Innovation, Technology, and Knowledge Management

Antonio Leal-Millan
Marta Peris-Ortiz
Antonio L. Leal-Rodríguez *Editors*

Sustainability in Innovation and Entrepreneurship

Policies and Practices for a World with Finite Resources

Springer

Innovation, Technology, and Knowledge Management

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Series Foreword

The Springer book series *Innovation, Technology, and Knowledge Management* was launched in March 2008 as a forum and intellectual, scholarly "podium" for global/local, transdisciplinary, transsectoral, public–private, and leading/"bleeding"-edge ideas, theories, and perspectives on these topics.

The book series is accompanied by the Springer *Journal of the Knowledge Economy*, which was launched in 2009 with the same editorial leadership.

The series showcases provocative views that diverge from the current "conventional wisdom," that are properly grounded in theory and practice, and that consider the concepts of *robust competitiveness*,[1] *sustainable entrepreneurship*,[2] and *democratic capitalism*[3] central to its philosophy and objectives. More specifically, the aim of this series is to highlight emerging research and practice at the dynamic intersection of these fields, where individuals, organizations, industries, regions, and nations are harnessing creativity and invention to achieve and sustain growth.

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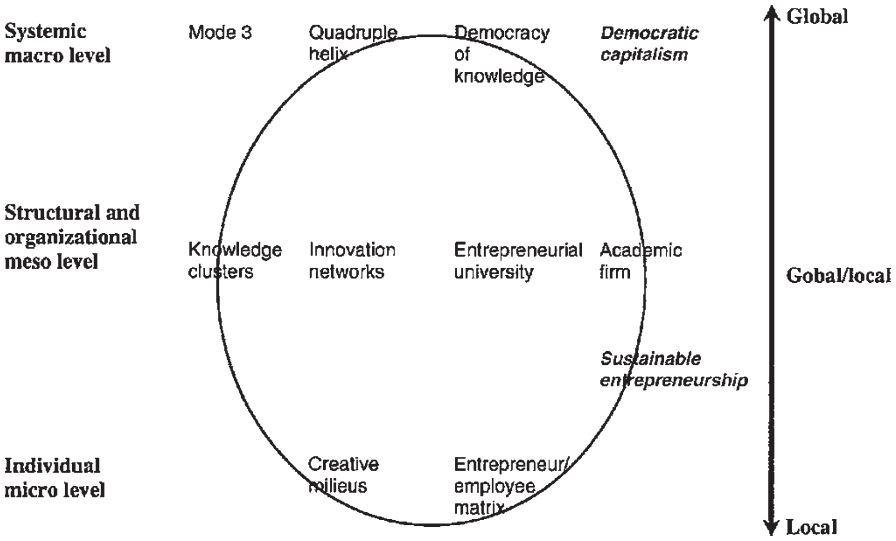
[1] We define *sustainable entrepreneurship* as the creation of viable, profitable, and scalable firms. Such firms engender the formation of self-replicating and mutually enhancing innovation networks and knowledge clusters (innovation ecosystems), leading toward robust competitiveness (E.G. Carayannis, *International Journal of Innovation and Regional Development* 1(3), 235–254, 2009).

[2] We understand *robust competitiveness* to be a state of economic being and becoming that avails systematic and defensible "unfair advantages" to the entities that are part of the economy. Such competitiveness is built on mutually complementary and reinforcing low-, medium-, and high-technology and public and private sector entities (government agencies, private firms, universities, and nongovernmental organizations) (E.G. Carayannis, *International Journal of Innovation and Regional Development* 1(3), 235–254. 2009).

[3] The concepts of *robust competitiveness* and *sustainable entrepreneurship* are pillars of a regime that we call *democratic capitalism* (as opposed to "popular or casino capitalism"), in which real opportunities for education and economic prosperity are available to all, especially—but not only—younger people. These are the direct derivative of a collection of top-down policies as well as bottom-up initiatives (including strong research and development policies and funding, but going beyond these to include the development of innovation networks and knowledge clusters across regions and sectors) (E.G. Carayannis and A. Kaloudis, *Japan Economic Currents*, pp. 6–10, January 2009).

Books that are part of the series explore the impact of innovation at the "macro" (economies, markets), "meso" (industries, firms), and "micro" levels (teams, individuals), drawing from such related disciplines as finance, organizational psychology, research and development, science policy, information systems, and strategy, with the underlying theme that for innovation to be useful, it must involve the sharing and application of knowledge.

Some of the key anchoring concepts of the series are outlined in the figure below and the definitions that follow (all definitions are from E.G. Carayannis and D.F.J. Campbell, *International Journal of Technology Management*, 46, 3–4, 2009).



Conceptual profile of the series *Innovation, Technology, and Knowledge Management*:

- The "Mode 3" Systems Approach for Knowledge Creation, Diffusion, and Use: "Mode 3" is a multilateral, multinodal, multimodal, and multilevel systems approach to the conceptualization, design, and management of real and virtual, "knowledge-stock" and "knowledge-flow," modalities that catalyze, accelerate, and support the creation, diffusion, sharing, absorption, and use of cospecialized knowledge assets. "Mode 3" is based on a system-theoretic perspective of socio-economic, political, technological, and cultural trends and conditions that shape the coevolution of knowledge with the "knowledge-based and knowledge-driven, global/local economy and society."
- Quadruple Helix: Quadruple helix, in this context, means to add to the triple helix of government, university, and industry a "fourth helix" that we identify as the "media-based and culture-based public." This fourth helix associates with "media," "creative industries," "culture," "values," "lifestyles," "art," and perhaps also the notion of the "creative class."

- Innovation Networks: Innovation networks are real and virtual infrastructures and infratechnologies that serve to nurture creativity, trigger invention, and catalyze innovation in a public and/or private domain context (for instance, government–university–industry public–private research and technology development coopetitive partnerships).
- Knowledge Clusters: Knowledge clusters are agglomerations of cospecialized, mutually complementary, and reinforcing knowledge assets in the form of "knowledge stocks" and "knowledge flows" that exhibit self-organizing, learning-driven, dynamically adaptive competences and trends in the context of an open systems perspective.
- Twenty-First-Century Innovation Ecosystem: A twenty-first-century innovation ecosystem is a multilevel, multimodal, multinodal, and multiagent system of systems. The constituent systems consist of innovation metanetworks (networks of innovation networks and knowledge clusters) and knowledge metaclusters (clusters of innovation networks and knowledge clusters) as building blocks and organized in a self-referential or chaotic fractal knowledge and innovation architecture (Carayannis 2001), which in turn constitute agglomerations of human, social, intellectual, and financial capital stocks and flows as well as cultural and technological artifacts and modalities, continually coevolving, cospecializing, and cooperating. These innovation networks and knowledge clusters also form, reform, and dissolve within diverse institutional, political, technological, and socioeconomic domains, including government, university, industry, and nongovernmental organizations and involving information and communication technologies, biotechnologies, advanced materials, nanotechnologies, and next-generation energy technologies.

Who is this book series published for? The book series addresses a diversity of audiences in different settings:

1. *Academic communities*: Academic communities worldwide represent a core group of readers. This follows from the theoretical/conceptual interest of the book series to influence academic discourses in the fields of knowledge, also carried by the claim of a certain saturation of academia with the current concepts and the postulate of a window of opportunity for new or at least additional concepts. Thus, it represents a key challenge for the series to exercise a certain impact on discourses in academia. In principle, all academic communities that are interested in knowledge (knowledge and innovation) could be tackled by the book series. The interdisciplinary (transdisciplinary) nature of the book series underscores that the scope of the book series is not limited a priori to a specific basket of disciplines. From a radical viewpoint, one could create the hypothesis that there is no discipline where knowledge is of no importance.
2. *Decision-makers—private/academic entrepreneurs and public (governmental, subgovernmental) actors*: Two different groups of decision-makers are being addressed simultaneously: (1) private entrepreneurs (firms, commercial firms, academic firms) and academic entrepreneurs (universities), interested in optimizing knowledge management and in developing heterogeneously composed

knowledge-based research networks, and (2) public (governmental, subgovernmental) actors that are interested in optimizing and further developing their policies and policy strategies that target knowledge and innovation. One purpose of public *knowledge and innovation policy* is to enhance the performance and competitiveness of advanced economies.

3. *Decision-makers in general*: Decision-makers are systematically being supplied with crucial information, for how to optimize knowledge-referring and knowledge-enhancing decision-making. The nature of this "crucial information" is conceptual as well as empirical (case study-based). Empirical information highlights practical examples and points toward practical solutions (perhaps remedies); conceptual information offers the advantage of further-driving and further-carrying tools of understanding. Different groups of addressed decision-makers could be decision-makers in private firms and multinational corporations, responsible for the knowledge portfolio of companies; knowledge and knowledge management consultants; globalization experts, focusing on the internationalization of research and development, science and technology, and innovation; experts in university/business research networks; and political scientists, economists, and business professionals.
4. *Interested global readership*: Finally, the Springer book series addresses a whole global readership, composed of members who are generally interested in knowledge and innovation. The global readership could partially coincide with the communities as described above ("academic communities," "decision-makers"), but could also refer to other constituencies and groups.

Washington, DC, USA Elias G. Carayannis

Foreword

It is with great pleasure that I write this foreword for the book which you now have in your hands, *Policies and Practices for Sustainability Innovation and Entrepreneurship*, edited by three Spanish scholars: Antonio Leal-Millan, Marta Peris-Ortiz, and Antonio Leal-Rodriguez. This important work tackles a very relevant issue in today's business environment: the role that innovation plays in achieving sustainability in a world with finite resources.

Environmental sustainability innovations hold the promise to grant future generations the possibility of enjoying planet Earth in the same way as those who have lived before them. These types of innovations have the potential to transform business processes and products by making them more eco-efficient, less resource intensive, and less wasteful. In a world with finite resources and increasing population, such innovations are crucial. Both established companies and new ventures need to assume responsibility in the transition toward a more sustainable business environment. If we keep the sustainable development paradigm in mind, new business opportunities are more likely to flourish with opportunities to innovate in a more sustainable way. Earth is in urgent need of these so-called sustainable entrepreneurs—the business leaders of the twenty-first century.

This published book has the merit of having compiled excellent research papers that cover a series of relevant topics about sustainability and entrepreneurship. You will find discussions on topics such as the role of cities and local governments on innovation toward sustainability, the motivations of responsible green consumers, the role of cooperatives in innovating to reduce carbon dioxide emissions and fight climate change, the role of sustainability standards and reputation in hospitality management, as well as a case study on sustainable entrepreneurship in an Indian fashion venture. These are all very relevant research topics that will advance our knowledge about sustainability and entrepreneurship synergies.

I congratulate the editors for having compiled an outstanding collection of research articles dealing with very key topics focused on sustainability, innovation, and entrepreneurship. Innovation is certainly just one of the key pieces of the sustainability puzzle, and research studies like these have the opportunity to motivate

business leaders and students—our future leaders—to work toward a more sustainable business world.

It fills me with pride to recommend this book to you, and I am heartened to see how much work on sustainable entrepreneurship and innovation has been achieved in my home country, Spain. Enjoy!

Baruch College, City University of New York, Ivan Montiel
New York, NY, USA

Contents

Chapter 1
The Route Towards Sustainable Innovation and Entrepreneurship: An Overview

Antonio Leal-Millán, Marta Peris-Ortiz, and Antonio L. Leal-Rodríguez

Abstract To what extent can the introduction and proactive embracement of proactive corporate environmental strategies, processes and activities lead to more innovative and entrepreneurial firms? Might sustainability be a core issue while attempting to cope with some of the world's main challenges? This chapter presents some insights with regard to sustainable innovation and entrepreneurship, two topics that are receiving increased attention at the academic and managerial levels. Moreover, we underline the key contributions of the different chapters included in this book.

1.1 Introduction

These days the linkages between business spheres and environment protection are becoming increasingly popular, shaping therefore a topic that is conquering the attention of academics (i.e., scholars and researchers working both for public and private institutions), practitioners (i.e., managers and policy makers) and society in general. At the research level it is certain that sustainability has become an incredibly popular topic. In this vein, Google Scholar lists approximately 3,500,000 outcomes for the tag "sustainability"; 2,520,000 results for the tag "sustainable management"; 3,770,000 results for the tag "environmental management"; around 4,090,000 outcomes for the tag "green management"; and over 2,740,000 results for the tag "green innovation". Moreover, there can be identified distinct widespread terms such as "eco", "sustainable", "environmental", and "green", oriented to label

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those managerial efforts intended at decreasing the harmful impacts that organizations exert upon the environment.

In addition, these research topics are being progressively endorsed and supported by academic institutions. Just to mention a few examples, it is noteworthy the continuous progress and the high quality research work that is being carried out by the Organizations and the Natural Environment (ONE) Division of the Academy of Management, which is self-described as a scientific community of fellows devoted to the advancement of research, lecturing, and service at the juncture of organizations and the natural environment. It is also remarkable the work developed by the Group of Research on Organizations and the Natural Environment (GRONEN), which organizes an international conference and doctoral consortium every 2 years in an European setting. Besides, there is an extraordinary proliferation of scientific journals and books—the Scimago Journal Rank (SJR) reveals that there are up to 112 journals within the Renewable Energy, Sustainability and the Environment category—special issues, academic conferences, conference tracks and doctoral dissertations addressing sustainability-related issues.

There may undoubtedly be a broad range of reasons underlying the escalation in the number of publications and the growing interest devoted by the academic community to environmental management and sustainability issues. A clear motive is that plenty of companies are being subject to considerable pressures exerted by governmental policies, international environmental legislation, customers' demands and an accelerated societal environmental awareness. Due to the extremely dynamic and turbulent global business scenario, environmental management is becoming important for companies. Such context is characterized by the presence of harsh environmental regulations, social pressures and the spread of environmental concern. The combined effect of these pressures is leading firms to pay attention and get involved in sustainability activities (Porter & Van der Linde, 1995). A second reason may arise from the fact that an emergent proportion of executives and shareholders are being convinced that there are important business opportunities and benefits linked with being and behaving in a more sustainable manner. Whatever are the factors motivating this boom of the academic literature on the field of sustainable management, the fact is that practitioners are gradually going to need and demand deeper insight and guidelines as to how becoming greener, which could effectively find in such scientific books and journal articles.

The influence exerted by the enterprises' proactive environmental corporate strategies on its business outcomes outlines a research topic that has been extensively examined and debated within the literature on the field of organizations and the natural environment (Albort-Morant, Leal-Millán, & Cepeda-Carrión, 2016). Accordingly, the extent to which organizations might obtain benefits from "greening" its products, services, processes and operations has turned into a pivotal question for plenty of scholars within the strategic management and organizational behavior literature, as illustrated by the substantial volume of empirical studies targeted at examining the ties between the proactive implementation of environmentally-driven or green corporate strategies and financial performance or competitive advantages attainment, as pointed by Aragón-Correa and Sharma (2003).

Coherently with Marcus (2015), green innovations should be comprehended as strategic choices, since in a similar way to any other strategic adoption, they are not free from uncertainty or future prospects that might be more or less likely to finally occur. The path to sustainability is full of challenge and complexity. Yet, it is the role of scientists to shed light upon the set of uncertainties that surround this matter. Therefore, this book, which is entitled "Policies and Practices for Sustainability in Innovation and Entrepreneurship", is aimed at providing the reader with a wide range of insightful theoretical and empirical foundations about whether adopting sustainable innovative managerial practices actually pays off.

This book, which is composed of nine chapters—excluding this first introductory chapter—aims to become a reference work that provides the readers with an accurate source of inspiration and solutions to their troubles concerning the ongoing challenge of improving the management of sustainability issues. All these questions, which are closely linked to the methods of obtaining and distributing different products and services, are within the framework of entrepreneurship and represent new business possibilities by rearranging or changing the different productive factors (Schumpeter, 1934) or discovering new opportunities (Shane & Venkataraman, 2000).

1.2 Theoretical Background

Organizational innovativeness is commonly assumed to play an important role in the achievement and maintenance of competitive advantages and organizational performance. Previous investigations emphasize innovation as a critical condition for firms that seek the embracement of technological advances, sustained growth, the exploration of new markets, the adaptation to customers' needs and requests, and definitively the attainment of sustainable competitive advantages and the enhancement of their business performance (Jiménez-Jiménez & Sanz-Valle, 2006). Several scholars believe that innovations occur after some novelty, fresh or original idea is obtained with regard to firms' products, services or processes (Damanpour & Gopalakrishnan, 1998; Zaltman, Duncan, & Holbek, 1973). On the other hand, there can be found some research works pointing out that the mere generation of these novel or new ideas is not enough to be properly considered innovation, but such idea yet requires to be effectively developed and applied to commercial ends (Escorsa & Valls, 1997). Thus, there has traditionally existed some controversy with regard to the proper thought of organizational innovation, since while some authors place it at the initial steps, others advocate for its location at the implementation or final phase.

Following Beise and Rennings (2005), and as a field of opportunities (Shane & Venkataraman, 2000), sustainable innovations entail a broad set of novel or enhanced processes, practices, methods, systems, products and services oriented to elude or minimize an organization's environmental impact. Chen, Chang, and Lin (2014) define "green innovation" as organizational innovations that comprise the design, elaboration and perfection of sustainable products, services or processes. Such

innovations may include from technological innovations involved in energy saving, the reduction of pollution and residuals, waste recycling, or more sophisticate designs. Sustainable innovations have turned into an essential strategic tool for firms aiming to face the sustainability challenge and to remain competitive within their context due to the increasing popularity of environmental trends (Chen, Chang, & Wu, 2012).

Firm innovativeness and entrepreneurship happen to be two notions that frequently develop rather interrelated in the literature. Since innovation commonly stands as an essential condition or prerequisite within the entrepreneurial process, a company's competence to foster and mature fruitful innovative ideas might lead us to consider this link a recursive relationship. Furthermore, Drucker (1985) claims that entrepreneurship and innovation jointly constitute key drivers underlying economic advance and superior performance that explain the success of organizations and society in general.

Peris-Ortiz (2009) coins the term "corporate entrepreneurship" to denote the competence inherent to a firm's collection of executives and staff who cooperate and make decisions aiming to foster entrepreneurship, organizational learning and innovation at the corporate level. Such capability is linked to the aptitude to ascertain or generate business opportunities; the faculty to exploit these prospects on the basis of social networks and institutional capital (Audretsch & Monsen, 2008); and the process of organizational regeneration that permits and enables constant innovative development. Besides, Albort-Morant and Rey-Martí (2015) use the term "entrepreneurial capital" to refer to the firms' members that continually innovate and assume risks with the determination of contributing to their companies' advance. Thus, it seems that as proposed by Schumpeter (2000), innovation and entrepreneurship are often two sides of the same coin. This author suggests that one of the key features of entrepreneurs deals with the capability to combine already existing resources in creative ways. Hence, the introduction of disrupting changes might be difficult to be fully assigned to firm innovativeness or entrepreneurial capacity isolatedly.

Academic authors have declared that the innovative activity of entrepreneurship helps as a dominant energy in the advance of an environmentally and socially sustainable economy. However, empirical research on the topic has not evolved at the same pace as business action and the interest of individuals and governments in the phenomenon. Thus, additional empirical research is still needed on the relationship between entrepreneurship and sustainable development that sheds light upon the complexities of the phenomenon (Dean & McMullen, 2007).

One of the central issues in the relationship between entrepreneurship and sustainable development is the paradox of the normative pretensions of entrepreneurship as a solution to the challenges of sustainable development versus research in environmental and welfare economics. This paradox underscores the extent of the limits of sustainable business action. In fact, the claims of sustainable entrepreneurs contrast with certain theoretical propositions accepted or recognized in the economic literature. That is, the public and non-exclusive nature of environmental resources can generate conflicts between individual and social objectives and incen-

tives, all of which can be manifested in the emergence of egoistic entrepreneurial behaviors that deteriorate societal and ecological conditions. The advice of this paradox is that green entrepreneurship can be controlled to situations where individual and social interest and reasons are aligned under the current system of economic institutions. In contrast, in the absence of such conditions, sustainable entrepreneurship would fail to exist and fulfill its normative implications (Pacheco, Dean, & Payne, 2010). These authors "*view sustainability challenges as a prisoners' dilemma problem wherein entrepreneurs face a potential competitive disadvantage when pursuing costly sustainable actions, as such costs may not be borne by competitors. We refer to this entrepreneurial predicament as the "green prison": wherein entrepreneurs are compelled to unsustainable behavior by the process of competition, given that sustainable actions are punished, rather than rewarded*" (Pacheco et al., 2010, p. 465).

Thus, the firms' introduction and proactive embracement of proactive corporate environmental strategies, processes and activities may lead them to become more innovative and entrepreneurial. Within an economic context increasingly concerned about environmental issues, a novel and interesting source of competitive advantage is derived from the recognition that customers value those organizations that make significant efforts to develop an efficient environmental management and to interact with the environment in a responsible manner (Leal-Rodríguez, Leal-Millán, & Ariza-Montes, 2016).

1.3 Overview of Book Contents

This book includes ten chapters related to sustainability and innovation in an entrepreneurship framework. Jointly, the chapters in this book reflect varied approaches. They examine the theme using different theoretical backgrounds and different methodologies. Individually, each chapter offers rich insights regarding the phenomenon they examine.

Chapter 2 undertaken by Gema Albort-Morant, Silvia Martelo-Landroguez and Antonio L. Leal-Rodríguez, *Fostering a Relationship Learning Context as a Driver of Green Innovation Performance and Green Customer Capital*, analyzes the combined effects of promoting a relationship learning context on green innovation performance and green customer capital. This chapter develops a research model that links relationship learning, green innovation performance and green customer capital. Partial Least Squares (PLS) path-modeling, a variance-based Structural Equation Modeling technique is used to test and validate the research model and hypotheses. The results suggest that firms should make and endeavor and invest resources in enhancing their relational capital. Besides, in order to create green customer capital it is advisable that firms are able to transform this relationship learning into green innovative outcomes.

Chapter 3, *Smart Cities, Innovation and Sustainability: Which Role for Cities in Fostering "Green" Entrepreneurship?* by Claudia Ghisetti, studies the link between

entrepreneurship and institutional conditions in the case of smart cities. She discusses that green entrepreneurship might be linked to being localized in a smart city. The chapter presents a newly collected dataset on a smart city for the Emilia-Romagna Region in Northern Italy. The results suggest that Poles and administrative centres face significantly higher smart levels, and the contiguity to a centre influences its smartness.

Chapter 4, *How Cultural Beliefs and the Response to Fear Appeals Shape Consumer's Purchasing Behavior Toward Sustainable Products* by Nuria Rodríguez-Priego and Francisco J. Montoro Ríos. This study examines how cultural beliefs and other cognitive processes related with the response to fear appeals can contribute to explain why consumers choose to purchase goods produced by sustainable companies. For this purpose, it tested the Cultural Cognition Theory and the Protection Motivation Theory as determinants of consumers' purchasing behavior. Results show that the more egalitarian and the less hierarchical individuals are, the more they will reward sustainable companies. Besides, consumer's behavior toward the companies is determined by their perception of environmental threat and their perceived response efficacy.

Chapter 5 by Macarena Pérez-Suárez and Daniel Antón, *Sustainable Social Management: The Case of Co-operative*, aims to reveal the situation of cooperatives with respect to sustainability. Despite the global situation regarding the need to enhance energy efficiency, the manner in which these co-operatives take it into account is not clearly shown. Consequently, this research provides a series of effective measures for CO_2 emission mitigation and energy efficiency improvement. Thus, the aim was to understand the sustainable responsibility of co-operatives by means of CO_2 emission evaluation and their sources. The outcomes reveal the scarce concern of companies about the energy consumption and their environmental impact. In this sense, co-operatives must optimise the social management of defined environmental practices to comply with the considered ethical behaviour.

Chapter 6, *Improving Environmental Management Systems by ISO 9001 in the Spanish Hospitality Sector* by Aurora Martínez-Martínez, Juan Gabriel Cegarra-Navarro and Alexeis García-Pérez. This paper examines the relevance and importance of an ISO 9001 certification as an enabler of Nonaka and Takeuchi's SECI model and the processes of reusing and updating the environmental knowledge of an organisation. The adoption of ISO 9001 exercises a moderating effect on environmental management practices. Therefore, the study has direct implications for management practices.

Chapter 7 by Marco Bettiol, Valentina De Marchi and Eleonora Di Maria, *Social Entrepreneurship and Upgrading in Emerging Economies: The Indian Case of Industree and Its Brand Mother Earth* aims to analyze the possibility to realize production system delivering high social, environmental and economic performance in the context of emerging economies. They provide an in-depth analysis of an Indian successful firm, specialized in the production and retail of home and fashion industries which successfully improved social and environmental conditions along its value chain through the social entrepreneurship approach.

