and 0.18 for ROA and firm size, respectively, indicating that aggregating these values to the sector level is likely justified. However, ICC1 values of 0.27 and 0.18 also indicate that important level-1 variability remained for these variables and thus that a multilevel approach that incorporates these variables at multiple levels (firm and sector) is likely useful.

In the next step, the degree to which lobbying is affected by the sector is tested. This analysis is also conducted using the ICC1. Results revealed an ICC1 of 0.14 indicating that characteristics of the sector could explain 14% of the variance in lobbying activity. These results indicate that multilevel analyses accounting/controlling for sector membership have important advantages for studying lobbying (Bliese and Hanges, 2004).

A fundamental assumption in multilevel models is that the intercepts can vary randomly among groups. Before proceeding with fitting the data in multilevel models this assumption is tested by implementing likelihood ratio tests for ICC1 values as per the procedure described in Bliese and Ployhart (2002). The likelihood ratio test results for the ICC1 values of ROA (154.87), number of employees (44.39) and lobbying intensities (47.16) are all found to be significant with p values less than 0.0001. Hence it can be concluded that the models that allow the firm level ROA, number of employees and lobbying intensities to randomly vary fit the data better than the models that fix the intercepts to be constant across firms.

As the initial analyses using ICC1 indicated that the data made multilevel modeling necessary, the actual multilevel analyses are continued to test the hypotheses. First, the relationship between the number of employees at the firm and at the sector level with lobbying is studied. Results in Table 7 show that the raw effect of firm size on lobbying is 0.33 (Model 1; equations (5) and (7)).

When number of employees centered at the sector means, the effect becomes slightly stronger (0.36) (Model 2; equations (8) and (9)).

Model 4 (equations (8) and (11)) further shows that the relationship at the sector-level (0.20) is smaller than at the within-sector level (0.35). However, the effect at the sector-level has a lower level of statistical significance compared to the effect at the within-sector level.

Furthermore, Model 3 (equations (10) and (11)) indicates that the difference between the effect on the sector-level and the within-sector level (0.09) is not statistically significant.

Next, a potential cross-level interaction between number of employees at the within-sector level and GHG emission profile is

examined. An effect of this type would indicate that bigger firms within sectors with higher GHG emissions have a stronger relationship between firm size and lobbying. No evidence for this type of effect is observed. Model 5 is constructed for testing this effect by extending equations (12) and (13) described in Section 5.4.

The equations for model 5 is provided below.

$$\text{Level-1: } Y_{jk} = \beta_{0k} + \beta_{1k}[\text{Employees}_{jk} - M_k(\text{Employees}_{jk})] + e_{jk} \quad (19)$$

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + \gamma_{01}[M_k(\text{Employees}_{jk})] + \gamma_{02}\,(\text{GHG profile}_k) + u_{0k} \quad (20)$$

$$\beta_{1k} = \gamma_{10} + + \gamma_{11}\,(\text{GHG profile}_k) + u_{1k}$$
$$\beta_{2k} = \gamma_{20} + u_{2k}$$

The Model 5 is extended to create the Model 6 by including the variable ROA as a control variable.

The equation for the Model 6 is provided below.

$$\text{Level-1: } Y_{jk} = \beta_{0k} + \beta_{1k}[\text{Employees}_{jk} - M_k(\text{Employees}_{jk})] + \beta_{2k}[\text{ROA}_{jk} - M_k(\text{ROA}_{jk})] + e_{jk} \quad (21)$$

$$\text{Level-2: } \beta_{0k} = \gamma_{00} + \gamma_{01}[M_k(\text{Employees}_{jk})] + \gamma_{02}[M_k(\text{ROA}_{jk})] + \gamma_{03}\,(\text{GHG profile}_k) + u_{0k} \quad (22)$$

$$\beta_{1k} = \gamma_{10} + + \gamma_{11}\,(\text{GHG profile}_k) + u_{1k}$$
$$\beta_{2k} = \gamma_{20} + u_{2k}$$

The results from the Model 6 appeared in expected lines. The firm level effects (−0.01) show that firms with lower ROA lobby more. The effect (−0.04) is both stronger and of higher statistical significance at the sector level which also supports the theory of economic regulation. It must be noted even after controlling for ROA the main relationship between firm size and lobbying intensity has remained unchanged.

Overall, the findings suggest that both number of employees and ROA can predict lobbying and differ across different levels of analysis. Sectors with higher GHG emissions increases firm level lobbying but does not serve as a cross-level moderator of the number of employees/lobbying relationship.

Model 1 to Model 6 only incorporates two levels of analysis – the organizational level and the sectorial level. The results support hypotheses 1A and 1B. To test the country level effect as predicted using hypothesis 1C Model 7 is introduced. The equation for Model 7 is provided below.

$$\text{Level-1: } Y_{jkl} = \beta_{0kl} + \beta_{1kl}[\text{Employees}_{jkl} - M_{kl}(\text{Employees}_{jkl})] + \beta_{2kl}[\text{ROA}_{jkl} - M_{kl}(\text{ROA}_{jkl})] + e_{jkl} \quad (23)$$

$$\text{Level-2: } \beta_{0kl} = \gamma_{00l} + \gamma_{01l}[M_{kl}(\text{Employees}_{jkl})] + \gamma_{02l}[M_{kl}(\text{ROA}_{jkl})] + \gamma_{03l}\,(\text{GHG profile}_{kl}) + u_{0kl} \quad (24)$$

$$\beta_{1kl} = \gamma_{10l} + \gamma_{11l}\,(\text{GHG profile}_{kl}) + u_{1kl}$$
$$\beta_{2kl} = \gamma_{20l} + u_{2kl}$$

$$\text{Level-3: } \gamma_{00l} = \delta_{000} + \delta_{001}\,(\text{GDP/Capita}_l) + v_{00l}. \quad (25)$$

$$\gamma_{01l} = \delta_{010} + v_{01l}$$
$$\gamma_{02l} = \delta_{020} + v_{02l}$$
$$\gamma_{03l} = \delta_{030} + v_{02l}$$
$$\gamma_{10l} = \delta_{100} + v_{10l}$$
$$\gamma_{11l} = \delta_{110} + v_{11l}$$
$$\gamma_{20l} = \delta_{200} + v_{20l}$$

Model 7 is a (hierarchical) three-level model in which country-sectors are nested in countries. ROA is also included as a control variable in Model 7. The dataset for fitting this model is somewhat reduced because two lower-level units are commonly the absolute minimum to differentiate variance across levels (when only one lower-level unit is nested in the higher-level unit the two cannot be separated). Accordingly, countries with only one observation for each sector are removed. The resulting dataset includes 605 observations nested in 201 country-specific sectors which are in turn are nested in 21 countries. This type of model assumes that countries are an important determinant of lobbying activity and treats firms in the same branch but in another country separate from each other (i.e., Model 7 would treat oil industry in the USA as being different from the oil industry in Brazil). Model 7 also allows adding a country-level moderator variable – the GDP/capita. Results for Model 7 fails to confirm H1C as the effect (0.01) of GDP/capita on lobbying is found to be statistically not significant. Rest of the results obtained from Model 7 are largely similar to the results seen in Model 1 to Model 6. It is important to note that Model 7 adds considerable complexity to the analysis and multilevel researcher would commonly recommend reducing the complexity of this model. For instance, some of the variance components could be constrained to 0 to make model estimation more feasible. The results of Model 1 to 7 are summarized in Table 7 below.

The next section presents a discussion of the results presented in this section.