Chapter 8, *The Relationship Between Revenue and Environmental Responsibility: A Causal Study Using Reputation in the Hotel Industry* by José Manuel Mariño-Romero, Ana María Campón-Cerro, José Manuel Hernández-Mogollón and José Antonio Folgado-Fernández. The authors focused on determining to what extent hotels' consciousness of environmental responsibility generates a positive impact on profitability, as represented by RevPAR, a performance metric specific to the hotel industry. The results reveal that environmental sustainability has a significant positive impact on RevPAR and that reputation acts a mediating factor in this context. Thus, hotel companies need to bear in mind that corporate social responsibility policies regarding the environment are not an undesirable cost but rather an investment that ensures long-term, sustainable financial returns.

Chapter 9, by Carolina Afonso, Diana Gavilan, Jesús García-Madariaga and Helena Martins Gonçalves, *Green Consumer Segmentation: Managerial and Environmental Implications from the Perspective of Business Strategies and Practices,* aims to better explore the importance of green consumer segmentation and its implications from a management point of view. The authors analyze which variables better characterize green consumers in order to propose a theoretical framework to enable and support organizations to better understand green consumer profile. It also enables managers and marketers to target and develop better marketing strategies for these segments.

The last chapter (Chap. 10), *How Strong Might Be a Carbon Tax on Electricity Consumption to Reach Spanish H2020 Targets?* by J.M. Cansino, M.A. Cardenete, M. Ordóñez and R. Román, evaluates the cumulative impact (2014–2020) that a tax on electricity consumption would have on it consumption in Spain in the period 2014–2020. The main conclusions and practical implications that can be derived from this chapter are: (1) the introduction of an electricity consumption tax (ECT) without tax recycling has an inflationary impact, an important welfare loss; (2) the introduction of the new tax (ECT) with tax recycling and tax neutrality requires a small reduction in employer-paid Social Security contributions and generates only a slight increase in consumer prices and a loss of household welfare less than the revenue generated by the new tax; and (3) the introduction of the new tax (ECT) with price stability leads to a decline in employer-paid Social Security contributions.

1.4 Conclusions

Sustainability, entrepreneurship and innovation are concepts closely linked to each other, and analyzing issues at their interface is crucial to understanding the best practices and policies for sustainable social and economic development. While pertinent for managers, practitioners, academics and society in general, it broadly draws on the most up-to-date research, making it also a valued source for academics studying entrepreneurship and innovation and networks and the wide array of sustainability strategy issues they raise.

The pressures exerted by governmental policies, international environmental legislation, customers' demands and an accelerated societal environmental awareness, have turned entrepreneurship and sustainability relations into an inextricable question. Although there are situations—markets or industries—in which green sustainability can be a "green prison", this is the path of entrepreneurial behaviour for the future.

We expect this book links academic research and draws on practitioner experience to offer a comprehensive understanding of how and why Policies and Practices for Sustainability in Innovation and Entrepreneurship are not only indispensable fields of study but also the very foundations for social and economic behaviour.

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Chapter 2
Fostering a Relationship Learning Context as a Driver of Green Innovation Performance and Green Customer Capital

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Abstract Sustainability is a popular topic within the current literature on the fields of management and economics. There are plenty of studies that empirically address the ties between strategic management (i.e. knowledge management) topics and corporate environmental performance. However, there is a scarcity of empirical studies examining the combined effects of promoting a relationship learning context on green innovation performance and green customer capital. This chapter develops a research model that links relationship learning, green innovation performance and green customer capital and empirically tests the research hypotheses through Partial Least Squares (PLS-SEM) analysis. Our results suggest that firms should make an effort and invest in resources to enhance their relational capital. Besides, in order to create green customer capital it is advisable that firms are able to transform this relationship learning into green innovative outcomes.

2.1 Introduction

Green consciousness is currently playing an important role due to the rise of international environmental regulations, such as Kyoto Protocol, Montreal Convention, Waste Electronics and Electrical Equipment (WEEE), etc. (Chang & Chen, 2012). Besides, environmental management is becoming crucial for companies because of the highly dynamic and global business environment. Due to the popular environmental trends, green innovations have become important strategic tools to obtain sustainable development in the manufacturing industries (Chen, Lai, & Wen, 2006;

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Chen, Shih, Shyur, & Wu, 2012). For this reason, companies adopt a proactive and preventive strategy to deal with the impact of the advent of the environmental era.

Sustainability has also become a noteworthy topic from the business performance lens. Several studies support that green innovation contributes to the development of firms' innovation portfolios (Hull & Rothenberg, 2008), enabling profitability and the improvement of overall quality of life (Hart, 1995). Furthermore, there is an increasing demand for products among environmentally sensitive consumers (Marcus & Fremeth, 2009). Moreover, green innovations could hinder imitation opportunities, at the same time that generate barriers to others competitors, and develop competitive advantages (Chang, 2011). Our study addresses the following research question: Is the relationship learning context a driver of green innovation performance and green customer capital?

The label 'green' indicate the organizations' move towards environmental sustainability. This 'green' perspective emerges because of the popularity of environmentalism nowadays. A successful green customer capital can help firms move towards environmental sustainability. The number of companies concerned about being responsible and less harmful to the environment grows every day because of environmental pressures from the society (Chen et al., 2006). The global climate change has contributed to the consumer environmental consciousness (Chen & Chang, 2012, 2013) and leads companies to change their business models to respond effectively to customer's concerns. Our findings confirm that relying on relationship learning mechanisms is critical to attain and enhance the firm's green customer capital. Furthermore, in order to create green customer capital it is advisable that firms are able to transform this relationship learning into green innovative outcomes.

In this vein, there are several studies that link relationship learning mechanisms with innovation outcomes (Leal-Rodríguez, Roldán, Ariza-Montes, & Leal-Millán, 2014; Leal-Rodríguez, Roldán, Leal, & Ortega-Gutiérrez, 2013) or with green innovation (Albort-Morant, Leal-Millán, & Cepeda-Carrión, 2016; Chen, Lin, & Chang, 2009; Fang, Fang, Chou, Yang, & Tsai, 2011). Other studies have focused on the assessment of the links between relationship learning and green intellectual capital (Chen, 2008b). Besides, Leal-Millán, Roldán, Leal-Rodríguez, and Ortega-Gutiérrez (2016) explores the tie between green innovation performance and customer capital. However, there is a scarcity of empirical studies aimed at understanding the links between green innovation performance and relationship learning with green customer capital. Hence, building upon the previous literature, this chapter develops a research model that links these three constructs. The purpose of this study is hence to test the mediating effect of green innovation performance (GIP) in the relationship between relationship learning (RL) and green customer capital (GCC).

We define RL as a process oriented to sharing information and knowledge with customers, suppliers, partners, and other stakeholders. GIP is defined as a strategic need for firms aiming to meet customers' wishes without harming the environment. And, finally, we introduce GCC as a novel construct that refers to the value derived from an organization's relationship with its customers under the trends of the strict international environmental regulations and the growth of customer environmentalism.

We test our model in the automotive component manufacturing sector (ACMS) in Spain using a sample of 112 companies.

This study is organized as follows. First, we present a review of the existing literature and we define the variables under study. Next, we discuss the research model and hypotheses. We then describe the sample and methodology used. The next section presents the empirical results of the study. And, finally, we display the discussion of results, the conclusions, and future lines of research.

2.2 Theoretical Background

2.2.1 Relationship Learning

Nowadays, firms are continually sharing information and knowledge with their customers, suppliers, partners and other stakeholders. The business partnerships can create value for companies and improve their competitive advantages (Vargo & Lusch, 2004). The studies from Hallen, Johanson, and Seyed-Mohamed (1991) and Snehota and Hakansson (1995) were the first works in deepening into and theorize around the concept of relationship. These authors conceptualize relationship as the mutually oriented interaction between two reciprocally committed parties. Since these seminal works, the topic concerning the assessment of relationships between organizations has received a growing attention.

Selnes and Sallis (2003, p. 81) conceptualize relationship learning as "a joint activity in which the two parties strive to create more value together than they would create individually or with other partners". Cheung, Myers, and Mentzer (2011) explain that relationship learning is a joint activity between the firm and a supplier or buyer in which two parties share information, which is jointly interpreted and integrated into a shared relationship-domain-specific memory that changes the likelihood of potential relationship-specific behavior.

Relationship learning is conceived as a multidimensional construct made up of three ordinary capabilities: (1) information sharing, (2) joint sensemaking, and (3) knowledge integration (Selnes & Sallis, 2003). The first ordinary capability consists of an exchange of information between two interested parties. The second one is defined as the improvement of insight, knowledge, and associations between the past, present and future actions (Fiol & Lyles, 1985). And, finally, the third capability explains that integration is a sign of the state of collaboration that exists among departments that are required to unify their efforts due to the demands of the environment (Cheung et al., 2011).

Therefore, relationship learning is a process oriented to sharing information and knowledge with other stakeholders, and hence, increasing future behavior. To generate good relations, firms tend to deploy strategic alliances, joint ventures, R&D consortia, partnerships and inter-firm networks (Doz, Olk, & Ring, 2000). In this way, firms can and should use external and internal ideas to attain competitive

advantages. For example, the firms of the automotive component manufacturing sector provide highly customized products and services to large automakers. For this reason, they must be very well connected with their suppliers and customers to know what are the last innovations that they wish to incorporate in its portfolio of products and services. Hence, the companies within this sector will be able to incorporate specialized knowledge and skills in the development of new products and processes, which would enable them to differentiate from their competitors.

2.2.2 Green Innovation Performance

As we have said before, the label "green" recently appears as one of the most relevant terms coined to indicate the organizations' move towards environmental sustainability. Moreover, being green is an incentive for fostering a non-stop innovation strategy and for creating new market opportunities for companies aiming to satisfy new consumer demands, creating hence value and performance (Albort-Morant et al., 2016). Thus, green innovation is based upon two fundamental pillars: sustainability and innovation.

Prior research defines innovation as the creation, development and implementation of new products, processes and services (Damanpour, 1991). Lately, several studies are assessing innovation as a critical way to moderate or avoid environmental damage (Pérez-Valls, Cespedes-Lorente, & Moreno-Garcia, 2015). In this vein, Beise and Rennings (2005) contribute to the definition of the green innovation concept, stating that it comprises new or improved practices, processes, techniques, systems, and products to prevent or minimize environmental damages.

Chen et al. (2006, p. 332) conceptualize green innovation performance, as "the hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management". Besides, these authors state that there are two types of green innovation performance: green product innovation performance and green process innovation performance. Green product innovation performance consists of product improvements related to environmental innovation, and green process innovation performance involves process improvements related to energy-saving, waste recycling, no toxicity or pollution-prevention (Chen 2008a). Subsequently, Tseng, Huang, and Chiu (2012) propose four categories for the green innovation performance concept: (1) product innovation, (2) process innovation, (3) management innovation, and (4) technological innovation. The green management innovation is defined as a firm's aptitude to prepare green projects that allows to re-design and improve the products or services that carry out the environmental criteria, and the green technological innovation is defined as the installation of new green equipment for carrying out the development of green products and services.

Companies that are proactive on green innovation strategies might be able to encompass competitive advantages (Buhl, Blazejewski, & Dittmer, 2016). In the

same vein, Leal-Millán et al. (2016) have recently redefined the concept of green innovation performance, conceptualizing it as a strategic need for firms aiming to meet customers' wishes without harming the environment.

2.2.3 Green Customer Capital

In addition to human and structural capital, customer capital is considered another element of intellectual capital. Customer capital focuses on the firms' relationships with its customers (Chan & Wang, 2012; Edvinsson & Malone, 1997; Leal-Millán et al., 2016). Although there is no single definition of customer capital, all definitions are based on the relationships between firms and their customers or the value of these relationships (Chan & Wang, 2012; Leal-Millán et al., 2016).

Customer capital is considered to be a major source of competitive advantage in the knowledge era (Chang & Tseng, 2005). According to Duffy (2000), customer capital is the product of the customer relationship management. Customer relationship management is defined as the firms' activities that are oriented towards creating and maintaining long-term relationships with their customers in order to obtain customer loyalty and satisfaction (Martelo-Landroguez, Barroso-Castro, & Cepeda-Carrión, 2011). Therefore, customer relationship management is mostly about transforming the business into a customer-focused company (Martelo-Landroguez, Barroso-Castro, & Cepeda-Carrión, 2013). Firms are not necessarily locked into internally controlled resources and capabilities for strategy and growth purposes, but may draw on customers as sources of new ideas and problem-solving capabilities, and flexibility in assimilating new resources and capabilities (Zander & Zander, 2005).

Consequently, customer capital encompasses a strong component of knowledge about firms' customers that increases when customer relationships are created and maintained over the years. Hence, customer capital highlights the importance of customer relationship management in firms (Chan & Wang, 2012). Firms need to know what is the best way to manage customer relationships in order to maintain and improve them. Although existing literature has discussed the relevant issues about customer capital, no examples in the literature examine customer capital from a green perspective. Environmental changes affect the management of firms. This is why well-known concepts related to firms' management are turning to be 'green'. We would like to address this gap in the literature by proposing a novel construct: green customer capital (GCC). We can find an approach to this concept in Chen (2008b) with the introduction of the green relational capital and in Chang and Chen (2012) who introduced the green relationship capital.

We refer to Duffy (2000) to define GCC as the value, in terms of contributions to current and future revenues, derived from an organization's relationship with its customers under the trends of the strict international environmental regulations and the growth of customer environmentalism. The term GCC describes the capability of firms to understand their customers' environmental wishes, problems and behaviors. GCC helps firms to design and implement a strategy to meet their customers'

environmental needs (Wensley, Cegarra-Navarro, Cepeda-Carrión, & Leal Millán, 2011). The creation, enhancement, and maintenance of close relationships between firms and customers demand the search for mutual environmental interests. The firms' investment of resources in these common environmental interests will develop satisfactory and long-lasting relationships with customers in the environmental era. Thus, this investment of resources will positively influence green customer capital.

2.3 Research Model and Hypotheses

2.3.1 Linking Relationship Learning and Green Customer Capital

Currently, many companies are urged to adopt a proactive strategy to deal with the impact of the advent of the environmental era. Hence, they are called to integrate environmental concerns into their strategies, being able in turn to satisfy their customer at the same time that they remain competitive. As previously mentioned, the term green customer capital might be introduced to describe the firm's capability to understand their customer's environmental preferences, problems and behaviors, being able in turn to design and implement a strategy that will meet environmentally conscious customers' needs (Wensley et al., 2011).

Firms are currently dealing with hypercompetitive markets where customers are becoming increasingly demanding as a consequence of having access to a greater number of companies, products and services. Hence, firms have to make an effort to identify customers' needs, as it is necessary to build strong company-customer relationships. To this end, companies should carry out a joint activity between customers, suppliers and other partners in which the two parties share green-related information and knowledge.

Several studies have focused on explaining that value creation is regarded as the necessary objective for a buyer and a supplier to engage in a relationship (Huang, Hu, Liu, Yu, & Yu, 2016). Nevertheless, the impact of relationship learning on customer capital is still poorly developed or offers inconclusive results. On the one hand, Chen, Zhu, and Xie (2004) expose that customer capital is directly connected to business performance and the firm's intellectual capital. Concretely, these authors state that customer capital is the main determinant in transforming intellectual capital into market value. In addition, according to Duffy (2000), the development and application of customer capital indicators is vital for the sustaining of competitive advantages. On the other hand, other studies claim that buyer-supplier relationships can detrimentally affect strategic outcomes due to increased cultural disparity and a lack of goal congruence between partners who operate in different contexts (Anderson & Jap, 2005; Griffith & Myers, 2005).

The recent work of Leal-Rodríguez et al. (2014) refer to relationship learning as a joint activity between the organization and one or more parts—customers, suppliers, partners, etc.—in which the purpose is to share information. These relationships differ in terms of organization's learning capability, and some relationships perform better because they have developed the right learning methods (Selnes & Sallis, 2003). Therefore, companies should enable the exchange of information with different suppliers, partners and customers to enhance their knowledge base, skills and competitiveness through common learning mechanisms. It might help to improve the firm's ability to meet the needs of its partners (Cheung et al., 2011).

Consequently, companies must build robust relationships with their customers in order to learn from them. In this sense, companies can develop new products and services for emerging customers if they know better the needs of the existing ones. Therefore, we posit the following hypothesis:

H1: Relationship learning (RL) is positively related to Green Customer Capital (GCC).

2.3.2 The Mediating Role of Green Innovation Performance on the Relationship Learning-Green Customer Capital Link

Managers are increasingly taking into account the environmental issue when developing and launching new products. This includes changes in the product portfolio or in the production processes that contribute to reduce the emissions, recycle, and to enhance eco-design, eco-efficiency or waste management among other implementations (De Marchi, 2012). However, adopting green innovation practices implies handling extensive quantities of knowledge both internal and external to the company.

Following Leal-Millán et al. (2016), we define green innovation performance as a strategic need for firms that gives them the opportunity to meet customers' wishes without harming the environment. Indeed, investing resources in green innovation and environmental management constitutes a mechanism for the firm to attain a good image, to reach new markets, to develop new products and services, and to gain sustainable competitive advantages (Chen, 2008b).

According to Wong (2012), green innovation creates value by addressing customers' green interests. Green innovation will also contribute to the creation of relationships between firms and customers. Therefore, green innovations will lead firms to create and maintain long-term relationships with customers and to turn these customer relationships into sustainable competitive advantages; and, in turn, to create green customer capital. In this vein, if a green product or process has been developed by a firm taking into account the consumer environmentalism, green customer capital will increase. Namely, green innovations will increase the value that results from firm-customers relationships.

In this way, relationship learning can be defined as an antecedent of green customer capital and green innovation performance, as it is a joint activity between the company and one or more parts—supplier, customer, partner, etc.—in which the purpose is to share pertinent information (Leal-Rodríguez et al., 2014). In addition, Chang and Lin (Chang & Lin, 2014, p. 345) argue that "the collaboration begins with the distribution of end products to end users (customers), and goes back to the manufacturing, the procurement of raw materials, and finally to the suppliers of materials and services".

Therefore, the development and implementation of collaboration between the organization and one or more parts, allows the exchange of information, the development of knowledge associations between past, present and future actions, and the development of relationship-specific memories stored in the organization's collective cognitions, values and beliefs.

Collaboration with other stakeholders, such as suppliers or customers, is well known as a factor or driver of organizational innovation (Taylor & Thorpe, 2004; Zaheer, Gulati, & Nohria, 2000). The information gathered by means of networking and cooperation contributes to the development of the firm's absorptive capacity that can lead to innovation, and improve business performance (Leal-Rodríguez et al., 2014). It could help companies to take actions that enable their products and processes to do the least harm to the environment.

To develop successful green innovations, suppliers and customers must collaborate with companies. In the case of suppliers, they can indicate the most protective material or processes to the environment. On the other hand, the customers could help companies to meet their needs, and have the capability to implement strategies by being responsive to customers. Thus, the building of collaboration networks between companies and stakeholders has increasingly become a necessity as for developing green innovations at the same time that contributes to reach higher environmental performance (Fig. 2.1).

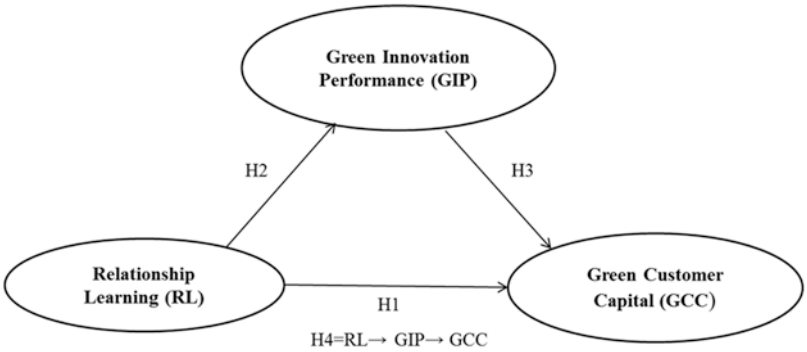
On the basis of the above statements, we hypothesize:

H2: Relationship learning is positively related to Green Innovation Performance.
H3: Green Innovation Performance is positively related to Green Customer Capital.
H4: Green Innovation Performance positively mediates the Relationship Learning-Green Customer Capital link.

2.4 Method

2.4.1 Data Collection and Sample

In this research, we chose the sector of automotive component manufacturers in Spain (ACMS) because this industry presents high doses of knowledge-intensity, innovativeness, and customer orientation. Moreover, the ACMS presents special characteristics that differentiate it from other areas of activity (i.e., non-industrial



Source: Author´s

On the basis of the above statements, we hypothesize:
H2: Relationship learning is positively related to Green Innovation Performance.
H3: Green Innovation Performance is positively related to Green Customer Capital.
H4: Green Innovation Performance positively mediates the Relationship Learning-Green Customer Capital link.

Fig. 2.1 Research model and hypotheses. *Source:* Author's

sectors). These companies provide components and highly customized products and services to mainly major automobile manufacturers (e.g., Renault, Citroen, Ford, Peugeot). The sample is drawn from a list of "Sernauto", the Spanish Association of Manufacturers of Equipment and Components for the Automotive Industry (http://www.sernauto.es). From the 960 companies within this sector, 387 companies received the questionnaire. After two mailing efforts, the outcome is 112 usable surveys returned (a 28.94% response rate).

2.4.2 Measures

The survey was designed on the basis of the literature review present in this study. All of the questionnaire items used to measure the variables were seven-point Likert measurement scales rating from 1 = 'high disagreement' to 7 = 'high agreement'. Building on the previous work of Chen et al. (2006), eight items compose the scale for green innovation performance (GIP). For measuring green customer capital (GCC), we adapted a five items scale from Chen (2008b). Finally, we refer to Selnes and Sallis (2003) to measure relationship learning (RL) and its measurement includes 17 items. We have modeled RL as a second order construct shaped by three dimensions—information sharing, joint sensemaking, and knowledge integration—(see Appendix).

2.4.3 Data Analysis

The selected method for analysing data was structural equations modeling (SEM). Specifically, we relied on the use of Partial Least Squares (PLS), a variance-based SEM technique. This method simultaneously allows the assessment of the reliability and validity of the measures of theoretical constructs (outer model) and the evaluation of the relationships hypothesized among these constructs (inner model) (Barroso, Cepeda, & Roldán, 2010).

Following Roldán and Sánchez-Franco (2012), Partial Least Squares (PLS) is a suitable technique for this study because (1) the sample size (n = 112) is lower than 250 observations (Reinartz, Haenlein, & Henseler, 2009); (2) the study is oriented to predicting the dependent variables (Chin, 2010); (3) the model is complex because it has different types of variables—first and second order constructs—; and (4) latent variables scores are used in the subsequent analysis for predictive relevance (Hair, Hult, Ringle, & Sarstedt, 2014). For obtaining the results of our study, we have used the SmartPLS 3.0 software (Ringle, Wende, & Becker, 2014).

2.5 Results

We analyze and interpret the PLS model in two stages: (1) the assessment of the reliability and validity of the measurement model; and (2) the evaluation of the structural model.

2.5.1 Measurement Model

The evaluation of the measurement model shows that our results are completely satisfactory both for the first order construct and dimensions, and for the multidimensional construct.

Accordingly with Hair et al. (2014), the indicator's outer loadings should be higher than the 0.707 threshold. In this case, all standardized loadings are greater (Table 2.1). Second, all the variables comply with the construct reliability requirement, as their composite reliabilities (pc) surpasses the 0.7 level (Table 2.1). Moreover, these latent variables achieve convergent validity because their average variances extracted (AVE) surpass the 0.5 critical level.

Finally, all the variables attain the requirement of discriminant validity according to the Fornell-Larcker and the Heterotrait-Monotrait (HTMT) criteria (Table 2.2). Table 2.2 presents the comparison of the square root of AVE versus correlations. According to Fornell and Larcker (1981), to achieve satisfactory discriminant validity, the diagonal elements (in bold) should be significantly greater than the off-diagonal elements in the corresponding rows and columns. Besides, the HTMT

Table 2.1 Measurement model: loadings, construct reliability and convergent validity

Construct	Outer loading	Composite reliability	Cronbach alpha	Average variance extracted (AVE)
Relationship learning		0.968	0.950	0.909
IS	0.966			
JS	0.949			
KI	0.947			
Green innovation performance		0.933	0.916	0.636
GIP1	0.854			
GIP2	0.826			
GIP3	0.830			
GIP4	0.851			
GIP5	0.741			
GIP6	0.881			
GIP7	0.607			
GIP8	0.755			
Green customer capital		0.903	0.865	0.651
GCC1	0.811			
GCC2	0.830			
GCC3	0.896			
GCC4	0.794			
GCC5	0.690			

Source: Authors' own data

Table 2.2 Measurement model: discriminant validity

Fornell-Larcker Criterion				Heterotrait-Monotrait Ratio (HTMT)			
	GCC	GIP	RL		GCC	GIP	RL
GCC	**0.807**			GCC			
GIP	0.756	**0.798**		GIP	0.995		
RL	0.712	0.750	**0.954**	RL	0.994	0.998	

Source: Authors' own data

Notes: *GCC* green customer capital, *GIP* green innovation performance, *RL* relationship learning. Fornell-Larcker Criterion: Diagonal elements (Bold) are the square root of the variance shared between the constructs and their measures (AVE). Off-diagonal elements are the correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements

ratio of correlations evaluates the average of the correlations (Henseler, Ringle, & Sarstedt, 2015).

The Fornell-Larcker criterion fails to identify discriminant validity issues in the vast majority of cases because it only detects a lack of discriminant validity in more than 50% of simulation runs in situations with very heterogeneous loading patterns (i.e., 0.50/0.70/0.90) and sample sizes of 500 or less. In contrast, the Heterotrait-Monotrait (HTMT) criterion yields specificity rates of 80% or higher in terms of

Table 2.3 Structural model results

	Model A		Model B			
	$R^2_{GCC} = 0.328$		$R^2_{GCC} = 0.443$			
			$R^2_{GIP} = 0.476$			
Relationships	*Path coefficient*	*Support*	*Path coefficient*	*Percentile bootstrap 95% CI*		*Support*
				Lower	*Upper*	
H1: RL→GCC	0.410***(4.433)	Yes	0.571***(6.129)	0.355	0.772	Yes
H2: RL→GIP			0.636***(8.726)	0.421	0.960	Yes
H3: GIP→GCC			0.362***(3.849)	0.156	0.567	Yes

Source: Authors' own data

Notes: *GCC* green customer capital, *GIP* green innovation performance, *RL* relationship learning
t values in parentheses: t(0.05, 4999) = 1.645; t(0.01, 4999) = 2.327; t(0.001, 4999) = 3.092
*p < 0.05; **p < 0.01; ***p < 0.001

inter-construct correlations as high as 0.95, which many researchers are likely to view as indicative of a lack of discriminant validity. Exceptions occur in sample sizes of 100 and with lower AVE values. With respect to more homogeneous loading patterns, the Fornell-Larcker criterion yields much lower sensitivity rates, particularly when the AVE is low. Furthermore, HTMT yields sensitivity levels of 95% or higher under all simulation conditions. In general, the HTMT approach detects discriminant validity issues with higher reliability (Henseler et al., 2015). In this case, we can observe that RL, GIP and GCC are very correlated because their values are superior to the threshold level of $HTMT_{95}$.

2.5.2 Structural Model

Table 2.3 presents the variance explained (R^2) in the endogenous variables and the path coefficients for the two models under study (model A with direct relationships, and model B with indirect or mediating effect). Following Hair, Ringle, and Sarstedt (2011), we utilize a bootstrapping resampling technique (5000 resamples) to generate standard errors and t-values (t-statistics), which enables the evaluation of the statistical significance of the relationships considered in the models.

Table 2.3 also includes the three main direct links. We observe that the hypotheses are significant. In model A, the direct link between RL and GCC has a positive effect (c = 0.410; t = 4.433). When green innovation performance (GIP) is introduced as a mediator variable, the direct RL-GCC link becomes reduced. Thus, model B shows how the direct relationship between RL and GCC is lower than in model A (c′ = 0.571; t = 6.129). In addition, the paths for the RL-GIP (a = 0.636; t = 8.726) and GIP-GCC (b = 0.362; t = 3.849) relationships are as well statistically significant.

In Table 2.3, we also present the bootstrap 95% confidence intervals (percentile) for the indirect effect, which are always greater than zero (Baron & Kenny, 1986). It is used to test the mediation effect (Williams & MacKinnon, 2008). According to Chin (2010), this specific model in question including both direct and indirect paths, performing N-bootstrap resampling and finally multiplying the direct paths that make up the indirect path under evaluation.

2.6 Discussion and Conclusions

Plenty of research studies have argued the existence of a direct link between relationship learning and innovation outcomes or green innovation (Albort-Morant et al., 2016; Chen et al., 2009; Fang et al., 2011; Leal-Rodríguez et al., 2013). Besides, Chen (2008b) examines the links between relationship learning and green intellectual capital, which is at the core of the superior order concept of green customer capital. Another study by Leal-Millán et al. (2016) explains the relationship between green innovation performance and customer capital. However, the links between green innovation performance and relationship learning with green customer capital have been scarcely explored. Hence, building upon the previous literature, this chapter develops a research model that links these three constructs.

Results suggest that both the direct and indirect effects of relationship learning and green innovation performance on green customer capital are positive and significant. Moreover, the structural model supports that relationship learning mechanisms exerts a positive impact on green customer capital and that this influence is attained by reconfiguring and enhancing green innovation performance, finding support for the indirect effect of RL on GCC via GIP.

This chapter brings several relevant contributions both at the theoretical level and for practitioners. First, we introduce and define the concept of green customer capital for the first time. We believe GCC might become an interesting variable that should be considered by academics and managers, as it might act as catalyst for business performance and competitive advantage. Second, on the basis of the literature on relationship learning, green innovation performance and green customer capital, we have built a research model that demonstrates the direct and mediated relationships between these variables. Third, we empirically test the research model and hypotheses within a sample containing data from 112 Spanish automotive components manufacturing companies.

The main conclusion and practical implication that can be derived from our results is that relying on relationship learning mechanisms is critical in order to attain and enhance the firm's green customer capital. Therefore, companies ought to invest effort and resources in building relational capital with their different stakeholders (i.e., customers). Nevertheless, as our mediation hypothesis reveals, in order to create GCC it is not enough to foster RL strategies, but is advisable to transform this learning into green innovative outcomes. In other words, only that learning that conducts to GIP improvement will lead to GCC enhancement. Therefore, managers

at ACMS firms must orient their RL efforts to green-related issues, which might in turn lead to improving their GCC.

These managerial implications are even more meaningful for practitioners within the ACMS, since these firms are usually forced to operate in a context characterized by the development of joint projects and the establishment of narrow relationships with their customers. These firms' customers are not the end users of automotive vehicles but the large corporations that manufacture these vehicles (i.e., Renault, Peugeot, Ford, Citroen, etc.). In such context of close cooperation, ACMS companies may establish and reinforce strong ties with its customers, generating in turn a partnership relationship instead of the normal customer-supplier link. Hence, green innovation and relationship learning can be among the key strategies that should be encouraged at the managerial level in order to attain an enhanced customer capital.

However, this study is not deprived of limitations. First, we were able to provide just a snapshot of ongoing processes. Thus, we were unable to explore the subtleties of the processes over time. Further research should include a longitudinal study aimed at gathering measures at different points of time, which might allow us to verify the relationships proposed in our theoretical model. Second, the model in this study was general and it did not use control variables or other factors or variables, neither moderating effects. For this reason, for future studies we are planning to examine the moderating effect of environmental variables that we expect might influence the results. Finally, the study only considers the sector of automotive component manufacturing companies in Spain. It might be then interesting to change this particular geographical context (Spain) or this specific sector (ACMS) in further studies, in an attempt to generalize our insights and conclusions.

Appendix: Questionnaire Items

Relationship Learning (RL)

Relationship learning (RL): Information sharing (1 = high disagreement and 7 = high agreement). In my project team:

RL1 We exchange information on successful and unsuccessful experiences with products exchanged in the relationship with partners and suppliers.
RL2 We exchange information related to changes in end-user needs, preferences, and behavior.
RL3 We exchange information related to changes in market structure, such as mergers, acquisitions, or partnering.
RL4 We exchange information related to changes in the technology of the focal products.
RL5 We exchange information as soon as any unexpected problems arise.
RL6 We exchange information related to changes in the organizations' strategies and policies.

RL7 We exchange information that is sensitive, such as financial performance and know-how.

Relationship learning (RL): Joint sensemaking (1 = high disagreement and 7 = high agreement). In my project team:

RL8 It is common to establish joint teams to solve operational problems in the relationships with partners, suppliers and customers.
RL9 It is common to establish joint teams to analyze and discuss strategic issues in the relationship with partners, suppliers and customers.
RL10 The atmosphere in the relationship with partners, suppliers and customers stimulates productive discussion that encompasses a variety of opinions.
RL11 We have a lot of face-to-face communication in this relationship.

Relationship learning (RL): Knowledge integration (1 = high disagreement and 7 = high agreement). In my project team:

RL12 We frequently adjust our common understanding of end-user needs and behavior.
RL13 We frequently adjust our common understanding of trends in technology related to our business.
RL14 We frequently evaluate and, if needed, adjust our routines in order-delivery processes.
RL15 We frequently evaluate and, if needed, update the formal contracts in our relationship.
RL16 We frequently meet face-to-face to refresh the personal network in this relationship.
RL17 We frequently evaluate and, if needed, update information about the relationship stored in our electronic databases.

Green Innovation Performance (GIP) (1 = High Disagreement and 7 = High Agreement)

GIP1 The company chooses the materials of the product that produce the least amount of pollution for conducting the product development or design.
GIP2 The company chooses the materials of their products that consume the least amount of energy and resources for conducting the product development or design.
GIP3 The company uses the fewest amount of materials to comprise their products for conducting the product development or design.
GIP4 The company would circumspectly evaluate whether their products are easy to recycle, reuse, and decompose for conducting the product development or design.

GIP5 The manufacturing process of the company effectively reduces the emission of hazardous substances or wastes.
GIP6 The manufacturing process of the company effectively recycles wastes and emission that can be treated and re-used.
GIP7 The manufacturing process of the company effectively reduces the consumption of water, electricity, coal, or oil.
GIP8 The manufacturing process of the company effectively reduces the use of raw materials.

Green Customer Capital (GCC) (1 = High Disagreement and 7 = High Agreement)

GCC1 My firm designs its products or services in compliance with the environmental desires of its customers.
GCC2 My company's cooperative relationships about environmental protection with its upstream suppliers are stable.
GCC3 My company's cooperative relationships about environmental protection with its downstream clients or channels are stable.
GCC4 My company has stable and well cooperative relationships about environmental protection with its strategic partners.
GCC5 The customer satisfaction about environmental protection of my company is better than that of its major competitors.

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Chapter 3
Smart Cities, Innovation and Sustainability: Which Role for Cities in Fostering "Green" Entrepreneurship?

Claudia Ghisetti

Abstract This chapter aims at theoretically linking entrepreneurship and institutional conditions in the case of "smart cities". After discussing how agglomeration economies shape entrepreneurship through the main relevant body of literature, the chapter articulates on the concept of "smart city" and presents a newly collected dataset on a "smart city" for the Emilia-Romagna Region in Northern Italy. Elements that drive improvements in the "smartness" of a city are presented in order to derive policy implications and the theoretical linkages between entrepreneurship, particularly "green" entrepreneurship, and a peculiar case of such an institutional setting as a "smart city". The absence of proper data to test for a bi-directional causal link between entrepreneurship and smart city is discussed as a limitation of the current analysis and as a research line that deserves further investigation.

3.1 Introduction

The understanding of the linkages between entrepreneurship and institutional conditions requires, as a pre-condition, a deep analysis of how private economic agents are influenced by existing and foreseen policy settings and institutional frameworks. Those stimuli can, furthermore, vary according to the level at which the policy is implemented and the interaction with pre-existing policies and framework conditions that constitute the so-called policy mix. The chapter proposes to contribute to the understanding of such linkages by investigating how an entrepreneurial behaviour can be affected by a particular set of institutional conditions.

The main typology of entrepreneurship under scrutiny is "green" entrepreneurship, which is aimed at being oriented towards greener production, by means of the adoption of environmental innovations (EI). This latter term is defined as a

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production process, a service or management, or business methods that result, in a reduction of environmental risk, pollution and other negative impacts of the resources used (including energy use), compared to the relevant alternatives (Kemp & Pearson, 2007).

The body of literature on environmental innovations has dramatically expanded over the last few years, and a clearer picture of both the determinants and the effects of this particular type of innovation has been provided (Barbieri, Ghisetti, Gilli, Marin, & Nicolli, 2016). Such literature is quite heterogeneous, but overall it agrees with the fact that the main drivers for EI come from a combination of "market-pull", and "technology-push" factors, as well as "regulatory push-pull" factors, with institutional and framework conditions to be placed at the core of the agenda when aiming at understanding how to stimulate the pro-environmental behaviours of firms (for a review, Ghisetti & Pontoni, 2015)

What is quite neglected—and thus missing from the above-described picture—is the analysis of how particular institutional and framework conditions frame and influence these innovations: namely, the "smartness" of the city within which economic agents are located. The chapter proposes to review the concept of "smart city" and the associated taxonomies in order to help operationalise the concept, as described in Sect. 3.2. It then provides a discussion on the extent to which a "smart city" might be an institutional set up in which sustainability and innovation can coincide by putting particular emphasis on the development and adoption of EI in such a context of analysis.

A newly collected dataset is used to complement the analysis of sub-city evidence on the smartness of the cities. This dataset covers "smart cities" located in the Emilia-Romagna Region, in Northern Italy. Section 3.3 discusses the methodology, and Sect. 3.4 discusses results and concludes this chapter. The absence of proper data to test for a bi-directional causal link between entrepreneurship and smart city, and how the two might be mutually reinforcing is discussed as a limitation of the current analysis and, coherently, as a research line that deserves future investigation.

3.2 Conceptual Framework: Smart City and Entrepreneurship

The concept of "Smart City" has attracted the attention of policymakers, businesses and scholars in recent decades. Multiple approaches and views have been expressed and a broad picture has emerged as to what the requirements should be in for a city to be considered as a "smart city".

There is a consensus with respect to the role that digital infrastructure plays in shaping a "smart city", which is the availability and quality of a good information and communication technologies (ICT) infrastructure as the base for it to emerge. Globally, the concept of "smart city" is strongly intertwined with the concept of *knowledge base city*, *wired city*, *technocity*, *digital city*, and *creative city* (Tranos &

Gertner, 2012). The role of ICT infrastructure development in spurring economic performance on the one hand and the effects of human capital on urban development on the other hand are relationships whose investigation provided support for a positive correlation.

Berry and Glaeser (2005) present evidence that the tendency of skilled people to clusterise towards metropolitan areas is driven by the tendency of entrepreneurs to innovate and to consequently employ people on the basis of increasingly higher skills, so that an initially high level of skills and human capital is correlated with growth in the skill composition of cities. Fu (2007) extends this reasoning to the possibility for urban environments to particularly gain from localised knowledge spillovers, which in turn would make a city even "smarter" than it would have been in the absence of such knowledge flows. The idea that cities provide firms and entrepreneurs with higher business opportunities is not at all new, and it dates back to the first economic theories on firms' behaviour and location choices, and the exploitability of agglomeration economies that may occur.

3.2.1 Urban Agglomeration Economies and Entrepreneurship

Starting from the work by Marshall (1920) on explaining location choices of firms that depend upon spatial agglomerations and the availability of a pooled (specialised) labour market, a broad and articulated body of literature has emerged on agglomeration economies. Krugman (1991) suggests that manufacturing firms are locating in places with a larger demand, but also the reverse holds true, i.e. that the location of the demand itself is a function of the distribution of manufacturing. Transportation costs, economies of scale, and the share of manufacturing in national income are products of those crucial elements that need to be analysed for the full understanding of these core-periphery localisation trends. Overall, there is a broad body of literature on agglomeration economies that has been aimed at discussing if, how and under what conditions they emerge, and what are the information and technological flows that can be exploited (Audretsch & Fritsch, 1994; Barca, Mccann, & Rodríguez-Pose, 2012; Krugman, 1991; Marshall, 1920).

As recently argued by Storper and Manville, such a debate is still pertinent:

> Regions grow where firms congregate and no theory of urban resurgence can afford to ignore agglomeration economies. We remain unsure, however, of what generates agglomeration and, conversely, of what weakens it (Storper & Manville, 2006, p. 1249)

Furthermore, it is still unclear, and thus it is still under scrutiny, whether Marshallian specialisation (Marshall, 1920) or Jacobian diversification externalities (Jacobs, 1969) are more likely to favour regional innovativeness (Van Der Panne, 2004). The concept of "related variety" aims at enriching the picture and providing a synthesis (Frenken, Van Oort, & Verburg, 2007). Important differences have been underlined between "simple" or "more traditional" knowledge spillovers and the socialised process of local knowledge creation in terms of the relationship capital of

an area (Capello & Faggian, 2005). Agglomeration is discussed as being even more relevant for small- and medium-sized enterprises (SMEs), as it allows them to compensate for their size limitations by drawing on external spillovers which engender in their area. Entrepreneurship has thus been mainly explained through these local externalities (Capello, 2002) and the literature has moved to understanding whether the peculiarities of industrial districts in terms of availability of agglomeration economies might be transferred to urban areas.

The paper by Capello (2002) enters the stimulating debate of whether entrepreneurship, in the sense of the capacity of firms to be more competitive, is more influenced by urbanisation or localisation economies, and it does so by estimating a production function at the firm level in a particular metropolitan area (Milan, Northern Italy). The finding takes the direction of supporting the role of localisation economies, as factor productivity is found to be higher for firms (especially small firms) who gain from localisation economies. Such a broad and heterogeneous body of literature is thus not going to be properly revised in the current chapter, but it is crucial in the context of this analysis, as it provides the very starting point for understanding the role of "smart cities" in fostering entrepreneurship.

Such starting point is the recognition of the role of agglomeration economies for creating valuable business opportunities, and the possibility for cities to provide such agglomeration economies (Fujita, Krugman, & Venables, 2001). Cities may become even more advantaged via *dynamic* agglomeration economies, when knowledge spillovers stimulate innovative activities and create new goods or services over the long term (Storper & Manville, 2006).[1]

3.2.2 *Smart City Definition and Its Linkage to Urban Agglomeration Economies*

The concept of "smart city" is, in some way, connecting those multiple strands of theories and evidence, in supporting the view that ICT infrastructure, together with human capital substantially, drive urban growth. It is therefore argued that the stress on Internet as being the major smart city identifier no longer suffices, as it is a bias reflecting the focus on ICTs of the early 1990s, which is the time-frame in which this concept gained momentum (Caragliu, Del Bo, & Nijkamp, 2011). However, when searching for a "smart city definition" on the Web, Caragliu et al. (2011) suggests that no evidence of a proper definition has been found, such that the concept might be defined as a still being ill-defined or *fuzzy*. In his article "Will the Real

[1] This literature can be even further extended by looking at the studies on creativity and cities which have developed around the work of Florida (2002) and the related hot debate surrounding that work. This will bring the reader out of the main focus of the work, so that such literature is not going to be discussed (key references are: Berry & Glaeser, 2005; Boschma & Fritsch, 2007; Florida, 2002; Glaeser, 1997, 1998, 2005; Glaeser & Maré, 2001; Glaeser & Resseger, 2010; Knudsen, Florida, Stolarick, & Gates, 2008; Nathan, 2007; Shapiro, 2006).

Smart City Please Stand Up?", Hollands (2008) goes deeply into the vagueness of the concept and questions the need of facing such an unclear concept, when cities wrongly apply it for self-defining themselves as being smart, without providing any evidence that would properly support such a claim. The author explicitly refers to the "unspoken assumption" behind the "self-congratulatory" nature of smart cities. An agreement has been reached that the "smartness" of a city should be something more than its ICT infrastructure, so as to include elements such as social inclusion, the role of creative industries and sectors, the role of environmental sustainability, as well as a city's absorptive capacity for creating knowledge flows and spillovers (Caragliu & Nijkamp, 2012; Caragliu et al., 2011; Hollands, 2008).

Manitiu and Pedrini (2016) stress that:

> In order to become smart, it sounds plausible that a city looks for a balanced development of both physical and intangible infrastructures under a proper institutional framework […] but this is subject to environmental, social and cultural constraints as well as opportunities (Manitiu and Pedrini, 2016, p. 1783).

Although there is no agreement on the exact definition of a "smart city", the most established definitions are noteworthy. Extensive reviews are proposed by Tranos and Gertner (2012) and Caragliu et al. (2011). One of the first definitions provided, the Hall (2000) definition, is more ICT-centred, as it defines a "smart city" as a:

> Safe, secure, environmental and efficient urban centre of the future with advanced infrastructures such as sensors, electronic devices and networks to stimulate sustainable economic growth and a high quality of life.

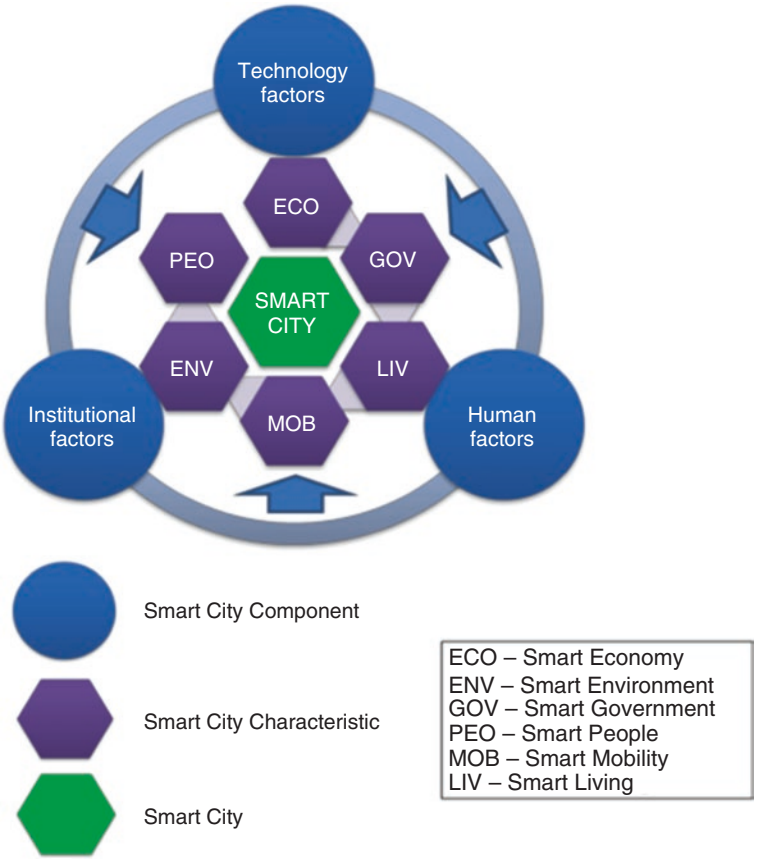
A good synthesis is provided by Caragliu and Del Bo (2012), who qualified a city smart as being:

> when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.

According to Giffinger et al. (2007), a "smart city" is instead a:

> well performing city in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens.

This definition encompasses elements which range from education, environment, quality of life and governance, and combines them together in a single framework. The heterogeneity in the approaches toward how to define a "smart city" is reflected in the difficulties there are in measuring it. One of the most established methodologies has been proposed by the Centre of Regional Science (SRF) of Vienna University of Technology in Austria, which has developed a conceptual framework along six main axes. This framework is strictly connected with the reviewed economic literature of the previous section, and elaborates on the report by Giffinger et al. (2007). This report provides a robust framework that is articulated in six dimensions—which will emerge in the next section—and it ends by proposing a ranking of 70 smart cities in Europe. This approach has emerged to be widely accepted and it will be the approach that is adopted in the remainder of this section,



Source: European Parliament (2014)

Fig. 3.1 Smart City framework. Source: *European Parliament* (2014)

as well as when the link between the literature that has been discussed thus far and the methodology and data are discussed.

3.2.3 Smart City Measurement and Green Entrepreneurship

Measuring a "smart city" is far from being an easy task, given the array of definitions and concepts behind it, which have been highlighted in the previous section. The methodological choice behind this chapter, draws on the generally accepted framework which has been synthesised into Fig. 3.1.

What is clear is that six dimensions (Smart Economy, Smart Governance, Smart People, Smart Living, Smart Environment, and Smart Mobility) contribute to the

overall concept of smart city. As far as the main research line of this chapter is concerned, entrepreneurship will definitely contribute to the Smart Economy dimension. As will be clarified in the next section, this dimension indeed captures economic backgrounds that are open for entrepreneurial activities. Augmenting entrepreneurship for a green component, i.e. analysing green rather than "standard" entrepreneurship, would instead contribute to improvements in the Smart Environment dimension. The latter is indeed capturing an environmentally sustainable city, and green entrepreneurship would be leading to win-win solutions whereby environmental improvements and economic gains are successfully combined.

The causal link between green entrepreneurship and the smart city may, however, also go the other way around (i.e. be the opposite of what would be expected). No theoretical or empirical contributions yet have analysed the other expected causal connection, that of between smart city and green entrepreneurship. Whether it can be hypothesised that living in smarter cities can contribute to increasing levels in green entrepreneurship, so far no evidence has been collected that would confirm/exclude this hypothesis. This latter point is out of the scope of this chapter, given the lack of proper data with which to test for such causality. It therefore remains as an interesting future research line.