6.2. Discussion

The results show that firm size is a good predictor for lobbying intensity. Furthermore, it is observed that GHG emission profile at the sector level has a positive moderating influence on lobbying intensity. GHG emissions at the sector level did not alter the relationship between firm size and lobbying at the firm level such that the relationship between firm size and lobbying is stable across sectors. However, the results show that sectors with many employees on average and high GHG emission profiles had firms that lobbied particularly intense. The effect of the control variable ROA is also worth mentioning. The results indicate a negative relationship between lobbying and ROA which is particularly stronger and of higher statistical significance at the sector level. This finding is in line with the theory of economic regulation. These findings suggest that firms with a larger workforce and belonging to comparatively underperforming sectors with higher GHG emissions may be motivated to lobby particularly hard. The results support H1A and H1B but not H1C. H1C may not be supported because of the incorrect operationalization of the country level construct. Instead of the GDP/capita, an indicator with a more proximate relationship with the sector such as percentage contribution of a given sector to a country's GDP could have been more appropriate. The main result at the firm level that firm size has a statistically significant and positive relationship with lobbying concurs with the only other inferential study on climate change lobbying made by Delmas et al. (2016). However, the study presented in this paper could not compare the "U - shaped" relationship observed by Delmas et al. (2016) between firm-specific GHG emissions and lobbying intensities for two reasons. Firstly the multilevel models presented in this paper are linear mixed effect models, and non – linear relationships are not explored. Secondly, GHG emissions are considered at a sector level unlike in the study of Delmas et al. (2016) where GHG emissions are considered as a firm level variable. However, future studies may explore such relationships.

Table 7
Random coefficient models testing the relationship between organizational level variables and lobbying and the moderating effects of sector and country level factors.

Type of model component	Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Level-1 (organizational)	Intercept	2.31**	2.42**	2.31**	2.42**	2.43**	2.45**	2.62**
	Employees	0.33**		0.32**				
	SM-centered employees		0.36**		0.35**	0.36**	0.37**	0.37**
	SM-centered ROA						-0.01†	-0.03*
Level-2 (sectorial)	SM Employees			0.09	0.20†	0.24*	0.22*	0.41*
	SM ROA						-0.04*	-0.02
	GHG					0.02**	0.02*	0.04**
Cross-level interaction (Between Level 1 and Level 2)	SM-centered employees × GHG					0.00	0.01	0.00
Level-3 (National)	GDP/capita							0.01
Variance Components (For M7, Level-3 in parentheses)	Intercept	0.24	0.24	0.22	0.24	0.21	0.19	0.17 (0.07)
	SM-centered employees	0.10	0.12	0.10	0.13	0.13	0.12	0.00 (0.00)
	SM-centered ROA						0.00	0.00 (0.00)
	Intercept employees correlation	-0.097	0.053	0.075	0.39	0.432	0.261	0.00 (0.028)
	Intercept ROA correlation						-0.001	0.00 (.001)
	Employees ROA correlation						-0.008	0.00 (0.00)
	Residual	1.36	1.36	1.36	1.36	1.36	1.36	1.11

Note: †$p < 0.10$, *$p < 0.05$, **$p < 0.01$. The employee variable indicates the number of employees in 100,000s such that increase by 1 corresponds to an increase of a firm's employees by 100,000. The GHG emission profile variables are divided by 100 such that 1 unit increase in GHG emission profile of a company would correspond to an increase in its emission intensity (tonnes of CO2/full time employee) by 100 units. For Model 1–6, 981 firms nested in 123 sectors. For Model 7, 605 firms, nested in 201 country - sectors, nested in 21 countries. All predictors that are not Sector Mean (SM)-centered are centered at the sample (grand mean) mean.

It must be noted that the analysis presented in this paper only provides a limited exploration of the multilevel nature of corporate lobbying strategies on climate change. A fuller exploration will require multilevel assessment of Hillman and Hitt (1999) all the three lobbying strategy types of constituency building, information dissemination and financial incentivization in more detail. While certainly, the results indicate that number of employees is a good indicator of a firm's constituency building capabilities and ROA as a good indicator to determine the motivation behind adopting the financial incentivization strategy. However, a fuller account will require testing for how other factors across different levels may moderate these relationships. A fuller account may include additional firm level variables such as the degree of internationalization as a construct under organizational culture structure and processes. Shareholder activism as a construct under organizational stakeholder among others. Additional variables at the sector level could also include business concentration ratios of the individual sector which are a characteristic of sector-specific product processes and services. Further, the influence of socio-cultural factors at the national level and norms and values at the individual level may expose how these macro and micro features contrast against each other in moderating lobbying behavior of a company. Further, the analysis presented in this paper does not assess the aspects of information dissemination strategy which must also be included for a fuller account of the multilevel exploration of lobbying strategies on climate change. A fuller account must also explore how these three different strategy types interact with each other to identify how different contexts may motivate firms to choose one or the other or a combination of these different strategic approaches. A fuller account may also take a granular approach by looking at individual firm's stance on various issues concerning climate change. Finally, it is to be noted that the results of the analysis presented in this paper do not imply any causal claims.