3.3 Method and Empirical Context

This chapter makes use of a novel and recently constructed dataset in a selected Italian Region, which is exploited in order to shed light on the (mainly institutional) drivers and barriers that favour (or hamper) the achievement of smart city targets in administrations with different sizes and characteristics. Such a case study, upon which the dataset has been constructed, the Emilia Romagna Region, is of crucial importance: it is one of the most industrialised and innovative regions (NUTS 2) in Italy, and it is a relevant case for analysis, given its innovation-oriented institutional setting and its peculiar economic conditions. Furthermore, as stated in Truffer and Coenen (2012), the body of sustainability transition literature is extremely damaged by its spatial blindness and the marginal role devoted (thus far) to the role of regions and sub-national levels in driving sustainability.

The originality of the current analysis is that it aims at contributing to fill this gap and shedding new light on how institutions—and in particular smarter cities under a sub-national dimension of analysis—are "smarter". As explicitly mentioned in the "Cities of Tomorrow" Report by the European Commission:

> The importance of small- and medium-sized cities should not be underestimated. A large part of the urban population live in small- or medium-sized cities spread across the continent. These cities play a role in the well-being and livelihood not only of their own inhabitants but also of the rural populations surrounding them. They are centres for public and private services, as well as for local and regional knowledge production, innovation and infrastructure (European Commission, 2011, p. 4).

The methodology chosen to construct the Regional "Smart City Index" for the municipalities is grounded on the following methodologies: European Smart Cities (Giffinger et al., 2007), the ICity Rate (Forum PA, 2015), and the Smart City Index by Ernst & Young (Between, 2014).

Overall, 90 indicators have been selected, which revolve around six dimensions of smartness: Smart Economy, Smart Environment, Smart Governance, Smart Living, Smart Mobility, and Smart People. Each dimension is built via relevant thematic areas, which have been fine-tuned by the Emilia Romagna Region and ASTER and each of which is covered by multiple indicators, again selected by the working group.

Smart Economy here thus captures an economic background that is open for entrepreneurial activities, including those by women and foreigners, and which can attract innovative enterprises and combine those with traditional sectors. It revolves around the thematic areas of (1) attractiveness; (2) Innovative firms and medium high-tech; (3) IT of ICT firms; (4) Research and Development and (5) Entrepreneurship Dynamism. The latter reflecting the Schumpeterian creative destruction cycle by looking at how dynamic a municipality is, in terms of entry and exit of its entrepreneurial activity, and thus its dynamism.

Smart Environment reflects an environmentally sustainable territory in which the local administration can proactively search for a reduction in environmental pressures. It covers the following thematic areas: (1) Energy savings in buildings; (2) Renewable sources; (3) "Green" or environmental enterprises; (4) Air quality; (5) Waste recycling and disposal; (6) Green areas.

Smart Governance relates to having a financially stable and sound public administration, which utilises ICT to improve its connections with citizens, including having transparent and open data. This dimension is built according to the following thematic areas: (1) Institutional set-up; (2) Open Data; (3) e-Government; (4) Social participation; (5) Interactive services and (6) Degree of institutional planning.

Smart Living is a broad concept and it relates to a territory which offers cultural, touristic, social and health services, and which utilises ICTs to improve its supply to citizens. It covers the areas of (1) Cultural offers; (2) Libraries; (3) Schools and related services; (4) Social services, and (5) Tourism.

Smart Mobility relates to a place that is characterised by a deep attention towards the needs of citizens in terms of mobility, either by using ICTs for handling mobility services or by being oriented towards sustainability and reduction in emissions related to transportation. It also includes promoting the use of shared economy practices for transport and commuting among citizens. It is linked to the thematic areas of: (1) Interactive services for mobility; (2) Public transportation; (3) Car accident rate; (4) Commuting facilities; (5) orientation towards a Sustainable and Smart Mobility.

Smart People captures most of the contributions that have been highlighted in a review of the literature (e.g. Glaeser, 2005) and is related to the roles of creative people, the availability of a highly educated and skilled labour force, and more broadly the human capital a city can count on. It permits to also capture the participation of citizens and the exploitability of ICTs and infrastructures that allow such human capital to improve its social and working conditions, and how the sharing

Table 3.1 Main variables of descriptive statistics

Variable	N	Average	Standard deviation	Min	Max
Economy	340	15.66	6.514	6.682	85.78
Environment	340	30.17	6.103	18.53	44.94
Governance	340	32.57	11.66	12.36	94.21
Living	340	24.21	9.062	1.786	68.14
Mobility	340	25.73	7.817	10.29	81.33
People	340	20.46	5.867	9.871	67.60
SmartER	340	24.80	5.755	14.87	72.76
Contiguity	340	0.306	0.461	0	1
Dps1 (Belt)	340	0.500	0.501	0	1
Dps2 (Intermediate)	340	0.241	0.428	0	1
Dps3 (Peripheral)	340	0.159	0.366	0	1
Dps4 (Pole)	340	0.0618	0.241	0	1
Dps5 (Intermunicipality Pole)	340	0.0206	0.142	0	1
Dps6 (Ultraperipheral)	340	0.0176	0.132	0	1
POP 2014	340	13,096	31,593	83	384,202

Source: Authors' own data

economy can shape this dimension. It captures the areas of: (1) Cultural demand; (2) Creative works and co-working; (3) Employment rates; (4) Internet use and digital literacy; (5) Education.

Globally, the methodology followed has been derived from existing established methodologies and frameworks of analysis, and for methodological details the reader can refer to the official report (Regione Emilia-Romagna, 2016). What is new, and it is the main originality of the current exercise and dataset, is that it is the first attempt that goes beyond the typical "border" of a "smart city", in that it refers to all of the 340 municipalities of the Region and it exploits mainly municipal-level data. The existing methodologies for measuring a "smart city" were instead meant to represent only large- or medium-sized cities. This is crucial, given the structure of the selected Region and the specific mention by the EU Parliament regarding the need of not leaving small cites behind.

Out of the 340 municipalities of the Emilia-Romagna Region, 88 are micro-sized (with less than 3000 inhabitants), 60 are small-sized (3001–5000 inhabitants), 136 are medium-sized (5001–14,999 inhabitants), 56 are medium-large-sized (15,000–49,999 inhabitants), and only 13 are large-sized, with more than 50,000 inhabitants. In terms of population, 60% of the regional population live in smaller municipalities. Furthermore, what is lacking is a body of literature (both theoretical and empirical) that can be taken as a reference with respect to the role of "smart city" for a peculiar type of entrepreneurship, that is the "green" entrepreneurship.

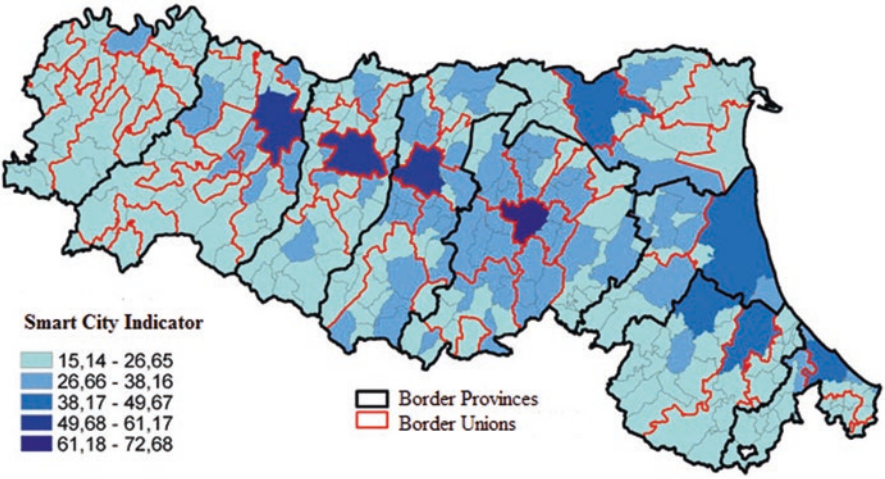


Fig. 3.2 Distribution across Emilia-Romagna Region of the values of Smartness. *Source:* Regione Emilia-Romagna (2016)

3.4 Main Evidence and Discussion

The final indicator of "smart city", which will be labelled from now on as SmartER, shows a deeply heterogeneous picture when it comes to the smartness values of the 340 municipalities with a minimum value of 15.14 and a maximum value of 72.68 (Table 3.1). Figure 3.2, extracted from the Report by Emilia-Romagna Region (2016), reports such a heterogeneous picture.

As entrepreneurship and "green" entrepreneurship are clearly intrinsic components of a "smart city" index that is constructed in such a way, meaning that they enter the index as direct indicators which are aggregated in their own dimensions, the current exercise does not allow creating any inference regarding any causality between a "smart city" and its green entrepreneurship. In other words, the relationship between SmartER and entrepreneurial activities in environmentally-related fields in those cities cannot be properly modelled within this dataset, as the latter are by construction positively correlated with the final level of the index.

What the current chapter proposes is thus to investigate which are the structural conditions that help in improving the overall smartness of a city

Ordinary Least Squares (OLS) estimations were used to correct for heteroscedasticity and were are carried out on seven selected models, having as a dependent variable, respectively, the fully aggregated index (SmartER), as well as its six dimensions (Economy, Environment, Governance, Living, Mobility, and People).

As for the explanatory variables, the number of citizens in 2014 (POP 2014), the contiguity to one of the administrative centres, built according to a properly constructed 0–1 contiguity matrix (Contiguity), and the structural characteristics (DPS)

are controlled for. The aim is to investigate which are the structural and institutional conditions that favour the smartness of a city/municipality.

Structural and Institutional characteristics (DPS) are constructed according to the Department for Development and Economic Cohesion classification methodology (http://www.dps.gov.it/it/index.html), on the basis of the presence of specific public services and (in case they are lacking) on the basis of the distance (in terms of time) to the sites having those services, which are defined as the Poles.

Overall, municipalities are grouped into six DPS categories: Pole (21 municipalities), Intermunicipality Poles (7 municipalities), Belt (170 municipalities), Intermediate (82 municipalities), Peripheral (54 municipalities) and Ultra-Peripheral (6 municipalities).

From Table 3.1, the dimensions differ in the distributive properties among the municipalities, being for instance Governance, which on average is performing better but also has a higher variation (standard deviation equal to 11.66 points).

Before moving to the main results, it is noteworthy that, given the cross-sectional nature of the dataset constructed, the regressions analysis this presented has to be read in terms of mere correlations, rather than in terms of proper causation linkages.

Table 3.2 reports the main results, differentiated by the dimensions of smartness under scrutiny.

Most of the heterogeneity in the results is explained by the DPS, as areas that are defined as Poles or Inter-municipal Poles having higher values than the peripheral areas, as can be expected. As higher values are recorded for the administrative centres, the variable Contiguity captures the role that living close to an administrative centre has for increasing the smartness of neighbouring municipalities.

What emerges from Table 3.2, is that proximity matters for most of the dimensions. As an exception to that, *Economy* seems not to be statistically influenced by the proximity to a centre. On the contrary, *Environment* is negatively associated with proximity, and rather than being beneficial for positive knowledge externalities, municipalities close to the administrative centres are damaged by their negative externalities. *People*—taken as a pure control variable—is slightly, but positively, associated with smartness. As stated in Sect. 3.2, such an analysis might benefit if it is properly extended to account for the role of green entrepreneurship in shaping both Smart Environment and Smart Economy. This is left for future research, given the outlined data constraints.

3.5 Conclusions and Implications

Whether a "smart city" is an institutional context that favours "green" entrepreneurship still deserves a deep investigation, as no evidence has emerged thus far, and an appropriate dataset to empirically investigate for such linkages is missing. In principle, it can be expected (and also tested, but in future research) that the peculiarity of a "smart" institutional context and the combination of the six dimensions of

Table 3.2 OLS estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SmartER	Economy	Environment	Governance	Living	Mobility	People
Contiguity	0.8852**	-0.0535	-1.4039**	2.8807**	1.4671*	1.3582**	1.3749**
	(0.4183)	(0.4173)	(0.5496)	(1.1929)	(0.8820)	(0.5748)	(0.6840)
Dps1 (Belt)	3.1580***	0.7193	-13.2765***	11.2075***	14.4656***	4.2294***	1.4149
	(1.1234)	(1.2940)	(1.1425)	(2.4181)	(2.0176)	(1.5367)	(1.3520)
Dps2 (Intermediate)	2.1704*	-0.3488	-7.0579***	7.6099***	10.8218***	1.8157	-0.5547
	(1.1541)	(1.2830)	(1.1847)	(2.4575)	(2.1523)	(1.5589)	(1.4061)
Dps3 (Peripheral)	2.5780**	1.1882	-3.1463***	4.5105*	9.9546***	2.8619*	-1.2657
	(1.1707)	(1.3058)	(1.1806)	(2.4997)	(2.2644)	(1.6259)	(1.5142)
Dps4 (Pole)	3.0697**	0.1463	-12.5455***	8.8078**	11.9943***	6.7438***	3.4708*
	(1.5062)	(1.6832)	(1.7007)	(3.8262)	(2.8592)	(2.5504)	(1.9357)
Dps5 (Interm. Pole)	5.0397***	0.5439	-14.1113***	16.7728***	18.5746***	6.9373***	3.7666**
	(1.6111)	(1.4612)	(2.2655)	(4.4265)	(2.6631)	(2.3968)	(1.5869)
POP 2014	0.0001***	0.0002***	0.0000***	0.0002***	0.0001***	0.0002***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Constant	19.7349***	12.7498***	39.9286***	19.9105***	9.5050***	18.9111***	17.5799***
	(1.0875)	(1.2541)	(1.0596)	(2.2727)	(1.9048)	(1.4726)	(1.2730)
N	340	340	340	340	340	340	340
R^2	0.7071	0.8023	0.5081	0.4784	0.3478	0.6679	0.5061

Source: Authors' own data
Standard errors in parentheses
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

smartness that are the building components of a "smart city" would favour "green" entrepreneurship.

It is expected that a "smart city" would provide a valid opportunity for a "green" entrepreneurial context that allows innovations in environmentally related fields and technologies. After discussing the most relevant literature and findings on the linkages between "smart city" and entrepreneurship, and the main methodologies used to define and measure a "smart city", the chapter has proposed a newly-collected dataset for the Emilia Romagna Region, in Italy. Such a dataset presents the opportunity to extend the analysis of "smartness" from administrative centres and cities to smaller municipalities. This would provide fuel for future research that would aim at crossing the standard boundaries of the city in order to investigate the smartness of a place.

Empirical analysis has been performed on these data in order to outline which are the main elements (mainly institutional and structural) that affect the overall smartness of the municipalities under scrutiny. The results suggest that Poles and administrative centres face significantly higher smart levels, and the contiguity to a centre influences its smartness. Overall, it seems to emerge that peripheral municipalities are structurally unable to obtain significantly high levels of smartness that would increase (in principle) green entrepreneurship, while poles would face higher probabilities for such an event. This would call for proper policies that would be directed to fill this location gap, which is not providing equal and comparable opportunities.

Future research is, however, needed in order to shed more light on how "green" entrepreneurship and the "smart city" are related, and how this linkage is affected when the boundary of the city is extended to also include municipalities, and not leave small- and medium-sized cities lagging behind on this "smart path". The dataset that was used, and similar extensions towards a panel data structure, would allow to make proper inferences and to establish a clear causation between the two elements. Thus far, its cross-sectional nature, and the presence of indicators of entrepreneurship and start-ups in building the overall aggregated index, do not allow to operationalise such an extension.

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Chapter 4
How Cultural Beliefs and the Response to Fear Appeals Shape Consumer's Purchasing Behavior Toward Sustainable Products

Nuria Rodríguez-Priego and Francisco J. Montoro-Ríos

Abstract This study examines how cultural beliefs and other cognitive processes related with the response to fear appeals can contribute to explain why consumers choose to purchase goods produced by sustainable companies. For this purpose, it tested the Cultural Cognition Theory and the Protection Motivation Theory as determinants of consumers' purchasing behavior. There are two independent ordered probit regression models that examine the relationships between the proposed independent variables and the behavior of respectively punishing non-sustainable companies and rewarding sustainable companies. Results show that the more egalitarian and the less hierarchical individuals are, the more they will reward sustainable companies. Besides, consumer's behavior toward the companies is determined by their perception of environmental threat and their perceived response efficacy. These outcomes are relevant for companies seeking to differentiate their products and their image to improve the positioning in the market, and for governments aiming at increasing citizens' awareness toward global climate change.

4.1 Introduction

Global climate change has become unequivocal and one of the most significant environmental issues in recent years. Scientists coincide regarding the current precarious state of the environment. The 2015 United Nations Climate Change Conference COP 21 held in Paris emphasizes the urgent need to reduce the global annual emissions of greenhouse gases by 2020. According to this agreement, the aggregate emission pathways should hold the increase in the global average

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temperature to well below 2 °C above pre-industrial levels. Furthermore, countries should pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels (UNFCCC, 2015).

Environmentally concerned individuals are aware of these problems. They will support efforts to solve them, and will be willing to contribute personally to their solution (Dunlap & Jones, 2002, p. 485). Consumers who are concerned with global warming will try to take into account their involvement when purchasing (Datta, 2011; Laroche, Bergeron, & Babaro-Forleo, 2001; Mainieri, Barnett, Valdero, Unipan, & Oskamp, 1997). Engagement in pro-environmental behavior has increased in the last decades from a consumer's perspective (Dunlap, Gallup, & Gallup, 1993; Schultz, 2002). A review of past studies suggests the existence of different factors related to green behavior. There are two major streams (Dietz, Stern, & Guagnano, 1998): studies focused on socio-demographic factors and studies of values, beliefs and other socio-psychological constructs related to environmentalism. In the first line, there are many studies stating that demographic variables are associated with environmental commitment (Straughan & Roberts, 1999). Age has been examined by a number of researchers (e.g. Aaker & Bagozzi, 1982; Anderson & Cunningham, 1972; Samdahl & Robertson, 1989; Straughan & Roberts, 1999), although some studies reveal contradictions in their findings and are far from being conclusive, as the relationships are sometimes not significant (e.g. Barr, 2007; Diamantopoulos, Schelegelmich, Sinkovics, & Bohlen, 2003; Fraj & Martinez, 2006; Gatersleben, Steg, & Vlek, 2002). Similar results are shown when focusing on research concerning income, education and place of residence as environmental determinants, with certain studies stating opposite relationships between the variables (Kinnear, Taylor, & Ahmed, 1974; Samdahl & Robertson, 1989; Van Liere & Dunlap, 1981; Zimmer, Stafford, & Stafford, 1994).

The second stream attempts to explain environmentalism through psychological theories. It applies attitudes, values, beliefs and norms as determinants of behavior (Ajzen, 1991; Dunlap & Van Liere, 1978; Poortinga, Steg, & Vlek, 2004; Stern, 2000). In this research, we have focused on this second approach, considering that people differ when evaluating environmental problems as they diverge in their perceptions (Dunlap & Jones, 2002; Milfont & Gouveia, 2006).

The objectives of the present research are twofold. First, to examine whether individuals' beliefs may have an effect on their behavior. Second, to identify potential paths that may help change their behavior to more sustainable options, focusing on them as the target public.

The present study tests two theories to increase the understanding of consumers' behavior related with sustainable companies. First, regardless of the scientific consensus about environmental hazard, it seems that individuals still differ in their personal beliefs toward the issue (Maibach, Roser-Renouf, & Leiserowitz, 2009). The Cultural theory asserts that group membership might determine individuals' beliefs as patterns that become repetitive and predictable inside a cultural group (Schwarz & Thompson, 1990, p. 6; Kahan, Braman, Gastil, Slovic, & Mertz, 2005). Second, to understand the factors that influence fear, the Protection Motivation Theory (PMT) proposes that individuals protect themselves based on the perceived severity

of a threatening event, and the perceived self-efficacy of their behavior among other factors (Maddux & Rogers, 1983).

The outcomes presented could be helpful for corporations considering changing their production chain in order to include environmental care, as consumers will consider this when purchasing. In addition, they might consider the possibility to improve their communication strategies with the purpose of increasing consumers' awareness about the pro-environmental actions on behalf of companies so as not to miss any information that could distort the image that the corporations want to offer in an integrative way.

On the other hand, governments aiming to enhance citizens' pro-environmental behavior should focus on improving their perceived threat of global climate change, while also attempt to make them aware of the positive outcomes of their pro-environmental actions, so their perceived self-efficacy could increase and, as a consequence, their pro-environmental behavior.

This chapter begins with a literature review on Cultural Cognition and Protection Motivation. Section 4.3 describes the methods. Section 4.4 presents the results and discussion. Finally, Sect. 4.5 discusses the conclusions.

4.2 Conceptual Framework

Cultural Theory

The first theoretical approach that we apply in the present research is the Cultural Cognition. This theory is a subsequent development of the grid-group Cultural Theory (CT: Douglas, 1978; Thompson, Ellis, & Wildavsky, 1990). It states that there are two trends concerning the definition of culture. First, some authors refer to culture as mental constructs. This definition includes all the values, beliefs, norms, and biases related to individuals' membership to a cultural group. Second, it refers to the social relations that determine individuals' behavior and attitudes. Both ideas integrate the CT as ways of life (Thompson et al., 1990). This theory was further developed by Schwarz and Thompson (1990, p. 61) and others (Douglas, 1992; Douglas & Wildavsky, 1982; Wildavsky, 1987) and named the Four Political Cultures or CT. It answers two central questions about the existence of human beings: 'Who am I?' and 'How should I behave?' (Wildavsky, 1987). On the one hand, it argues that individuals' relationships to groups determine personal identity. It means that cultural groups affect individuals who incorporate to them (group dimension). On the other hand, behavior depends on the social circumstances to which an individual is subject (grid dimension), the degree to which an individual's life is circumscribed by other's instructions.

According to this approach, our knowledge, our actions, our way of justifying what we do and our judgments of people's behavior are all biased. Schwarz and Thompson postulated the existence of these Political Cultures in terms of individuals' perception of risk. Each is a package of biases that explains the view of one's surroundings. Thus, the two dimensions of sociality (group and grid) generate four

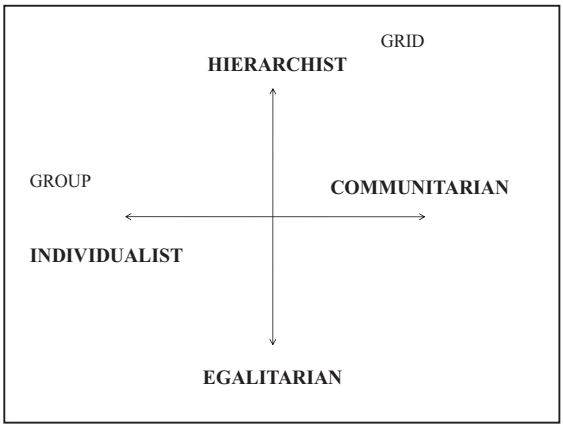

Fig. 4.1 Cultural cognition worldviews. *Source:* Kahan (2008)

basic forms of social relationships (Schwarz & Thompson, 1990, p. 6): Fatalism, Hierarchy, Individualism and Egalitarianism. Dake (1992) also proposed four separate scales to measure political attitudes identifying the quadrants isolated by grid and group dimensions.

Consequently, CT has three main claims and three propositions (Mamadouth, 1999). The first claim assumes that culture matters and everything that individuals do is culturally biased. The second claim is that we can only distinguish a limited number of cultural types with the grid-group dimensions. Third, we can apply the typology of viable combinations anywhere, and at any time, as they are universal. Concerning the propositions, the first is the compatibility condition meaning that we cannot combine social relationships and cultural bias contrary to each other as they must remain consistent and coherent. The second proposition is the impossibility theorem that states that there are only four ways of live. The third proposition is the variety condition meaning that the different typologies depend on each other to be viable.

CT is being tested empirically (Kahan, Braman, Gastil, Slovic, & Mertz, 2010). These authors developed a new approach called Cultural Cognition (CC) that asserts that individuals have different perceptions of risk, as mentioned above, and classifies them in four types of worldviews or supportive values.

Initially, CC used Dake's scales to measure worldviews while using two continuous attitudinal scales instead of four (Jenkins-Smith, 2001; Jenkins-Smith & Herron, 2009; Silva & Jenkins-Smith, 2007). The purpose was to avoid Dake's problems of multiple competing orientations in one individual, or low reliability of the measurement scales. One of the scales is for "Hierarchist-Egalitarian" and depends on the individual's orientation for high or low *grid*. The other scale measures the orientation toward weak or strong *group* ways of life, and it distinguishes between "Individualist-Communitarian" (see Fig. 4.1). CC eliminates the *Fatalism* option.

An individual with an individualistic worldview will give less importance to the group and collective interests will be less important than individual needs. This worldview will support less communitarian social order and collective needs will be secondary. The worldview of a communitarian individual, in contrast, will be the

opposite. Regarding the grid axis, a hierarchical individual will think that resources, opportunities, duties and rights depend on the social level while an individual with a low grid worldview will consider that society has to be egalitarian in the distribution of resources, opportunities, duties and rights.

The properties of the scale make it well suited for testing Douglas and Wildavsky's theory (Kahan, 2008). Public risk perception should be correlated with a combination of cultural worldviews and the position of an individual in the "grid-group" map, as hypothesized by Douglas (1985, p. 54). The present paper uses the items cited as a "short form" version of the scales. There are four latent variables, two for each axis as in Fig. 4.1 (Hierarchist vs Egalitarian; Individualist vs Communitarian). This paradigm states that individual perceptions of different hazards depend on cultural values (Douglas & Wildavsky, 1982). Thus, people from a particular dimension will assign similar reasons for events that are different from other dimensions.

Views of Nature

Douglas (1998, p. 98) has taken CT a step further by applying it to the view that individuals have about nature. The task of CT is to decompose the elements of this argument and show how each derived view of nature relates to a distinct vision of society. Schwarz and Thompson (1990) followed this theory stating that each view has a way of organizing and is predatory in terms of time, space and resources. A ball in a landscape as in Table 4.1 can graphically represent these four views. The category 'Nature Gradual' is a new proposal added by Leiserowitz and Smith (2010).

Protection Motivation Theory

This theory postulates that there are three main components of fear appeals that can drive an attitude change. The three components are the magnitude of danger of an event, the probability of occurrence, and the efficacy of the protective response (Rogers, 1975). PMT factors are 'threat-appraisal,' and 'coping appraisal.' The 'threat-appraisal' refers to the likelihood, severity and immediacy of the situation perceived by the individual. It is the individual's perception of the degree of harm that the event will cause and the probability of suffering from it. The 'coping appraisal' is the process related with individual's ability to cope with and prevent the threat. It consists of three elements. The first is the response efficacy, or effectiveness of the recommended behavior to prevent the harm. The second is the self-efficacy, as the belief that the individual can perform the recommended behavior to prevent the harm. The third is the response cost which is associated with the recommended behavior. Both the response efficacy and self-efficacy constructs derive from previous psychological theories such as the Self-Efficacy Theory (Bandura, 1977, 1982), and now define the PMT coping appraisal and many other psychological theories.

PMT explains individuals' behavior and attitude change when confronted to fear appeals of different type such as health related behavior (Pechmann, Zhao, Goldberg, & Reibling, 2003; Rippetoe & Rogers, 1987), but also pro-environmental behavior (Axelrod & Lehman, 1993; Bockarjova & Steg, 2014; Kim, Jeong, & Hwang, 2012). The last approach is of interest to this manuscript as it aims to answer what factors guide pro-environmental behavior and may help explain why individuals decide to buy products from companies that respect the environment (Fig. 4.2).

Table 4.1 The five views of nature

View of nature	Description	Representation
Benign	Nature provides global or stable equilibrium. In spite of what happens, the ball will always return to the bottom of the basin. This *laissez-faire* attitude is held by the managing institutions. There are abundant resources.	
Capricious	Random world. Members do not have any particular view concerning the environment. The situation of the resources is a lottery. Institutions with this view of nature do not really manage or learn but just cope with erratic events.	
Tolerant	The world is forgiving of most events, but is vulnerable to an occasional knocking of the ball over the rim. Resources are scarce, but controllable. The managing institutions must therefore regulate and control against unusual occurrences. It accepts that the small risk of disaster necessitates government regulation, but once minimum standards have been met, management should be free to make its own decisions. There are acceptable environmental risks that can be determined by experts.	
Gradual	Earth's climate is slow to change. Global warming will gradually lead to dangerous effects. It is represented by a ball in an inclined landscape.	
Ephemeral	The world is a terribly unforgiving place and the least jolt may cause a catastrophic collapse. There is a precarious balance of the ball on the landscape. The managing institutions must treat the ecosystem with great care as resources are depleting.	

Source: Adapted from Schwarz and Thompson (1990, p. 5) and Leiserowitz and Smith (2010)

In the context of pro-environmental behavior, the threat appraisal relates to individuals' perceived vulnerability to environmental hazards. If they feel vulnerable to climate change, they will be willing to act in consequence. The coping appraisal relates to the efficacy that individuals perceive of their actions to reduce climate change (response efficacy) or if they think they can have an effect in reducing global climate change. It also relates to the capacity that they believe to have to carry out these actions (self-efficacy).

4.3 Methods

4.3.1 Respondents and Procedure

We conducted in Spain an online survey developed by the Yale Project on Climate Change Communication. The original project examined the level of concern of the American population and provided several subgroups depending on their beliefs

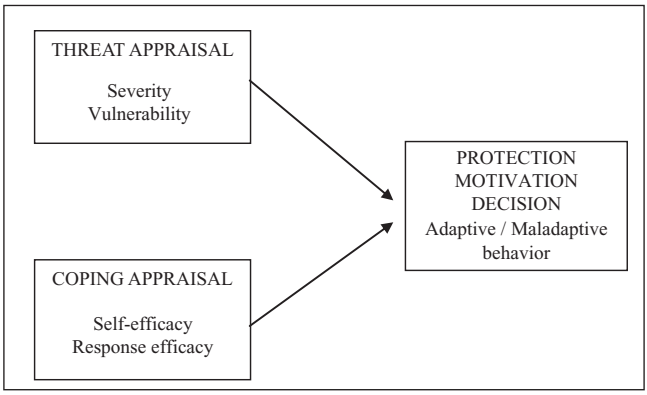

Fig. 4.2 Conceptual model of Protection Motivation Theory. *Source:* Adapted from Rogers (1983)

and behavior.[1] For the Spanish project, a total of 835 completed questionnaires were returned corresponding to an overall response rate of 75%. Yet 233 were excluded from the final data base since the time of response was considerably lower than the average (16 min) that participants spent in the pre-test questionnaire. The total final sample consisted of 602 individuals with females representing 52%. The ages ranged between 18 and more than 75 years distributed as shown in Table 4.2.

4.3.2 Measures

Dependent Measures

The survey measured two behavioral outcomes related with pro-environmental companies. The first behavioral measure was that of rewarding companies that were taking steps to reduce their impact on global warming by buying their products. The second behavioral measure was punishing companies that were not taking steps to reduce their impact on global warming by not purchasing their products. A single item measured each of the two variables and answers ranged in a [1–5] scale as in Table 4.3.

Independent Measures

Cultural Cognition Theory

There were four scales to measure each type of culture according to this theory. Participants have to provide their level of agreement with several statements in a 6-point Likert scale to be classified according to the four cultural types: hierarchist, egalitarian, individualist and communitarian. The software used in the online survey mixed and presented randomly the items corresponding to Individualist and

[1] http://climatecommunication.yale.edu/about/projects/global-warmings-six-americas/.

Table 4.2 Sociodemographic distribution

Sample	n = 602
Gender[a]	
Males	48
Females	52
Ages[a]	
18–24	13
25–34	22
35–44	20
45–54	24
55–64	17
65–74	4
75+	1
Education[a]	
Lower than high school	3
High school	11
Some college	40
Bachelor's degree	46

Source: Author's
[a]Data given in percentages

Table 4.3 Dependent measures

Variable	Item	Answer
Reward	*During the last 12 months, how frequently have you rewarded companies that were taking steps to reduce their impact on global warming, by buying their products?*	1. Never 2. Once 3. A few times (2–3) 4. Several times (4–5) 5. Many times (6+)
Punish	*During the last 12 months, how frequently have you punished companies that were taking steps to reduce their impact on global warming, by not buying their products?*	1. Never 2. Once 3. A few times (2–3) 4. Several times (4–5) 5. Many times (6+)

Source: Author's

Communitarian cultural types. The same happened with the items corresponding to Hierarchist and Egalitarian cultural types. All the items are presented (Table 4.4).

View of Nature

This construct was measured as indicated in Table 4.1 where each vision sees the environment as more fragile and delicate to spoil than the previous version.

Protection Motivation

The threat appraisal was measured through three separated items (see Table 4.5). The first aimed to measure the perceived personal severity and vulnerability of global climate change ('Threat_personal') while the second aimed to measure the perceived severity and vulnerability that future generations have to global climate

change ('Threat_future'). The third aimed to measure the perceived severity and vulnerability that plants and animals would have to global climate change ('Threat_animals').

The coping appraisal was measured through three separated items (see Table 4.6). The first item was reversed and measured individuals' perceived response efficacy, meaning if their actions had any effect on global climate change ('Coping_individual'). The second measured the response efficacy of the actions that individuals are already taking ('Coping_personal'). The third measured the response efficacy of this same actions if they were taken at a broader scale, meaning in all the industrialized countries ('Coping_industrialized').

4.4 Empirical Findings and Discussion

4.4.1 Reward Model

An ordered probit regression model tested the effect of the different independent variables on the behavior of rewarding companies for taking steps to reduce global climate change. For this purpose, the ordered probit model includes cultural cognition constructs ('individualist, communitarian, egalitarian and hierarchist') as independent variables. This is followed by view of nature ('nature'). Regarding PMT we have included both threat and coping appraisals as described in the previous section, with three separate items for each of them. Finally, we decided to also include socio-demographic variables such as gender, age and education to test if any of them had an effect in the dependent variable (see Table 4.7). The sample was reduced to n = 576 as several subjects avoided ~~to~~ answering the item related with the rewarding behavior.

The results reveal that individuals who are more egalitarian and less hierarchical will more frequently revert to the behavior of rewarding companies for taking steps to reduce global climate change (95% level of confidence). This is consistent with the literature on cultural cognition theory. However, individualism and communitarianism have no effect on the rewarding behavior. Contrary to what we expected, the construct 'view of nature' has no effect on this behavior.

Regarding the PMT, we see that only one of the items related with the threat appraisal has an effect. This means that individuals who feel global warming as a personal threat, and perceive its severity and their vulnerability, will be more willing to reward pro-environmental companies (p-value < 0.05). The items related with the coping appraisal show the expected effect. Participants who feel that their response has an effect on global warming, will perform the adaptive response. The three coping items, with a 99% level of confidence, show a significant effect on the behavior of rewarding pro-environmental companies.

Finally, there is no effect of any of the socio-demographic variables included in the model (gender, age and education) on the behavioral outcome.

Table 4.4 Cultural cognition measures

Variable	Item	People in our society often disagree about how far to let individuals go in making decisions for themselves. How strongly you agree or disagree with each of these statements? [1 = Strongly disagree; 6 = Strongly agree]
Individualist	1	The government interferes far too much in our everyday lives.
	2	It's not the government's business to try to protect people from themselves.
	3	The government should stop telling people how to live their lives.
	4	Too many people today expect society to do things for them that they should be doing for themselves.
	5	People who are successful in business have a right to enjoy their wealth as they see fit.
Communitarian	6	Sometimes government needs to make laws that keep people from hurting themselves.
	7	The government should do more to advance society's goals, even if that means limiting the freedom and choices of individuals.
	8	Government should put limits on the choices individuals can make so they don't get in the way of what's good for society.
	9	It's society's responsibility to make sure everyone's basic needs are met.
	10	People should be able to rely on the government for help when they need it.
Variable	Item	People in our society often disagree about issues of equality and discrimination. How strongly you agree or disagree with each of these statements? [1 = Strongly disagree; 6 = Strongly agree]
Hierarchist	11	We have gone too far in pushing equal rights in this country.
	12	A lot of problems in our society today come from the decline in the traditional family, where the man works and the woman stays home.
	13	The women's rights movement has gone too far.
	14	It seems like criminals and welfare cheats get all the breaks, while the average citizen picks up the tab.
	15	It seems like minorities don't want equal rights, but want special rights just for them.
Egalitarian	16	Our society would be better off if the distribution of wealth was more equal.
	17	We need to dramatically reduce inequalities between the rich and the poor, migrants and non migrants, and men and women.
	18	Discrimination against minorities is still a very serious problem in our society.
	19	It's old-fashioned and wrong to think that one culture's set of values is better than any other culture's way of seeing the world.
	20	We live in a sexist society that is fundamentally set up to discriminate against women.

Source: Author's

Table 4.5 Threat appraisal measures

Variable	Item	Answer
Threat_personal	*How much do you think global climate change will harm you personally?*	4-point Likert scale [Not at all – A great deal]
Threat_future	*How much do you think global climate change will harm future generations of people?*	4-point Likert scale [Not at all – A great deal]
Threat_animals	*How much do you think global climate change will harm plants and animals species?*	4-point Likert scale [Not at all – A great deal]

Source: Author's

Table 4.6 Coping appraisal measures

Variable	Item	Answer
Coping_individual (reversed)	*The actions of a single individual will not make any difference in global warming.*	4-point Likert scale [Strongly disagree-Strongly agree]
Coping_personal	*Think back to the energy saving actions you are already doing and those you would like to do over the next 12 months. If you did most of these things, how much do you think it would reduce your personal contribution to global warming?*	4-point Likert scale [Not at all – A great deal]
Coping_industrialized	*If most people in the modern industrialized countries around the world carried out these same actions, how much would it reduce global warming?*	4-point Likert scale [Not at all – A great deal]

Source: Author's

4.4.2 Punish Model

We repeated the regression model using the same approach as in the previous behavior. An ordered probit regression model tested the effect of the different independent variables on the behavior of punishing companies for not taking steps to reduce global climate change. Hence we tested the same independent variables as in the previous subsection (see Table 4.8). The sample was reduced to n = 598 as several subjects avoided answering the item related to punishing behavior.

The results show that none of the cultural cognition types have an effect on the behavior of punishing companies that are not pro-environmental. This result contrasts with that found for the behavior of rewarding.

As to the PMT, we found that only one of the items related with the threat appraisal has an effect as in the case of the previous model. This means that individuals who feel that global warming as a personal threat, and perceive its severity and feel vulnerable, will be more willing to reward pro-environmental companies (95% level of confidence) and to punish anti-environmental companies (99% level of confidence). The items related with the coping appraisal also reveal the expected

Table 4.7 Ordered probit regression for the reward behavior

Factors	Coefficient	Std. error	z	P>|z|	[95% Conf. interval]	
Individualist	0.0560	0.0583	0.96	0.337	−0.0582	0.1702
Communitarian	0.0157	0.0643	0.24	0.807	−0.1104	0.1418
Egalitarian	0.1222**	0.0591	2.07	0.039	0.0064	0.2380
Hierarchist	−0.1036**	0.0478	−2.17	0.030	−0.1973	−0.0099
Nature	0.0533	0.0412	1.29	0.196	−0.0275	0.1341
Threat_personal	0.1812**	0.0744	2.44	0.015	0.0354	0.3270
Threat_future	−0.0301	0.1137	−0.26	0.791	−0.2530	0.1928
Threat_animals	−0.0008	0.1085	−0.01	0.994	−0.2135	0.2119
Coping_individual	0.1603***	0.0448	3.58	0.000	0.0725	0.2481
Coping_personal	0.2349***	0.0644	3.65	0.000	0.1086	0.3611
Coping_industrialized	0.2406***	0.0713	3.37	0.001	0.1008	0.3803
Gender	−0.1062	0.0942	−1.13	0.260	−0.2907	0.0784
Age	0.0001	0.0035	0.04	0.967	−0.0067	0.0070
Education	−0.0463	0.0632	−0.73	0.463	−0.1701	0.0774

Source: Author's
****p < 0.01*; ***p < 0.05* Number of observations = 576
LR chi2(13) = 112.99 Prob > chi2 = 0.0000
Pseudo R2 = 0.0668 Log likelihood = −789.00958

effect. Participants who feel that their response has an effect on global warming, will perform the adaptive response which in this case means punishing anti-environmental companies. The three coping items show a significant effect on the behavior of punishing companies for not taking steps to reduce global climate change ('Coping_individual' and 'Coping_personal' at a 99% level of confidence, and 'coping industrialized' at a 95% level of confidence).

Finally, as in the rewarding model, there is no effect of any of the socio-demographic variables included in the model (gender, age and education) on the behavioral outcome.

4.5 Conclusions and Implications

The purpose of this chapter was to separately explain and predict two behavioral outcomes. The first is how consumers are rewarding companies that are committed to global climate change reduction. The reverse behavior is also happening and consumers are punishing companies that are not engaging in environmental protection as reflected in their refusal to purchase their products.

The tested models show that different factors predict the behaviors of rewarding and punishing. In the first case, the cultural cognition theory partially explains why people choose to buy products to reward pro-environmental companies, and this effect increases the less hierarchical and the more egalitarian individuals are.

Table 4.8 Ordered probit regression for the behavior of punish

Factors	Coefficient	Std. error	z	P>|z|	[95% Conf. interval]	
Individualist	−0.0013	0.0579	−0.02	0.982	−0.1148	0.1122
Communitarian	0.0411	0.0631	0.65	0.515	−0.0827	0.1649
Egalitarian	0.0691	0.0581	1.19	0.234	−0.0447	0.1829
Hierarchist	−0.0827	0.048	−1.7	0.08	−0.177	0.011
Nature	0.064	0.041	1.5	0.117	−0.0162	0.1459
Threat_personal	0.2276***	0.0724	3.14	0.002	0.0856	0.3695
Threat_future	0.0785	0.1107	0.71	0.478	−0.1385	0.2954
Threat_animals	−0.0882	0.1053	−0.84	0.402	−0.2947	0.1182
Coping_individual	0.1164***	0.0445	2.61	0.009	0.0291	0.2037
Coping_personal	0.3086***	0.0641	4.82	0.000	0.1830	0.4341
Coping_industrialized	0.1402**	0.0714	1.96	0.050	0.0003	0.2802
Gender	−0.1542	0.0928	−1.66	0.096	−0.3360	0.0276
Age	0.0032	0.0034	0.93	0.352	−0.0035	0.0099
Education	0.0248	0.0622	0.40	0.690	−0.0970	0.1467

Source: Author's
****p < 0.01*; ***p < 0.05* Number of observations = 598
LR chi2(13) = 115.61 Prob > chi2 = 0.0000
Pseudo R2 = 0.0640 Log likelihood = −844.75822

PMT is also useful ~~to~~ in explaining both the behaviors of rewarding and punishing companies. As a result, institutions planning to enhance individuals' pro-environmental purchasing behavior should focus on improving the efficacy of perceived response. They should make people aware of the possibilities that the adaptive behavior may bring to the scene, making them conscious of the positive outcomes of their pro-environmental actions.

Besides, the results obtained in the present study could be helpful to corporations contemplating changing their production chain in order to include environmental care as consumers will consider this when facing purchasing decisions.

In addition, they might consider the possibility to improve communication strategies with the purpose to increase consumers' awareness about the pro-environmental actions they are taking, so as not to miss any information that could distort the image that the corporations want to offer.

Finally, the present research has limitations since it only considers reported behavior. In future research we would recommend to measure real behavior as it may differ from what individuals report. Besides, the present results cannot be generalized to the other sectors of the population as there is a convenience sample that only includes participants with access to the internet.

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Chapter 5
Sustainable Social Management: The Case of Co-operatives

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Abstract Co-operative societies are significant in Andalusia, given the fact that the regional Social Economy leads the national outlook. Scientific literature generally supports their socioeconomic impact and business social responsibility, which are studied, as a whole rather than in detail, with regards to environmental aspects. Despite the global situation regarding the need to enhance energy efficiency, the manner in which these co-operatives take it into account is not clearly shown. Consequently, this research provides a series of effective measures for CO_2 emission mitigation and energy efficiency improvement. Thus, the aim was to understand the sustainable responsibility of co-operatives by means of CO_2 emission evaluation and their sources. Additionally, this research enquires into the available supporting economic incentives that are proposed and describes effective mitigation measures supported by the regulations regarding prevention and environmental quality. A participatory analysis of the selected co-operatives was also performed with a view to defining economic-environmental indicators and to provoking a gradual improvement of sustainability concerning their performance. The outcomes of this research reveal the scarce concern of companies with regards to the energy consumption and the economic and environmental impact. In conclusion, co-operatives need to optimise the social management from defined environmental practice in order to modify their behaviour. Their strategic direction has to encompass climate change risks and opportunities in their analysis and control systems. In this sense, this clearly specific commitment of co-operatives establishes a rising tendency to guarantee a stable productive model with minor atmospheric pollution.

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5.1 Introduction

Energy consumption, carbon dioxide emissions (CO_2) and their minimisation are descriptors supported at international, national, business, and academic levels. Experts in this field assure that the atmospheric alterations caused by carbon dioxide emissions are not variable (Solomon, Plattner, Knutti, & Friedlingstein, 2009). Concerning the estimated cost of technology and its relationship with atmospheric CO_2 levels, the current debate resorts to the prospect of technological progress at the service of exploration and the elimination of negative effects (Cantore & Padilla, 2010; Zeman, 2014).

The international duty is to fight global warming, which constitutes the basis of the popular commitment of the United Nations Framework Convention on Climate Change (UNFCCC): the Kyoto Protocol (1998) and the Paris Agreement (COP21) in 2015. Concretely, at a formal level, the latter lacks the signature of the majority of countries (the signature process started on 22/04/2016 and will expire on 21/04/2017) and the ratification to come into force. Regarding the content, there is an urgent need to solve the significant discrepancy between the aggregate effects of national mitigation promises, this is expressed in terms of annual emissions of greenhouse gases (GHG) in 2020, and Section II.17 which establishes raising the compatible financial tendencies with a low-GHG-emission trend. The key to this lies in a compulsory objective: "to hold the increase in the global average temperature to "below" 2 °C above pre-industrial levels by reducing emissions to 40 gigatonnes or to 1.5 °C above pre-industrial levels". Afterwards, each country will undertake "voluntary mitigation actions" for national GHG emissions. This may lead experts to require concrete actions for efficient GHG reduction policies (Cantore, 2011; Herold, 2012; Robiou, Jeffery, Guetschow, Christoff, & Meinshausen, 2016).

Similarly, latest news point towards GHG reduction with fluctuations of approximately 7% in Spain over recent years, bearing in mind the current economic crisis, and the increase of 3.2% in 2015 (EEA, 2016). These data reveal the simple effect of economic deceleration, and support the debate on the subject of environmental policies. In particular, Spain emitted 339.3 tons of GHG in 2015 (EEA, 2016), while reasserting its commitment to the Paris Agreement (COP21) in terms of GHG reductions of 40% for 2030.

The national actions on GHG emission reduction are precarious (Alcántara & Padilla, 2009), and CO_2 emissions historically tend to rise (Escolano & Padilla, 2009; Iglesias, 2013), which occasions infringement of Community Directives and distance from the international commitment. The irregularity is clear, since, for instance, the Peninsular Spanish Electricity System recorded a significant decrease of annual variation of −137.63% total CO_2 emissions in May 2016 (WWF-España, 2016). Therefore, on the one hand, the Spanish evidence demonstrates that the economic growth by itself does not entail a reduction in pollution. This constitutes the main thrust of scientific analyses on the relationship between economic growth and environmental pressures (Jusmet & Padilla, 2003).

On the other hand, according to EEA (2016), the Community evidence reveals an overall reduction of 24.4% in GHG emissions accompanied by a 47% increase in gross domestic product (GDP). GHG emissions decreased in the majority of sectors between 1990 and 2014. In absolute terms, GHG emissions have decreased by 1383 megatonnes (Mt) in the EU since 1990, reaching 4282 Mt of equivalent CO_2 in 2014. This reduction over the 24-year period was due to a variety of factors: the proliferation of renewable energies; the use of low-carbon fuels and improvements in energy efficiency; structural changes in the economy; the climate; and, a broad regulatory framework based on the principles of prudence, prevention, correction of pollution within its source and the key 'polluter pays' principle (e.g., Regulation EU No 540/2011 implementing directives regarding the monitoring and notification of GHG emissions).

This reality supports the academic sphere that considers the achievement of an international agreement in the long term by means of actions on energy efficiency (Cansino, Cardenete, Ordóñez, & Román, 2016), changes in energy and patterns of production and consumption, as well as technological innovation (Borghesi, Crespi, D'Amato, Mazzanti, & Silvestri, 2015; González-Eguino, 2011; Mace, 2011). In the words of Arto, Roca, and Serrano (2012), the compliance with the emission reduction does not have a regulatory nature, but it represents a resource applied to the environmental policy of many regions. The policies mitigating climate change effects are defined and also applied to geographical areas with specific climatological conditions (Baró et al., 2014; Freire-González & Puig-Ventosa, 2014; García de Jalón, Iglesias, Quiroga, & Bardají, 2013), thereby being considered mainly local. On the contrary, as stated by Cochran (2015), the climatic action at a local level may be determined by the GHG inventory and the tools related to emission measurements on a given territory (for instance, PACES 2016, Spanish acronym for Action Plan for Sustainable Climate and Energies of Seville). In this regard, recent studies on models for the evaluation of CO_2 emissions have taken place in Andalusia (Cardenete, Fuentes, & Polo, 2008; Mercader, Ramírez De Arellano, & Olivares, 2012).