Despite these limitations, it is hoped that the empirical example presented provides a good first account of how multilevel approaches may be applied in the context of business strategies and climate change. Hopefully, the operationalization procedure of the framework as presented in this section will prepare the ground for further exploration of multilevel theory building on business strategies and climate change.

Finally, the last section below makes some comments on the challenges and opportunities for developing multilevel theories on business strategies for climate change.

7. Towards setting a new research agenda

Multilevel research is challenging. Klein et al. (1999) have identified a number of such challenges. Some key challenges include the barriers to conducting interdisciplinary research, difficulties in scoping and boundary setting for the levels of assessment, the complexity of multilevel data availability and analysis. All of these challenges will remain and need to be negotiated for conducting multilevel research in the context of business strategy and climate change. Hopefully, this paper provides some helpful guidance in negotiating these challenges. The framework may be applied to a broad range of corporate climate change strategies including, among other, mitigation, adaptation and political strategies. By delimiting the number of levels and corresponding contextual factors, the framework provides concrete boundaries for identifying multilevel constructs for specific strategy types. For example, the framework may be useful for investigating how the impact of ethical work climate from the domain of “organizational culture structure and processes” on corporate climate change innovation strategies varies across countries. Relevant constructs for such an investigation may be drawn from the “national” level contextual factors such as the “sociocultural” and the “regulatory and judiciary framework.” To illustrate the point further the case of corporate adaptation strategies to the physical impact of climate change may be considered. A multilevel approach may be warranted to understand which specific organizational level “resources and capabilities” are needed to develop suitable corporate adaptation strategies depending on the severity of the physical impact of climate change across different countries. Among others, the “geophysical” contextual factor at the “national” level might be useful for identifying suitable constructs for measuring the severity of the physical impact of climate change for such an investigation. Developing testable multilevel hypotheses for any such investigation as cited above may require a multidisciplinary theoretical approach. Level specificities of different theories as identified in this paper can shed some light to such endeavors. The paper also provides a concise summary of the fundamental concepts of statistical multilevel modelling techniques as a basis for the operationalization procedure of the framework. Finally, on data availability, CDP database is a rich repository of climate change related information of major global corporations. This database could be very useful for assessing the organizational level constructs. Data availability at the higher levels, namely at the sector,

national, and transnational levels are also more readily available than before particularly on issues related to climate change as there is a growing number of academic papers with macro level analysis. The main challenge regarding data availability may come from the individual level. Lack of empirical investigation on the effect of individual behavior on the organizational level climate change strategy may be reflective of this barrier. Hopefully, the framework presented in this paper which captures two critical individual level contextual factors can facilitate overcoming this barrier.

Laszlo (1972) famously stated that "Multilevel theory is an ideal of science." The key message encapsulated in this quote is a journey towards a unified understanding of various phenomena occurring around us. The inherently interdisciplinary nature of multilevel research approach can aid us immensely in this journey. Particularly in the context of business strategy and climate change such an approach is still in its germinal stage. As Kozlowski and Klein (2000) have noted multilevel analysis is most promising when there exists a rich body of work exploring various dimensions of a given organizational phenomenon. More than two decades of research on business strategies and climate change has generated a wealth of information on its several aspects. The framework presented in this paper builds on this extensive body of scholarly work. Hopefully, the identification of the most relevant contextual factors as presented in the framework will invigorate a scholarly debate on delineating the boundaries of multilevel theorizing in the context of business strategies and climate change. Such a debate will be crucial in moving forward with multilevel theory building exercise. In addition, the paper presents a concise summary of the fundamental concepts of statistical techniques for multilevel modelling along with an empirical example which demonstrates the operationalization of the framework. Hopefully, this approach can pave the way for building multilevel theories for business strategies and climate change which may in future allow building multilevel strategic decision-making tools for managers in responding to climate change.

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