The business sphere is defined when considering the general scenario about the evaluation of emissions as a key element in the production of strategies and plans for lessening climate change. Thus, the ecological role of companies is the joint responsibility, then also known as 'environmental liability' (Russi & Martínez-Allier, 2002), with respect to a significant percentage of the total of GHG emissions (Chik, Rahim, Radam, & Shamsudin, 2013; Montoya-Torres, Gutiérrez-Franco, & Blanco, 2015; Ostad-Ahmad-Ghorabi & Attari, 2013; Qiu, Wang, & Wang, 2015). Accordingly, in 2014 the Spanish Climate Change Office of the Ministry of Agriculture, Food and Environmental Affairs, specified GHG emissions from fixed sectors such as industrial and energy facilities, which represent slightly less than half of Spanish emissions (45%). The ten largest businesses were shown to be responsible for 29% of the total emitted. In general, there are many publications on the environmental impact of companies, and especially their scarcities and challenges (Ortiz, Izquierdo, & Monroy, 2013; Reinosa, Guzmán, & Sánchez, 2014; Úbeda, De Burgos, & Ureña, 2011). Other authors indicate that the businesses focus on the environmental image (Camisón, 2010; Khanna, van der Voordt, & Koppels,

2013), although they may not consider the social awareness. According to Sueyoshi and Wang (2014a), companies can reach the balance between economic prosperity and environmental concern. Conforming to the Carbon Disclosure Project (CDP, 2015), there are more investments in initiatives aimed at reducing climate change impacts. Moreover, there has been a significant decrease in GHG emissions from Spanish companies within the last 5 years, mainly due to the management of energy efficiency and investments (Balabanov, Balabanova, & Dudin, 2015; Melnik, Lukishina, & Khabibrakhmanov, 2013; Wang, Li, & Sueyoshi, 2014).

As explained by Qiu et al. (2015), the treatment of the phenomenon of energy efficiency, a scenario of profitable energy technologies, regularly appears in the industrial sector. In order to face the prevailing global warming, companies utilise energy efficiency to reduce energy consumption, i.e., the evaluation of the energy efficiency, and the potential reduction of CO_2 emissions in the electricity sector have increased, given the fact that the energy savings allow increasing productivity and competitive advantage (Uddin, Rahman, & Memon, 2011; Wei, Löschel, & Liu, 2015). Reducing the impact of GHG is a business challenge, taking into consideration the environmental impacts as part of the integrated strategy and the business planning, under the implementation of specific and updated techniques (Meinrenken, Sauerhaft, Garvan, & Lackner, 2014).

Particularly, co-operatives are substantial businesses in Andalusia, given the fact that Social Economy leads the national outlook (Law 5/2011), representing more than 70% of all the companies created. According to official data, there were 42,929 Social Economy entities in Spain at the end of 2015 (20,258 co-operatives). Significant economic sectors in the country are cornered by the co-operative business, such as Unide (food industry), Cajamar (credit), Atlantis (insurance) and Ilunion (multi-sectoral). This group of social companies produces 10% of Spanish GDP (CEPES-España 2016) and generates employment, local development, social cohesion, and innovation. Experts consider this economic, social sector to be sufficiently important so as to have its own space in the social dialogue. However, despite having permanent public support, their environmental behaviour is not characteristic, as denoted by the scarce literature.

The co-operative societies are subjected to the principles of democratic participation in their decisions, autonomy of the management, and the primacy of human beings over the capital. Being regulated as Social Economy businesses, and promoting a solidarity-based economy, these companies emerge in a specific area in the use of endogenous resources. They are based on the economic principles of respect for the environment and social cohesion, and they are also pioneers in the practice of social responsibility (Barrera, 2008). It is worth noting that co-operatives especially champion a series of values, such as co-operation, training, economic participation, democratic management, etc., which ratify process improvement. These values derive from sustainable responsibility, and this is also worth verifying, for instance in the automated measurement of the carbon footprint and an equilibrated improvement plan. It is time to observe if this business reality contributes to the minimisation of the environmental impact, or if it could be considered a responsible sector, and whether these societies spread alternative consumption values or not. Therefore,

it should be convenient to investigate the environmental reality of Andalusian co-operatives.

From that background the issue of this research arises: 'the lack of knowledge of the amount of CO_2 emitted and the possibility of reducing it in co-operatives'. Thus, the aim of this research is to 'understand and improve the sustainable responsibility of co-operatives by means of measurements of CO_2 emissions'. To achieve this, a calculation methodology was performed on a sample of co-operatives in Seville. Hence, this research is considered a pilot enquiry on selected co-operative businesses of the industrial and services sectors, and therefore becomes explanatory and based on empirical reflections. The future intention is to extrapolate the behaviour of a representative sample of co-operatives in the Andalusian Social Economy sector from the model which is defined ahead.

The lack of prior enquiries allows this research to be classified as explanatory and exploratory, and as a predecessor of future scientific effort. As with other studies on the environmental impact of SMEs, this research focuses on the reduction of emissions using measures to increase energy efficiency (Gazi, Skevis, & Founti, 2012; Kostka et al., 2013; Thollander et al., 2015). Finally, this chapter is organised into the following four sections: initially, the review of the scientific literature that designs the conceptual model; subsequently, the description of the methodology; then, the results of this research; finally, the conclusions and implications.

5.2 Literature Review

Concerning the academic field, there are three topics in this research: co-operatives; measurement of CO_2 emissions; and environmental impact, among which individual scientific treatment is common, but global treatment is not, with the related literature having a sectoral scope (Senise, Torres, Parras, & Murgado, 2008). Along this line, the empirical evidence in relation to the energy efficiency is mostly associated with the building sector (Sozer, 2010). Nevertheless, co-operative societies are treated in terms of their socioeconomic impact (Carmona, Martínez, & Pozuelo, 2013), and business social responsibility (Galappaththi, Kodithuwakku, & Galappaththi, 2016; Glock, Jaber, & Searcy, 2012), which is studied as a whole rather than in detail with regard to environmental aspects. This is due to the fact that they are social companies, as they help to prevent and solve common problems (Borzaga, Depedri, & Galera, 2012; Cardozo, 2003; Chaves & Monzón, 2012).

Therefore, the literature shows localised experiences, mostly in Asian countries (Ren, Yuan, Ma, & Chen, 2014), but not in Spain (Arias et al., 2014). In this way, the academic field acknowledges that studies at the micro level are scarce, generally due to data limitations (Wei et al., 2015). Furthermore, Asian experiences should be explored even more, inasmuch as it is the territory in which the advanced mitigation technologies are more easily utilisable (Xie, Zeng, Zou, Tam, & Wu, 2013).

It is worth mentioning that the weaknesses of the state of the literature are the limited empirical results in Spain and Andalusia (Anaya-Romero et al., 2015), and

in international alliances in the field of research. Notwithstanding, there is abundant scientific literature regarding the economy of climate change (Cantore & Padilla, 2010), and the reduction of emissions and investment in low-carbon technologies. Laing, Sato, Grubb, and Comberti (2014) consider that the evidence in connection with both technological innovation and investment impacts is not significant. At the same time, the strengths reside in the numerous studies that support the minimisation of CO_2 emissions (Faccio, Persona, & Zanin, 2013), in particular, in the following production activities: services sector (Alcántara & Padilla, 2009); steel sector (Watkins, Makela, & Dahl, 2010); construction sector (Van den Heede, Maes, Gruyaert, & De Belie, 2012); naval sector (Doudnikoff, Gouvernal, & Lacoste, 2014); and, aluminium sector (Milford, Allwood, & Cullen, 2011).

The consulted literature includes diverse measurement methods: Social Accounting Matrix (SAM) with Environmental Accounts (Cámara, Flores, & Fuentes, 2013), and the Data Envelopment Analysis (DEA) econometric technique. These techniques treat numerous variables, such as the growth rate of CO_2 emissions, the corporate sustainability, or the quantitative evaluation by means of the operational performance and the reduction of CO_2 emissions (Díaz-Vázquez & Cancelo, 2010; Sueyoshi & Wang, 2014a, 2014b). With regard to the theoretical implications, this methodological diversity in measuring the environmental impacts (e.g. carbon footprint) implies a lack of international consensus on the most appropriate method. In addition, any calculation may be affected by the limited availability of the data, and by the uncertainty surrounding the key variables. Every conceptual framework should be validated using real data. The results and experiences are mostly generalised in order to display the obstacles and challenges during the measurement task (Montoya-Torres et al., 2015). For their part, the empirical implications contribute to knowledge and practice on environmental management. This influences the managerial process of the decision making, since the findings are useful and can be extrapolated to the preparation of the operation strategy (Sueyoshi & Wang, 2014b). Those proposals guide corporate managers and political leaders by providing quantitative assessment for actions, and information concerning the means to invest, influence and/or correct the reduction of non-desired outputs (Sueyoshi & Wang, 2014a). It is essential to divulge these findings to influence the oncoming enhancement (Úbeda et al., 2011).

This research is based on three topics: co-operatives; measurement of CO_2 emissions; and environmental impact. The scientific literature develops these topics and analyses the relationships between them. For its part, this research is supported by theories, defended by certain authors and opposed by others, such as those indicated by Bermejo, Arto, Hoyos, and Garmendia (2010): the theory of "dematerialisation" of the growth, or decoupling of the growth of the physical base (Herman, Siamak, & Ausubel, 1990); theory of "decarbonisation" (Nakicenovic, 1996); and, the theory of the positive relationship between economic growth and environmental protection, regarding energy consumption (Jalil & Mahmud, 2009). The latter theory is known as the Environmental Kuznets Curve (EKC) hypothesis (Panayotou, 1993), defined from the Kuznets Curve (1950), which has been supported for decades and justified on the basis of the growing per capita income, and the decrease in certain

environmental impacts by some countries (Figueroa & Pastén, 2009; Iglesias, 2013; Jusmet & Padilla, 2003).

The related literature has increased strongly in recent years, which may have been caused by the current economic crisis. This has boosted the continuous growth of low-carbon economy (Britton & Woodman, 2014), and the business managers' commitment to the energy efficiency policy (Melnik, Ermolaev, & Antonova, 2014). Accordingly, this research deals with resource consumption, and the measurement and decrease of environmental and economic impacts. Table 5.1 reveals the main motivation of this research, included in the approach of the scientific literature. Numerous studies are mostly empirical and descriptive, and lack precise methodological and measurement proposals. This research is intended to overcome that situation, and pave the way for future studies.

In relation to the treatment of co-operatives, it is clear that they constitute a universal legal form. Their social impact is chiefly explored, as illustrated by Brazilian experiences (Burke, 2010; Gutberlet, 2012). With regard to the environmental intervention of Social Economy, the performance and consideration for electricity consumption by co-operatives are emphasised. The territorial scope of the empirical demonstrations resides once again in China, but not in Spain. Next, the business sphere acknowledges the necessity of reducing CO_2 emissions via energy savings. Notwithstanding, the vast majority of the studies do not quantify them, but focus on energy savings measures such as those concerning office computer equipment and technological innovation. Once the industrial pollution has been identified, businesses deal with the environmental impact throughout their process design.

As stated by Agan et al. (2013), SMEs do not acquire the scientific interest they deserve, despite their significance in the national economy and pollution. By the same token, studies referring to co-operative societies and energy efficiency are placed in a marginal position, i.e., dealing with environmental issues in social companies does not seem to be frequent. This situation may change in the current planning period of the European Union, as the 2020 objectives for a smart, sustainable, unifying development involve those with respect to climate and energy. Certainly, at least 20% of the total EU budget for the 2014–2020 period is earmarked for projects and policies related to the climate towards a low-carbon economy, where social companies may find opportunities and be defenders of a transition process based on values of sustainability and social justice. Accordingly, meeting the demands of Social Economy Europe (SEE), the European Parliament recognised the Social Economy sector as part of the planning for economic, budgetary policies of the EU within its 2020 Strategy. Experts generally use the terms 'emerging sectors' and 'new employment sources' to refer to environmental or energy development activities, which can also be applied to co-operative societies. Therefore, it is only a matter of time before the scientific community explores this potential.

5.3 Method and Empirical Context

The methodology followed in this research comprises the observation, documentary analysis of businesses and in-depth interviews with the managers of three cooperatives (Khanna et al., 2013). In order to measure the selected variables, the essential data are gathered and analysed. Thus, an 'analysis model' is established with a quantitative component (ton CO_2 eq. inventories, economic assessment of measures, and period of return on investment (ROI)), and another qualitative part (list of improvement measures and enquiry into public economic support). This research provides a calculation methodology, and emission factors of scope 1 (gas, fossil fuel) and scope 2 (electricity) emitting sources (consumption), applied to specific social companies. The conceptual framework is the Regulation UNE-EN ISO 14064-1:2012 (last version on 02/04/2015), specifically the section concerning the specification for the GHG emission assessment at organisation level, which establishes one of the most well-known methodologies for the evaluation of GHG emissions on the basis of the Greenhouse Gas Protocol (GHG Protocol) of the World Resources Institute (MAGRAMA, 2015). Certain protocols for the estimation and evaluation of GHG emissions allow organisations to quantify their carbon footprint,

Table 5.1 Literature review

Topics	Authors	Key premises
Co-operatives	Arnáez (2011)	The appearance of the first electricity co-operatives (first half of the twentieth century) and these as a source of experimentation with new models of electricity consumption and generation. Their commitment to energy savings
	Osti (2012)	Realistic description of Italian co-operatives specialised in environmental services, and risible development of this economic activity
	Bermejo (2013)	The role of energy co-operatives as a development initiative of energy transition. Whilst the cost of renewable energies decreases, the number of energy co-operatives increases in Europe
	Llanos, Astigarraga, Jacques, and Picasso (2013)	Analysis of the production system from the strategic point of view, by means of an input-output model of fossil energy consumption to enhance energy efficiency
	Butcher and Xu (2014)	The behaviour of agricultural co-operatives against the environmental taxation in China
	Zhu and Guo (2015)	The environmental impact of rural co-operatives of an Asian area is detailed
	Jaio, Paredes, and Sánchez (2016)	It is considered that energy efficiency improvement measures are valid to palliate energy poverty. The socioeconomic profile of the partner of green co-operatives is described, as well as and their behaviour in relation to the social tariff for energy

(continued)

Table 5.1 (continued)

Topics	Authors	Key premises
Measurement of CO_2 emissions	Feng and Joung (2011)	Measurement of the sustainability of manufacturing industries using decision-making instruments: carbon emissions and energy consumption
	Kovács (2012)	An experience of efficiency in the SME biodiesel sector through technological modernisation, and the novel application and reutilisation of process materials
	Neves-Silva, Marques, Campos, Wolff, and Sucic (2012)	Data gathering of CO_2 emissions considered an inflow and support for commerce between companies
	Scott and Watson (2012)	There is business consensus regarding the necessity of reducing carbon emissions derived from energy consumption. Green technologies (cloud computing) are magnified on that basis
	Malmodin, Lundén, Moberg, Andersson, and Nilsson (2014)	Based on the life cycle of information and communication technologies (ICT) in Sweden, the assessments of the usage of global operation electricity and carbon footprint are conducted
	Tseng, Lee, Lin, and Chang (2016)	The significance of the SME sector in Taiwan and its CO_2 emissions are examined. It is explained how Internet (energy management in the Cloud EMS) reduces the costs of energy and carbon dioxide
	Yazan (2016)	Combinations of Sustainable Production Chains (Joint Production Chains JPCs) are proposed in order to evaluate the potential environmental benefits of co-operative actions via a business input-output (EIO) model
Impact on environment	Clarke-Sather, Hutchins, Zhang, Gershenson, and Sutherland (2011)	The organisational culture is increasingly taking into account the measurement of the business sustainability performance. This can be conducted through the measurement of the increasing performance in business sustainability, using systems of already existing sustainability indicators, or a system of own creation indicators. The latter is more difficult for SMEs
	Agan, Acar, and Borodin (2013)	The role of SMEs in industrial pollution in Turkey is addressed based on exploratory research on environmental processes (removal, reduction, and recycling systems) and impact upon business results
	Ramos, Cecílio, Douglas, and Caeiro (2013)	As companies face the environmental impact by means of environmental management instruments: reports, methods, audits, etc.

Source: Own production

considered as the total impact of an organisation on the climate through GHG emission to the atmosphere.

Firstly, a semi-structured questionnaire was designed and later tested by the Planning and Economic Analysis (SEJ230) research group. This questionnaire was applied to three cooperatives. The variables under study were selected: electricity consumption (Llanos et al., 2013; Qiu et al., 2015; Wang & Li, 2014) and gas consumption (Monfort et al., 2010; Thollander et al., 2015). In addition, the subsequent calculation take into consideration: indirect emissions of the organisation throughout a natural year (an extended period of time of 12 months, in the case of 2015) (Monfort et al., 2010); the partial condition of the organisation's activity in calculation scopes 1 + 2; and the data gathering concerning natural gas and electricity consumption. According to Neves-Silva et al. (2012), the energy consumption is a standard data measurement; since it provides the information to be processed in the company's management systems, with a view to achieving significant energy savings. Concurrently, the mitigation and control of CO_2 emissions are two great challenges (Wei et al., 2015).

Secondly, the CO_2 emissions in kg and their sources are inventoried by means of the aforementioned carbon footprint equation:

$$\text{Activity Datum} \times \text{Emission Factor} = \text{tons}\, CO_2 \text{equivalent}$$

Where Activity Datum refers to the quantity of the activity considered (kWh, km, kg, etc.); and Emission Factor accounts for the quantity of GHG emitted for each unit of the activity considered ($kgCO_2/kWh$).

This results in a certain amount (kg) of equivalent carbon dioxide (CO_2 eq.) (ton CO_2 eq. is the unit of the International System of Units to indicate the atmospheric warming potential). In addition, a series of instruments to reduce those emissions are proposed, specifying their possible public economic support. Certainly, every Social Economy company emits CO_2 during its production process and consequently, according to the consumption of inputs, it is possible to reduce the emissions in companies, regardless of their activity (Carretero & García, 2012).

Thence, the sequence considered is the following:

Step 1. To collect and analyse information regarding the industrial production process, allowing for the fact that the gas, electricity, and water account for the major part of the energy consumption of any building: utility bills; types of energy consuming equipment; schedule, uses and personnel consumption habits, and so forth. Consideration is given to the thermal envelope of the construction/building in which the activity is performed and the sort of production activity. Here, the aim is to localise current inefficiencies.

Step 2. To ascertain the total energy consumption of each organisation, i.e. the energy demand during the production process of each company. To this end, energy and functioning records corresponding to the 12 months (own consumption measurements and gas, electricity and water invoices for 2015) are examined. In this task, companies provide data to comprehend the situation of each facility.

Table 5.2 Emission factors considered

Emission source	Emission factor (unit of measurement)
Natural gas (m^3)	0.202 kg CO_2 eq/kWh
Electricity (kWh)	0.08 kgCO_2 eq/kWh
Potable water (m^3)	3.75 kg CO_2 eq/m^3
Ton CO_2 eq	Total kg CO_2 eq/1000

Source: own production based on MAGRAMA (2015, p. 43)
Note: Conversion of natural gas unit to energy unit: 10.70 kWh/m^3 (MAGRAMA, 2015, p. 16)

Step 3. To calculate the CO_2 emissions of each co-operative by means of the carbon footprint equation (Table 5.2):

Step 4. To identify specific actions for savings with a view to designing improvement plans to be instituted. In general, the following sources will be considered: heat generation, air-conditioning, hot water production, equipment/machinery and illumination.
The Savings of the Measure are:

$$\text{Savings}\,[\%] \times \left(\text{Estimated consumption/Year}\right) = \text{Consumption decrease/Year}$$

In addition, the Period of Return on Investment (ROI) is:

$$\text{Total expenses}\,[€]\,/\,(\text{Savings}][€]\,/\,\text{Year}) = \text{Years}\ \textit{for}\ \text{amortisation of the savings measures implemented.}$$

Step 5. Enquire into the Official Bulletins of the Public Administration as a secondary data source on the subject of open calls for economic support, which would promote the improvement plan that has been designed.

To summarise, the 'analysis model' establishes a calculation methodology and CO_2 Emission Factor, an action plan for minimisation, as well as promoting financial instruments. The weaknesses of the model are the following: it does not quantify other emissions of scope 1 (transit of vehicles, fossil fuel consumption, and leakage in heating and air conditioning equipment) and scope 3 (other indirect emissions such as raw materials, business trips using external means, etc.).

5.4 Results

This section analyses the energy consumption and therefore the CO_2 emissions to subsequently propose the appropriate measures to promote energy efficiency. In this regard, the most convenient solutions are described, establishing a diagnosis for the co-operatives under study.

Overall, when considering a building, the key lies in the optimum functioning of heating, air-conditioning, and illumination systems, and their automation, together with the electricity distribution system (Carretero & García, 2012). In this way, the cost of energy in industry can be between approximately 25 and 50% of production costs. Therefore, the improvement of the efficiency of electrical engines and distribution, and the speed limiters in machinery (especially engines), will bring about process optimisation.

The inventory of the energy consumption and indirect CO_2 emission sources of the three co-operatives under study indicates that Co-operative 1, in training services, entails significant electricity consumption, which may have been caused by office computer equipment.

Additionally, the consumption of kilowatt-hours in heating and air conditioning clearly indicates that a group of persons occupies the area. As shown in Table 5.3, this is a co-operative with moderate CO_2 emissions, nearly 7.02 tons CO_2 eq. The natural gas consumption reveals the commitment to the implementation of renewable energy measures. Co-operative 2, in wood packaging, registers elevated electricity consumption due to its industrial activity: 115.2 tons CO_2 eq. The reactive power is also considerable, and therefore this second company is the CO_2 emitter of greater impact. For its part, Co-operative 3, in upholstery, emits the total of 14.05 tons CO_2 eq, with a substantial percentage of electricity consumption and emission by specific machinery (10.9 tons CO_2 eq). This means that the company produces precisely and consistently. Undoubtedly, the ratio of workers established in co-operatives, in the region of 10–50 workers (SMEs), determines their impact on the carbon footprint, by means of their anthropogenic influence and electricity consumption.

As shown in Table 5.3, CO_2 emission due to electricity consumption is varied in absolute terms; in other words, one of the extremes reaches more than 115 tons CO_2 eq, while the opposite registers nearly 7 tons CO_2 eq. The major emitting sources are heating and air conditioning, specific production machinery and illumination. According to the prior results, the annual electricity consumption of co-operatives is estimated to be 44.3 tons CO_2 eq, similarly potable water adds 2.2 tons CO_2 and natural gas 5.6 tons CO_2 eq. As a result, Sevillian co-operatives from 10 to 50 workers emit nearly 52.10 tons CO_2 eq. per year. Finally, it is also important to mention the increased atmospheric pollution of the industrial sector against the services sector. By contrast, the studies by Bermejo et al. (2010), on sectoral energy consumption, explain the lack of difference between that caused by the services sector and the secondary sector.

Once the inefficiencies have been demonstrated, in the form of energy consumption and the associated polluting emissions, it is time to introduce the essential modifications. These will affect the use of technology, the automation of facilities, the behaviour of the personnel and internal strategies. In this way, a set of minimisation measures for energy consumption and emissions is proposed. They can be undertaken in work centres, selecting the most appropriate for each organisation. Those measures chiefly focus on the main points of energy consumption which are

Table 5.3 Inventories of energy consumption and CO_2 emissions of co-operatives

+ Indirect emissions							
Co-operatives				**1**	**2**		**3**
Items of electricity consumption (kWh)	Electricity consumption in heating/air conditioning			59,727	8,020		13,930
	Indoor illumination			8,553	11,054		5,053
	Specific machinery			–	1,371.43		111,841
	Office equipment			18,852	7,950		1,704
	Others			693	41,954		3,976
+ Total ton CO_2 eq							
Co-operatives	**1**	**2**	**3**	**CO_2 emissions (kg eq.)**			**Ton CO_2 eq.**
Electricity consumption (kWh)	87,825	1,440,407	136,504	7,026	115,232.56	10,920.32	133.18
Natural gas consumption (m^3)	52,772	18,232	12,840	10,659.94	3,682.86	2,593.68	16.93
Potable water consumption (m^3)	1,323	296	144	4,961.25	1,110	540	6.61
Reactive power consumption (kVArh)	–	696,780	–	–	2,720	–	2.72
Total emissions scope 1 + 2				22,647.19	122,745.42	14,054	**159.43**
				22.64	122.74	14.05	

Source: Own production
Note: Annual data gathered in 2015

Table 5.4 Summary of taxes and measures for savings in co-operatives

Aim	Measure
Optimisation of water consumption (savings between 50 and 75%)	Reduced flush systems in toilets
	Installation of push-button valves or proximity sensors in taps
Optimisation of electricity consumption (savings between 5 and 50%)	Envelope improvement in buildings through low-emissivity double glazing and PVC windows Envelope improvement in buildings through thermal insulation, thus reducing the thermal transmittance coefficient U-value
	Air conditioning by means of rotating absorption machines activated via solar thermal energy panels. The latter devices will also produce hot water for sanitary use
	Illumination: substitution of existing electromagnetic ballasts for electronic, adjustable ballasts. Natural illumination inlets, LED and low-consuming fluorescent lamps. Proximity sensor systems, timers (centralised control) and sectorisation of independent electrical circuits Electricity generation: solar photovoltaic panels and capacitor batteries to compensate for reactive energy Equipment: substitution of desktop computers for laptops; utilisation of software for consumption monitoring. Engines: speed limiters in 3 engines of 0.75 kW (savings of 30%); reduction of starting power in the three most consuming engines by means of frequency limiters; substitution of old engines for efficient engines IE2 750 W
Optimisation of natural gas consumption (savings between 5 and 40%)	Solar thermal panels to produce hot water for sanitary use

Source: Own production

identified in each inventory. Higher priority will be given to measures minimising the lack of energy efficiency.

The series of measures proposed are classified into different groups in a structured sheet (see Table 5.4). Regardless of the results of each consumption diagnosis, a great number of elements in the buildings are likely to be replaced by efficient equipment related to heating and air conditioning, distribution systems, storage, etc. The possible measures appear jointly with the savings percentage they can entail to reduce CO_2 emissions.

Table 5.4 shows consumption optimisation measures for indirect CO_2 emitting sources: electricity, natural gas and water. Both the considerable general electricity consumption and that concerning industry are summarised. Those measures are related to the envelope of the buildings, equipment (heating, air conditioning and production machinery) and illumination systems. This broad type of CO_2 minimising actions involves savings of between 5 and 75%. This percentage depends on the implementation of specific measures which occasion savings of between approximately 8 and 70% for co-operatives. Intervening in those CO_2 emitting sources reduces consumption significantly (25%) in most of the cases.

It is worth remembering that a partial emissions approach is addressed, therefore the option to compensate for emissions has not been considered, regardless of its existence. If the company decided to compensate for the total or part of those emissions, which would have already been reduced, this co-operative could contribute to CO_2 absorption projects of the Ministry of Agriculture, Food and Environmental Affairs (MAGRAMA).

Business activity aims to achieve economic profitability. As a consequence, the economic viability of the necessary measures proposed is assessed. In any case, both intangible (priorities, procedures) and tangible (labour for installation, current market prices) variables influence the decision making. Thus, the optimisation measures inherent to control and management systems (regarding time, functionality and logistics) of each company need mentioning: the influence of environmental conditions in time management, and the spatial distribution and flow chart. In the latter: minimising unproductive times and inefficiencies in movements of the personnel and vehicles; providing appropriate areas and schedules for storage; cleaning and maintenance of equipment and machinery; reducing waste by optimising the use of raw materials, reutilising surplus raw materials if suitable for production if their quality has not been undermined, and the use or selling of by-products.

In terms of energy efficiency, European regulations such as Directive 2010/31/EU require Spain to assume important obligations regarding fundamental aspects in buildings: heating and air conditioning, illumination, energy consumption, insulation and solar thermal energy utilisation. Apart from the CTE (Spanish acronym for Technical Building Code), at a national level all the aforementioned requirements are considered in Regulations of Thermal Installations in Buildings (RITE) (Royal Decree 238/2013), the update of the regulations on thermal insulations and the Action Plan for Savings and Energy Efficiency 2011–2020. The Spanish Ministry of Public Works and Transport assesses savings of between 30 and 40% in buildings due to the implementation of efficient energy consumption mechanisms, with an even greater percentage of CO_2 emission reduction (40–50%). The intention is to examine whether the savings justify the economic effort or not, and if there is public economic support for their promotion.

This section verifies the economic management of CO_2 pollution and its indirect emitting sources. Table 5.5 indicates that a Sevillian co-operative may invest approximately an average of 30,000 € in CO_2 emission reduction and energy efficiency enhancement. As displayed in the ROI periods, this investment is mid- to long-term, since more than 25% of the measures take between 1 and 10 years to amortise the costs. In particular, measures to optimise potable water consumption show a short ROI period, whereas natural gas and solar thermal energy entail long-term periods (more than 10 years). The expected savings rates, the ROI and the time to implement the measures vary significantly depending on the equipment chosen, its cost and destination (Carretero & García, 2012). Table 5.6 shows the main variables considered. Especially, a minimum reduction of 5% and a maximum of 20% can be achieved in electricity invoices by means of optimisation measures, with a ROI of below 10 years in industrial facilities.

Table 5.5 Economic assessment of CO_2 emission reduction

Improvement plan	Co-operative 1	Co-operative 2	Co-operative 3
Estimated total cost of the measures proposed (€)	42,651.50	41,562.00	9,605.00
Period of Return on Investment (ROI) (years of amortisation)	11	14	2
Total estimated savings (%)	25	33	19
Average investment (€)	31,272.80		

Source: Own production

Table 5.6 The savings rate and period for return on investment corresponding to the building

Building typology	Expected savings rate	Period for return (years)
Residential or commercial buildings	15–25% (without solar thermal energy)	2–4
Industrial facilities	5–20%	Up to 10

Source: Own production

From the financial standpoint, companies are supported to minimise CO_2 emissions and to achieve energy efficiency. In order to face the economic needs this research occasions, an in-depth enquiry concerning public incentives is undertaken. In Spain, the aid for savings measures and energy efficiency takes place through the Institute for Diversification and Energy Savings (IDAE). This institution is an active investor, the participation of which depends on the sector under research, the technology to be implemented and the economic volume of the action. At a regional level, The Andalusian Energy Agency joins the Action Plan for Savings and Energy Efficiency 2011–2020.

Once the information has been gathered, it is time to consider which group of energy efficiency measures may be economically supported for its implementation. The feasibility of these measures should be specified, assessing the cost and current subsidies. In this sense, Table 5.7 reveals a potential and open inventory of public economic aid.

The outcomes of this research verify the scarce concern of companies with regards to energy consumption, and the economic and environmental impact. In other words, co-operatives do not focus strategically on energy efficiency and savings, regardless of administrative requirements. The results obtained also show that co-operatives have the need to optimise the social management from defined environmental practice to modify their ecological behaviour. Therefore, the concern for the environment becomes compulsory within the social responsibility of these companies. Their strategic direction has to encompass climate change risks and opportunities in their analysis and control systems. In this regard, this clearly specific commitment of co-operatives establishes a rising tendency to guarantee a stable productive model with minor atmospheric pollution.

Table 5.7 The government incentives to favour optimum energy performance

Co-operative	Description	The eligible actions	% maximum rate of subsidy
1	Resolution of 28 April 2015 amending the regulatory basis of PAREER and convenes PAREER-GROW Programme (BOE 05/05/2015). Ministry of Industry, Energy and Tourism	Improvement of the existing thermal envelope	Economic support without remuneration: basic aid of 30%
2	Decree 303/2015 on regulating aid for companies to promote environmental protection and sustainable energy development. Ministry of the Presidency and Local Government (Junta de Andalucía)	Energy-saving and energy efficiency measures	Small companies: 25%
3	Resolution of 25 July 2012 amending various resolutions of the General Secretariat of Industrial Development and Energy (…) and establishing the rules for an Incentives Programme for Sustainable Energy Development of Andalusia: SMEs sustainable programme of the Andalusian Agency Energy (Efficient Lighting Programme). Department of Employment, Business and Commerce (Junta de Andalucía)	Efficient illumination	Range for subsidy: between 1,000 and 10,000 euros (excluding VAT)

Source: Own production based on the Official Bulletin of the Public Administration

5.5 Conclusions and Political Implications

This research deals with the application of theoretical knowledge by means of concrete interventions, so that the environmental impact of social companies can be diminished. Accounting for more empirical implications than theoretical ones, this pilot methodology is to be implemented.

Firstly, being understood as a social commitment, the fight against climate change must be strategically located in the internal planning of co-operatives. Studies of this kind consider this sector as a key agent of social transformation likely to mobilise a significant percentage of the population, in the case of Andalusia, towards environmental education and commitment. In addition, the recent environmental and energy efficiency requirements by regulations become business opportunities and produce greater expertise with which to face improvements and projects in the subject of energy.

Secondly, the estimation method employed adds a quantitative part to the qualitative, and quantifies the individualised effect. Its results reveal that co-operatives do not usually consider CO_2 emissions. The inventories estimate 52.10 tons CO_2 eq/year per co-operative, of which electricity consumption represents 44.3 tons CO_2

eq. According to the literature, the achievement of substantial reductions in CO_2 emissions in the electricity sector is possible through additional public, promotional policies, as demonstrated in this research. In general, the action must be large-scale, because there are no significant reductions at an organisation level, despite certain improvements with respect to the tendency scenario.

In addition, the measurement of the atmospheric pollution enables the possibility of undertaking minimising measures to reduce it and the costs of co-operatives. The pollution per employee of a Sevillian co-operative is approximately 2.8 tons CO_2 eq., that is to say, the co-operative SME sector emits that quantity. In any case, the emission reduction is possible through its evaluation and the implementation of measures (9 actions) with a savings percentage of between 8 and 70%. Undoubtedly, the percentage of CO_2 emission savings may reach 85%, depending on the action and its destination. Moreover, intervening in the CO_2 emitting sources provokes a relevant consumption decrease.

The results of this research show that, despite the great economic effort a co-operative in Seville must make to reduce CO_2 emissions and improve energy efficiency, the current European, national or regional public economic aid encourages these sorts of actions to minimise or prevent the emissions.

Additionally, MAGRAMA (2015, p. 35) states that "a carbon footprint report allows public communication of the results of its GHG emission inventory". This document reveals the fundamental elements of the organisation's carbon footprint (description of the company, factors employed, limits, methodology used, outcomes, activity index, etc.). This report should also contain the detailed information of the improvement plan (savings rate, action measures, budget, ROI, etc.) and attainable economic incentives. Using the carbon footprint estimation, the objective of reducing emissions in co-operatives entails certain steps: guaranteeing the commitment of the presidents of these co-operatives; choosing an absolute target; distinguishing between the limit and the purpose, fixing the target year; defining the level of that target (quantitative value and temporal extent); and, finally monitoring the progress (MAGRAMA 2015, p. 30). Perhaps it is time for the voluntary nature of the registration of environmental impact in organisations to become mandatory, led by social businesses as motors of change and in response to the reiterated momentum they have been receiving from the public sphere. In this way, social feedback and cohesion would also be established.

The companies under study show reduced sustainable responsibility, which eases the purpose of this research. This is to provide the co-operatives with a strategy to be applied to their production process (information, control and management), in order to increase energy efficiency and control the environmental impact. Further to this, the acquisition of more efficient equipment is directly bound to reducing consumption costs, which in turn allows earmarking the resulting capital for other functions in this kind of businesses. These functions are the training of employees in the subject of the environment, efficient production processes, and social actions that will have positive feedback to the environment.

As other authors have stated, these conclusions assume a long road ahead, as this is an area of multidisciplinary intervention. It is worth furthering economic data-

bases to improve the empirical research on CO_2 emissions and the short- to mid-term effects of minimisation measures on the behaviour of social companies. Co-operatives do not collaborate in terms of the environment. Consequently, they are not capable of exporting efficient measures and/or good practice. In other words, although these entities have the values of training, although, in fact, an improvement in knowledge is necessary here, and a certain environmental commitment, this is not bound to good practice. It is also proposed that the business representation bodies of the Social Economy produce their own GHG Emissions Calculation Guide, in line with other calculation guides published mainly by the Public Administration; for instance, the "Practical guide for GHG emission calculation" by the Catalan Office for Climate Change. The promotion and co-operative investment in renewable energies should also be enhanced. It is advisable to establish commitments to a more sectoral, ambitious CO_2 emission reduction to be more effective. Impartial information should be spread in the business sphere regarding the causes and consequences of CO_2 emissions, the possibility of reducing and compensating for them, and the benefits of their minimisation and consideration.

Concerning the limitations of this research, it would be appropriate to amend those related to the methodology by means of a representative sample, the application of decomposition techniques such as the Social Accounting Matrix (SAM) in the analysis of energy intensities, Input-Output Table (IO) and the DEA Method to analyse GHG emissions; and empirical findings of a more solid nature. Furthermore, future lines of research could be made into alternatives relating to sustainability as an economic component, and a social management model with updated environmental indicators. Hence, this proposal creates knowledge concerning the progress of a business reality in favour of the economic-environmental benefit in order to be considered in the decision making of the managers of the companies studied. The design of a model based on improved analysis may be considered by mastering the calculation of CO_2 emissions deriving from fuel consumption, an input/output table, the ROI ratio and the cost of each business investment subject to be subsidised.

To summarise, this research is in line with Directive 2012/27/EU, because it "promotes energy efficiency in production process and use", and undertakes energy audits in non-SME companies. This research considers it important to deal with instruments which allow SMEs to be aware of their situation concerning the use of energy and to detect opportunities to enhance energy efficiency and savings. Similarly, the Royal Decree 235/2013 on Energy Efficiency Certification of Buildings encompasses compulsory systems for consumption evaluation, and energy efficiency requirements. Lastly, the Paris Agreement (COP21) recognises the "social, economic and environmental value of voluntary mitigation measures and their secondary benefits".

Finally, the strength of this research is that scientific evidence on co-operatives and sustainable management are specified in a field in which the literature insufficiently describes the behaviour of the Social Economy business system in Andalusia. In addition, key concepts regarding waste management and the control of emissions from businesses are debated. Furthermore, suitable analytical models are needed to take into account the sustainability of social companies.

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Chapter 6
Improving Environmental Management Systems by ISO 9001 in the Spanish Hospitality Sector

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Abstract As the Knowledge Management discipline continues to evolve, socialisation, externalisation, combination and internalisation remain as key management practices for the creation of knowledge which enables organisations to successfully address environmental challenges. This paper examines the relevance and importance of an ISO 9001 certification as an enabler of Nonaka and Takeuchi's SECI model and the processes of reusing and updating the environmental knowledge of an organisation. These relationships are examined through an empirical study of 87 companies in the Spanish hospitality sector using repeated measures ANOVA validated by factor analysis. The study has direct implications for management practice as ISO 9001 represents a long-term programme to change, and a proactive way to improve knowledge management practices. Therefore, in order to consolidate knowledge management practices, companies need to provide and support organisational structures as ISO 9001.

6.1 Introduction

Increasing awareness of environmental problems brought about by business activity has led to greater political and social demands on firms to reduce their environmental impact. Managing the impact of the different business functions on the environment is now seen as a responsibility of all of its stakeholders: employees, managers,

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customers and the supply chain. Managers are held responsible for the design or adoption of strategies to protect the environment and the integration of such strategies in the operation of the firm. Environmental control requires new knowledge to be used to change attitudes towards efficiency, international cooperation and environmental challenges such as sustainability, emissions or waste management. In this study, 'environmental knowledge' refers to knowledge and awareness of environmental problems and strategies for their solutions (Zsóka, Szerényi, Széchy, & Kocsis, 2013).

Challenged by a new business context characterised by a global competition, rapidly shrinking product life cycles, more demanding customers and shorter response times, organisations need to pursue new competitive strategies. Higher product value is expected to drive improved levels of customer satisfaction. In this context environmental knowledge has become one the most important intangible assets for the business since it is accumulated through organisational learning and difficult to imitate (Leonard-Barton, 1992; Nonaka & Toyama, 2003; Cegarra-Navarro el al., 2013). Environmental management practices seek to improve and maximise the value of procedures and standards that regulate the processes through which goods and services are produced (Nonaka, 1994; Nonaka & Konno, 1998). This is achieved through different mechanisms that are effective in combining the socialisation, externalisation and internalisation of green business practices to reduce the environmental footprint and promote sustainability (e.g. Kaur, 2015; Oluikpe, 2012; Rai, 2011).

There are several environmental standards, which have allowed a few companies to become world leaders in the hospitality industry. Such guidelines support formal knowledge and technical projects within the organisation. Furthermore, employees' know-how used in the company's daily operations stem from such procedures and standards. ISO 9001 is one of the most widely used management tools in matters of quality. Procedures and standards derived from ISO 9001 successfully support the creation of environmental knowledge concerning the identification of sources of pollution or the development of preventive solutions (Wilson & Campbell, 2016). In other words, ISO 9001 has become a favoured system for many hospitality companies embarking on quality improvement, which in turn can support the implementation of environmental management practices (Wilson & Campbell, 2016). ISO 9001 can also be directly linked to knowledge through the realisation that an organisation's quality manual becomes the repository of its learned knowledge (Zeti, 2002). As Blackler (1995) noted, an ISO 9001 quality manual can be seen as a repository of 'encoded knowledge', which in turn can be used to gain the knowledge needed to enhance management practices (Lin & Wu, 2007). Therefore, ISO 9001 represents a guideline to build an efficient quality system and to provide learning effects (International Organization For Standardization [ISO], 2015; Lin & Wu, 2005).

Previous studies on ISO 9001 (e.g. International Organization For Standardization [ISO], 2015; Lin & Wu, 2005) have focussed on issues related to its implementation in organisations. However, not enough research has been reported on the relative influence of ISO 9001 on environmental management practices. Thus, it is not clear whether or to which extent ISO 9001 helps organisations in the implementation of

knowledge management initiatives that seek to improve their environmental management practices. In particular, questions arise over how knowledge management frameworks such as Nonaka and Takeuchi's SECI model for knowledge creation (Nonaka & Takeuchi, 1995) could benefit from ISO 9001 when organisations attempt to create and share knowledge for the ultimate purpose of protecting the environment. In line with the four ways to combine existing knowledge identified by the SECI model, this research has adopted four dimensions of knowledge conversion. These are tacit to tacit (socialisation), tacit to explicit (externalisation), explicit to explicit (combination) and explicit to tacit (internalisation). Broadly speaking, socialisation, externalisation, combination and internalisation take place continuously in what has been defined as a spiral of knowledge creation.

This study explores the interrelationships between ISO 9001 and the SECI model for knowledge creation. To such aim this paper presents an empirically tested SECI model which helps identify how ISO 9001 supports the Spanish hospitality sector in their efforts to implement successful environmental management practices. The proposed theoretical framework is presented in Sect. 6.2. Details of the survey which was used to collect appropriate data to test the model is presented in Sect. 6.3 and the results of testing the models are detailed in Sect. 6.4 which is followed by the conclusions of the research in Sect. 6.5.

6.2 The Conceptual Framework

6.2.1 Environmental Knowledge Management Practices

In order to determine which component of the SECI model could be improved by using ISO 9001, a model was developed using quantitative data collected from the Spanish hospitality industry. The research focused in particular on the section of the industry that deals with hotel operation and management. The hospitality industry is a key sector within the Spanish economy (Cadarso, 2005). It represents the second-largest foreign-tourist industry worldwide and the first in Europe (US$ 60 billion in) (United Nations World Tourism Organization [UNWTO], 2015).

As noted above, sustainable development is one of the priorities in the world's efforts to attain the well-being of mankind (Nouri, Karbassi, & Mirkia, 2008). Thus, the preservation of the environment becomes a crucial factor influencing hotel operations. Environmental regulations such as 2008/98/EC, updated on 14/07/2011, which aim to promote high quality recycling (Directive 2008/98/EC), and the recent increase in the number of hotels which have adopted certifications such as ISO 9001, Q quality and ISO 14001, are typical examples of such efforts. Moreover, the growing interest of tourists in sustainability and protection of environment has led to the emergence of so-called ecotourism or nature tourism, which in turn has helped hospitality companies to develop strategies that focus on the environment (Brockhoff, Chakrabarti, & Kirchgeorg, 1999).

In the last two decades the concept of environmental knowledge has been used to characterise the way in which organisations align their strategic goals to sustainable development (Wernick, 2003). This means that organisations with awareness of the importance of environmental knowledge will be more likely to be able to deal with environmental problems as they understand the benefits of environmentally responsible goals (Frick, Kaiser, & Wilson, 2004).

From a knowledge management perspective the above considerations could mean that hospitably companies may require an intensive use of different certifications (e.g. ISO 9001) to competitively operate in the current market conditions and satisfy its customer needs (Gómez-Loscos & González, 2014). In practice, however, the implementation of knowledge management strategies is not free from challenges (Lee & Choi, 2003) as it requires significant organisational and technological changes. In this sense, it can be appropriate for organisations to use management systems that have already been consolidated (Calvo-Mora, Navarro-García, & Periañez-Cristobal, 2015) such as those that focus on total quality and serve to support initiatives of knowledge management (Ju, Lin, Lin, & Kuo, 2006). These considerations led us to argue that ISO 9001 is a vehicle through which hospitality companies can generate, disseminate and use superior information on customers and competitors (Alegre & Sard, 2015; Erdogana & Baris, 2007).

Simultaneously, achieving and maintaining the ISO 9001 standards constitutes a process (Heng, 2001) which in itself becomes a source of new ideas and knowledge. Some of the information recorded by the ISO 9001 standard (e.g. environmental regulations) is not formulated or controlled by management within the organisation. Instead, such information is continuously created by employees. As staff move, groups dissolve and application wanes such information tends to be transformed and occasionally lost. In other words, the information provided by ISO 9001 can be a daunting asset to deal with and, for this reason, it is important to explore the knowledge flow processes that would enable organisations to retain and develop it (Lin & Wu, 2005). This process involves social interaction between sources of tacit and explicit knowledge and leads to knowledge creation, sharing and reuse (Cegarra-Navarro & Martinez-Martinez, 2010).

As Martelo and Cegarra-Navarro (2014) noted, knowledge in a firm emerges both from inside and outside the firm. In this process, the SECI model may play an important role in the creation of environmental knowledge. By its very nature, the SECI model has the potential to not only enable the transfer of knowledge between the organisation and its business environment, but also refine and improve the knowledge already available within the organisation. Furthermore, the model may have a positive effect on the success of knowledge search and retrieval strategies within the organisation and with its stakeholders. A key argument supporting this is that knowledge held by individuals is shared with other individuals and in the process it gets related to new knowledge (Nonaka, Toyama, & Konno, 2000).

Nonaka and Takeuchi (1995) suggested four dimensions for the SECI model, each playing a different but complementary roles in explaining how knowledge can be created in organisations. While sharing tacit knowledge between actors is considered a socialisation process, tacit knowledge becomes explicit through an

externalisation process. This conversion is due to a social process between groups and individuals (Nonaka & Takeuchi, 1995). Because of this social interaction, knowledge flows easily through different levels of the organisation (Kaur, 2015). There is tacit knowledge and explicit knowledge that revolve around this model. While explicit knowledge can be presented through verbal communication and written reports, tacit knowledge refers to knowledge, which is only known by an individual and is difficult to communicate to the rest of the organisation (Polanyi, 1966). In other words, tacit knowledge refers to attitudes, commitments, emotions and behaviour, and is difficult to communicate. In the SECI model, knowledge creation begins with socialisation (SOC), continues with externalisation (EXT), combination (COM), and internalisation (INT), before returning to socialization, although at a new level, this is the spiral of knowledge creation is created in the organisation (Nonaka et al., 2000).

The first phase, 'socialisation' (SOC hereafter) consists of the transfer of tacit to tacit knowledge, it offers an opportunity for experience sharing to create tacit knowledge and improve collaboration throughout a project life-cycle. It encourages individuals to spend time together in joint hands-on experiences, informal meetings, and work in the same environment to exchange personal or specialized knowledge (Andreeva & Ikhilchik, 2011).

The second phase, 'externalisation' (EXT hereafter) consists of the transformation of tacit knowledge into explicit knowledge, and therefore only considers the transformation of existing 'know-what' and 'know-how' among team members, without taking into account the combination of new knowledge existing within different teams (Tyagi, Cai, Yang, & Chambers, 2015). During this stage, the know-how is exposed in the form of concepts, ideas, images, hypotheses, analogies and models for explaining key facts to others through demonstration, comparison and experimentation. Therefore for these authors, the efficiency of this process depends upon the level of education and motivation of participants.

The third phase, 'combination' (COM hereafter) is a process whereby "explicit knowledge is collected from inside or outside the company and then processed to form more well-organised and explicit knowledge resources. Although this process is based on a social interaction between often experienced members of groups and departments, it also involves the less skilled or less experienced members of those teams through a number of organisational activities (Nonaka et al., 2000).

The last phase, 'internalisation' (INT hereafter) is the tacit adoption of the explicit knowledge that has been generated and disseminated (North & Kumta, 2014). The 'INT' reflects the transformation of explicit knowledge into tacit knowledge through continuous individual and collective interactions. In this process, the old explicit concepts obtained from 'COM' are updated, expanded, extended, transformed and then shared by the individuals of the organisation in their own tacit knowledge, according to their own styles and experiences, thus, starting again a new cycle. It is closely related to learning by doing.

In this context, the research questions that drive this research -discussed in detail in the following section, are:

1. How does the presence of ISO 9001 affect socialisation, externalisation, combination and internalisation processes?, and
2. Can ISO 9001 Enhance Knowledge Management Structures?

6.2.2 Development of Hypotheses

In order to evaluate the efficiency of ISO 9001, it is necessary to elaborate theories and models that take into account the performance of the organisation as well as the efficiency of the group-learning processes within the organisation and with its stakeholders. This research is going to link SOC, EXT, COM and INT with the degree to which the ISO 9001 is implemented within the organisation. As previously discussed, ISO 9001 is a widely accepted standard that provides guidelines, rules and characteristics for adopting green practices (Blackler, 1995; International Organization For Standardization [ISO], 2015; Lin & Wu, 2005; Zeti, 2002). Furthermore, the literature also includes evidence of relationships between quality management and knowledge management practices. These relationships have been analysed taking as a reference the ISO 9000 family of quality management systems standards (Honarpour, Jusoh, & Nor, 2012; Marcus & Naveh, 2005; Tang & Tong, 2007). When consistently applied, they help knowledge users to simultaneously achieve alignment and adaptability within environmental management practices (e.g. SOC, EXT, COM and INT).

It is also important to note that when information is fragmented within a company, environmental knowledge is hard to obtain, and as a result knowledge management practices suffer (Boiral, 2002, 2009). In this sense Fryxel and Lo (2003) argued that employee compliance with new practices becomes an imperative for the successful use of corporate knowledge across its business processes. A possible explanation for these findings may relate to the fact that ISO 9001 fosters search and retrieval of relevant knowledge from the repositories and enable stakeholders to apply this knowledge, for instance, in the prevention of pollution (Cordano & Frieze, 2000) or the development cleaner processes (Aggeri, 1999).

Another relevant aspect is that the ISO 9001 requirements are likely to change over time. When that happens, the organisation may need to exploit their prior guidelines, rules and characteristics and also update or replace such knowledge structures. So, whilst managers have to support the creation and management of knowledge structures so that employees remain up to date with the changes in ISO 9001 requirements (Carmona-Moreno, Céspedes-Lorente, & Burgos-Jimenez, 2004). To such aims, processes such as SOC, EXT, COM and INT help foster the development of new knowledge that could be valuable for updating the ISO 9001 requirements (Tyagi et al., 2015). Through SOC, EXT, COM and INT, employees are able to seek out those more experienced partners who could provide them with insights and guide on how to update the ISO 9001 requirements within the organisation. For example, employees and customers who worked with social networks often get together to exchange ideas about previously established standards for

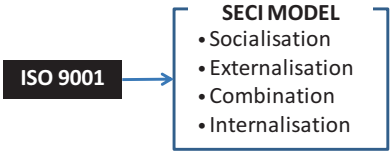

Fig. 6.1 Theoretical model

existing services and ideas for new services and, as a result, new guidelines and rules emerge (Chandana, 2001).

Taking the above consideration into account, this study proposes the theoretical model shown in Fig. 6.1 according to which a firm with an ISO 9001 certification holds a key capability for the updating of environmental knowledge through SECI model. Explicit and tacit knowledge are addressed by the ISO standard. To manage prior environmental knowledge effectively, firms could put in place a SECI model which enables employees to update their assumptions and then replace new or modified environmental knowledge. In this way, firms with a SECI model will be able to use environmental knowledge in their efforts to deal with challenges such as sustainability, emissions or waste management. Given the framework above, the following hypotheses have been proposed for this study:

H1: ISO 9001 is associated to the presence of Socialisation (SOC).

H2: ISO 9001 is associated to the presence of Externalisation (EXT).

H3: ISO 9001 is associated to the presence of Combination (COM).

H4: ISO 9001 is associated to the presence of Internalisation (INT)

6.3 The Empirical Study

Data Collection The focus of the data collection process was the Spanish hospitality industry. The unit of analysis for this study was the organisation, on the assumption that aspects relating to the creation of environmental knowledge affect the entire organisation. The criteria defining our initial sampling frame was that target companies were included in the CNAE-552 (the Spanish National Classification of Economic Activities 552) and had at least 10 employees. On this basis, a list of 560 Hotel Operators was obtained from the SABI[1] database (based on the statistics for the year 2006). However, once every CEO or business owner were contacted by telephone and invited to participate in the study, only 245 companies agreed to participate in the first instance. As a result, the final sample size was 245 companies.

[1] Sistema de Análisis de Balances Ibéricos (SABI database) contains financial information for 520.000 companies (480.000 from Spain and 40.000 from Portugal). This includes public and private, Spanish and Portuguese companies, with up to 10 years of data, updated daily.

Once the 245 organisations had agreed to participate, the data collection process started. Data sets were gathered in two phases, the first of which lasted two months, from early January to the end of February 2014. From a sample of 245 companies, 87 companies responded to a survey whereby participants were asked questions about environmental activities carried out by their hotels and the learning processes implemented to create and update environmental knowledge in a context of intensive innovation. This produced a response rate of 15.53% of the total. A comparison between companies which had provided a response and those that had not done so yielded no significant differences in relation to turnover, total assets or the number of employees, which suggests that non-response bias did not constitute a significant issue in this research (Armstrong & Overton, 1977).

Measures Churchill's (1979) approach to questionnaire development was used. Scales were combined from several other relevant empirical studies with new items to make an initial list of 13 items distributed as follows: $4 \times 3 = 12$ of these measuring knowledge management processes, and 1 item measuring ISO 9001. The survey was initially validated by academics with expertise in organisational learning from Universities of Murcia and Cartagena (Spain) during the period of June–July 2008.

A series of telephone interviews were then conducted involving managers from a pilot sample of two leading Spanish hotels. These respondents were asked to indicate the reasons why they implement environmental management practices. All responses were related to economic reasons such as conservation of materials or energy, adherence to industry codes or legislative requirements, decreased costs, process and product innovation. In fact, it was found that such initiatives were also being used by businesses as communication tools to demonstrate their commitment to preventing issues which could have a negative impact on the environment. As a result of this pre-testing, we made some minor modifications based on the suggestions received.

The final measures relating to the existence of knowledge management processes consisted of three items adapted from a scale designed by Lee and Choi (2003) to measure the constructs of knowledge socialisation, externalisation, combination and internalisation. Specific issues relating to the development of the questionnaire and its related constructs are elaborated below (see Appendix for a list of items).

- Consistent with the findings of Lee and Choi (2003), items that addressed knowledge socialisation were interwoven with issues related to encouraging individuals in the organisation to track changing markets and share market intelligence with external agents.
- Also consistent with Lee and Choi's (2003) findings, items that addressed knowledge externalisation were interwoven with issues related to the encouragement of selected individuals in the organisation to transform their tacit knowledge of customers or experts into other forms which were easy to understand by others.
- Knowledge combination items described the process of formalising and storing concepts into a knowledge system, such as databases and knowledge bases so that reconfiguration of existing information through sorting, adding, combining, and categorising explicit knowledge could be used to create new knowledge (Lee & Choi, 2003).

Table 6.1 Factor loadings of reflective constructs

	SOC14	EXT14	COM14	INT14
SOC_1	***0.90***	0.61	0.60	0.55
SOC_2	***0.90***	0.47	0.50	0.59
SOC_9	***0.81***	0.39	0.41	0.45
EXT_1	0.55	***0.88***	0.40	0.51
EXT_2	0.30	***0.80***	0.34	0.31
EXT_3	0.56	***0.90***	0.52	0.45
COM_1	0.41	0.42	***0.91***	0.34
COM_2	0.59	0.48	***0.94***	0.48
COM_3	0.56	0.46	***0.93***	0.44
INT_1	0.47	0.44	0.39	***0.87***
INT_2	0.59	0.47	0.38	***0.90***
INT_3	0.58	0.44	0.48	***0.91***

Each indicator contributes to the respective construct and all the loadings are significant at 95%

- Knowledge internalisation items were focused on the use of knowledge about environmental issues for the development and implementation of business plans (Lee & Choi, 2003).
- In order to have a reference point about the presence of ISO 9001. They had to indicate whether (1): they had ISO 9001 or (0): they didn't have ISO 9001.

Measurement Model The evaluation of psychometric properties in each of the measurement scales used for different constructs is based on the methodological suggestions developed by Churchill (1979) and was validated for convergence and discrimination (Anderson & Gerbing, 1988; Lehmann, Gupta, & Steckel, 1999). The results of the confirmatory factor analysis and the reliability of the scale using PLS-Graph software version 03.00 Build 1058 are shown in Table 6.1 (Chin, 2003). Table 6.1 shows the relationships between the different constructs and their indicators, the latent model perspective was adopted, in which the latent variable is understood to be the cause of the indicators. With regard to the measurement model, we began by assessing the individual item reliability (Table 6.1). The indicators exceed the accepted threshold of 0.7 for each factor loading (Carmines & Zeller, 1979).

From an examination of the results in Table 6.2 it can be argued that all of the constructs are reliable. The values for both the Cronbach's alpha coefficient and composite reliability are greater than the 0.7 required in the early stages of research and also greater than the stricter value of 0.8 for basic research (Nunnally, 1978). The AVE should be greater than 0.5, meaning that at least 50% variance of the indicators should be accounted for (Fornell & Larcker, 1981). All the constructs of our model exceeded this condition (Table 6.2). To assess the discriminant validity, we compared the square root of the AVE (the diagonal in Table 6.2) with the correlations between constructs (the off-diagonal elements in Table 6.2). On average, each construct relates more strongly to its own measures than to others.

Table 6.2 Descriptive statistics and correlation matrix

	Mean[a]	SD	CA	CR	AVE	1	2	3	4	5	6
1. ISO9001	0.48	0.50	n.a.	n.a.	n.a.	**n.a.**					
2. SECI	6.99	1.50	n.a.	n.a.	n.a.	0.22	**n.a.**				
3. SOC	6.93	1.77	0.84	0.90	0.76	0.33	0.83	**0.87**			
4. EXT	6.16	2.06	0.80	0.88	0.72	0.23	0.80	0.53	**0.84**		
5. COM	7.07	1.84	0.89	0.93	0.81	0.10	0.78	0.57	0.49	**0.90**	
6. INT	7.79	1.83	0.87	0.92	0.79	0.02	0.79	0.61	0.49	0.45	**0.88**

Notes:
[a]*Mean* the average score for all of the items included in this measure, *S.D.* Standard Deviation, *CA* Cronbach's Alpha, *CR* Composite Reliability, *AVE* Average Variance Extracted, *n.a.* not applicable
[b]They represent the dimensions of each second-order construct. The bold numbers on the diagonal are the square root of the Average Variance Extracted. Off-diagonal elements are correlations among construct

6.4 Results

In order to determine the differences in environmental management practices in relation to whether or not ISO 9001 was present, the system repeated measures ANOVA was used. This method proves the explanatory power of only one factor or independent variable, not metrics in our case (ISO=1 and no ISO=0), on a set of dependent variable metrics (i.e. SOC, EXT, COM, and INT). Mauchly's test of sphericity tests the null hypothesis that the error covariance matrix of the orthonormalized-transformed dependent variable is proportional to an identity matrix. As the Mauchly's test of sphericity is significant $\chi^2 = 11.52$ with a significant level of ($p<0.05$) we can assert that the dependent variables are related. The Box's M test of equality of covariance matrices is significant with an F value of 2.29. Therefore, we support that the observed covariance matrix of the dependent variables is not equal across groups.

As shown in Table 6.3, the multivariate contrast analysis shows that the Lambda of Wilks is of 0.84 with a significant level of ($p<0.01$). Furthermore, the partial Eta squared is of 0.15 and the observed power is of 0.90. In consequence, ISO 9001 has an explicative power on dependent variables (SOC, EXT, COM, and INT). Tests of within-subjects effects show an F value of 23.18 at a level of ($p<0.01$). Therefore, we can assert that there are some differences among means of SOC, EXT, COM, and INT. The effect size for each independent variable was of (0.21), with an estimated power of (1). The interaction *SECI*ISO* shows an F value of 3.45 at a level of ($p<0.05$). Therefore, there are also differences among means of the interaction *SECI*ISO*. In this case, the effect size for each independent variable was of (0.04) with an estimated power of (0.77).

Testing of between-subjects effects shows an F value of 47.00 at a level of ($p<0.01$). Therefore, we can assert that there are differences depending on whether or not there is the presence of ISO. The partial Eta squared is of 0.35, and the observed power is of (1). If we analyse the univariate tests, it can be observed that the meaningful differences are found concretely in SOC and EXT. Table 6.3 shows

Table 6.3 ANOVA ISO 9001 factor (individual variables)

Variable	ISO 9001	Mean	Std. deviation	N	F	Partial Eta Squared	Observed power
	NO	6.36	1.91	45			
SOC	YES	7.54	1.38	42			
	TOTAL	6.93	1.77	87	10.825[a]	0.11	0.90
	NO	5.69	2.08	45			
EXT	YES	6.67	1.93	42			
	TOTAL	6.16	2.06	87	5.137 [b]	0.06	0.61
	NO	6.88	1.72	45			
COM	YES	7.27	1.96	42			
	TOTAL	7.07	1.84	87	0.969[ns]	0.18	0.16
	NO	7.75	1.68	45			
INT	YES	7.83	2.00	42			
	Total	7.79	1.83	87	0.047[ns]	0.03	0.05
Wilks' Lambda (0.84)					5.04[a]	0.15	0.90
Tests of within-subjects effects …….. SECI					23.18[a]	0.21	1.00
Tests of within-subjects effects …… *SECI*ISO*					3.45[b]	0.04	0.77
Test of between-subjects effects …… SECI					47.00[a]	0.35	1.00
Box's M			24.384	F=2.29[b]			
Mauchly's Test			$\chi^2_{(5)}$=	11.52[b]			

[a]<0.01; [b] p<0.05; [ns]not significant

that ISO 9001 had a positive influence on SOC. It was significant with an F value of 10.82 with a level of (p<0.01). Table 6.3, again, shows that ISO 9001 with an F value of 5.137 at a level of (p<0.05) had a significant effect on EXT. This analysis supports partially support H_3 and H_4 and strongly support H_1, H_2 respectively.

6.5 Conclusions

A common framework is required to effectively implement environmental management practices within the hospitality sector. This would enable organisations within the industry to address environmental challenges such as the identification of sources of pollution or the development of preventive solutions for the purpose of sustainability or to manage waste or emissions. In this sense, standards, guidelines, rules and characteristics resulting from the process of implementing ISO 9001 represent an important source of information. Therefore, a key practical contribution of this research is its capacity to inform decision makers on how ISO 9001 can enhance environmental management practices within the organisation and with its stakeholders. The adoption of ISO 9001 exercises a moderating effect on environmental management practices, and the process of implementing ISO 9001 constitutes in

itself a prior step to the implementation of green practices in the hospitality companies that we have studied.

Another key practical contribution of our research derives from the proposed theoretical model. The model highlights the fact that although both SOC and EXT are directly influenced by the adoption of ISO 9001 in the organisation, the effect of ISO 9001 on COM and INT is statistically insignificant. A plausible explanation for this can be found in the need for hospitality companies to attract new guests by offering green services and increasing practices such as recycling, donating perishable foods and using corn key cards. This is particularly valid for in a turbulent context such as that where the Spanish hospitality sector has operated during the period that we have examined. In order to reach these goals, processes such as SOC and EXT, oriented towards attracting potential new customers, are a necessary tool for learning and improving the efficiency of hotels on providing these new services. In other words, hospitality companies are focused on gaining new customers through SOC and EXT rather than retaining clients by COM and INT.

The third significant contribution made by this research consists of the questioning of the importance of 'time' in the relationship between ISO 9001 and environmental management practices. This paper has been able to provide only a snapshot of ongoing processes and not measures of the same process over time. However, the literature shows that hospitality companies in general and hotels in particular need 'time' in order to take advantage and exploit the standards, guidelines, rules and characteristics resulting from the implementation of ISO 9001 (Lin & Wu, 2007; Tang & Tong, 2007; Martínez-Martínez, Cegarra-Navarro & García-Pérez, 2015). For example, actions such as recycling or using new corn key cards may take time to be understood and transformed into value by employees across the company. In line with previous research by Din, Abd-Hamid, and Bryde (2011), our results confirm that while SOC and EXT structures may not necessarily require a long time, it may take longer for the organisation to realise the benefits of implementing INT and COM. Therefore, future research should examine how time influences ISO 9001 when implementing INT and COM processes.

Despite a number of significant contributions to theory and practice, this research has some limitations worth noting. Firstly, the focus of our empirical study has been the Spanish hospitality companies. Future research could examine the adoption of the SECI model with effective implementation of ISO 9001 in other sectors. Secondly, this study considered the implementation and adoption of one standard, namely ISO 9001. The study of other standards, guidelines and rules, different from those related to ISO 9001 could help organisations understand other mechanism for supporting environmental management practices. Future studies could examine the feasibility of providing specific standards, guidelines or rules that facilitate INT and COM processes rather than SOC and EXT practices. Finally, further research could use other methodological research approaches to study this phenomenon, enabling triangulation of data resulting from observational case studies.

Appendix: Questionnaire Items

Socialization of knowledge (1= high disagreement and 10= high agreement):		
SOC_1: Our company stresses gathering information from suppliers and customers.		
SOC_2: Our company stresses building databases on products and service.		
SOC_3: Our company stresses planning strategies by using published literature.		
Externalisation of knowledge (1= high disagreement and 10= high agreement):		
EXT_1: Our company stresses the use of deductive and inductive thinking.		
EXT_2: Our company stresses the use of metaphors in dialogue for concept.		
EXT_3: Our company stresses exchanging various ideas and dialogues.		
Combination of knowledge (1= high disagreement and 10= high agreement):		
COM_1: Our company stresses building up environmental materials by gathering management figures.		
COM_2: Our company stresses building databases on products and service		
COM_3: Our company stresses planning strategies by using published literature, computer simulation and forecasting.		
Internalization of knowledge (1= high disagreement and 10= high agreement):		
INT_1: Our company stresses forming teams as a model and conducting acquisition from databases, and sharing results with entire departments.		
INT_2: Our company stresses enactive activities with functional departments by cross-functional development teams		
INT_3: Our company stresses sharing and trying to understand management visions through communications with fellows.		
ISO 9001	☐ Yes	☐ No

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Chapter 7
Social Entrepreneurship and Upgrading in Emerging Economies: The Indian Case of Industree and Its Brand Mother Earth

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Abstract The possibility of realizing production systems which deliver high social, environmental, and economic performance has gained attention in internationalization studies at large. While the literature has focused on large firms from Western countries, we investigate the role of firms from emerging economies (EE) in supporting upgrading and improving the social and economic conditions of local producers while delivering a quality product targeting a sophisticated market niche. This chapter present evidence of an Indian firm specialized in the home and fashion industries (Industree), which successfully improved social and environmental conditions along its value chain through the social entrepreneurship approach. This case study shows that also EE firms can promote social and economic upgrading among their suppliers and that economic upgrading is necessary for the attainment of social upgrading. Design and retail, usually prerogatives of developed country firms, are key factors in supporting the achievement of success in both dimensions.

7.1 Introduction

The importance of the sustainability agenda has risen exponentially at the international level in recent years. Both in developed and developing countries, realizing production and consumption systems that reconcile the potential tradeoff between economic, environmental, and social objectives is emerging as an important policy goal, given global climate change and the increasing environmental concerns (Porter & Van Der Linde, 1995). Simultaneously, managers and policy makers increasingly recognize the business opportunities resulting from the introduction of products and practices which have a smaller environmental impact and improve the social conditions of workers (Porter & Kramer, 2002). The growing consumer awareness of the

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impacts of consumption choices on the environment and workers' conditions in developing countries, the pressure of strict policy, and the actions of non-governmental organizations (NGOs) to draw attention to firms' social and environmental performance—all these factors encourage firms to pursue more sustainable production systems in order to reduce reputation risks, tackle specific market niches, and lower costs.

In the context of the disintegration of production at the global level, studies on global value chains (GVC) (Bair, 2009) highlighted that firms leading GVC are key actors in economic development, handling a significant proportion of global trade and imposing standards in their industries (Gereffi, 2005; Gereffi & Korzeniewicz, 1994). By requiring all suppliers (often located in developing countries) to meet social and environmental standards and by transferring technology and knowledge, those (large multinational) firms may also decisively encourage them to undertake environmental and social improvements (Jeppesen & Hansen, 2004).

However, to date, the literature has focused mostly on the strategies of firms in developed countries. The rise of emerging economies (EEs) as engines of the global economy requires new insights into whether and how firms in these countries can reconcile economic growth with better working conditions, higher labor standards, reduced environmental impacts, and broad social and ethical concerns. This chapter explores how EE firms can couple economic, social, and environmental upgrading and the possible consequences at the micro level (suppliers) of the value chain. This chapter presents a case study of a Bangalore-based firm, which has competed in national and international markets while increasing the share of value received by its suppliers and taking into account the environmental and social dimensions of its production.

7.2 Conceptual Framework

Since the 1970s, the disintegration of production and the integration of trade at the global level have spurred the development of global and regional production networks, which account for a growing share of overall production and employment worldwide, especially in export-oriented industries (Feenstra, 1998). The emergent literatures on GVCs have focused on the organization of production and material flows in these networks and the division of labor between independent actors from developed and developing countries (Bair, 2009). This literature is aimed at understanding the nature and content of inter-firm linkages crossing international borders, moving from a model of vertically integrated firms to the development of complex forms of coordination among globally dispersed, independent actors.

Many theoretical and empirical contributions from the GVC literature have focused on the opportunities of learning and market access, which developing country suppliers gain from participating in value chains led by developed country firms. Scholars emphasize the opportunities for EE producers to "move up the value chain" (Ponte & Ewert, 2009, p. 1638) through the process of upgrading, in which lead firms transfer

and share knowledge with suppliers, who then can improve the capabilities in the value chains in which they participate (e.g., Carrillo & Zárate, 2009). Although the early focus of the literature was the economic dimension of upgrading (Humphrey & Schmitz, 2000, 2002), the growing importance of the sustainability agenda has prompted a shift toward the study of social and environmental upgrading (Roseland, 2000; Staritz & Gereffi, 2011) in order to determine if and how the three converge.

The literature focused on economic upgrading has only recently begun to consider the social dimension, investigating the impacts of GVCs' inclusions on workers' entitlements and the quality of employment. As well, the literature has examined and the conditions that lead to improvements in both firms' competitiveness and workers' social conditions. Social upgrading has been defined as "the process of improvement in the rights and entitlements of workers as social actors, and enhances the quality of their employment" (Barrientos, Gereffi, & Rossi, 2012, p. 324). According to these authors, social upgrading consists of two components: measurable standards (including the improvement of workers' conditions, such as contract type, social protection, and health and safety levels) and enabling rights (including less easily quantifiable rights, such as freedom of association, collective bargaining, and non-discrimination).

Different trajectories for joint economic and social upgrading can be envisioned, including moving toward better work typologies, increasing social upgrading through bettering work conditions, and finally social upgrading at a smaller level, i.e., by household-based producers (Barrientos et al., 2012). However, while firm's participation in GVCs induces to economic upgrading under certain conditions, it might not necessarily cause social upgrading too (Rossi, 2013). Studies on social entrepreneurship suggest that, if establishing social values as a company mission, some firms can explicitly include social upgrading in their strategies (Dees, 1998). Although there is no univocal definition of social entrepreneurship (Martin & Osberg, 2007; Pless, 2012), one can argue that, in the framework of social entrepreneurship, the entrepreneur's aim is to couple the for-profit initiative with more social-oriented outcomes in order to benefit society in general (Sabeti, 2011). Social entrepreneurs tend to carry out economic activities in order to create positive impacts on specific disadvantaged categories, such as those lacking sufficient financial resources to "achieve any transformative benefit on [their] own" (Martin & Osberg, 2007, p. 35). Social entrepreneurs mobilize public and private resources and integrate them into an original production scheme. Social entrepreneurs also assess their financial, economic, managerial, and social results of their initiatives (Dees, 2007), going beyond the traditional economic indicators (e.g., size) and employing new measures and tools (e.g., social audits).

Adapting definitions drawn from the managerial literature, environmental upgrading can be defined as "the process by which economic actors move towards a production system that avoids or reduces environmental damage from their products, processes or managerial systems" (De Marchi, Di Maria, & Micelli, 2013, p. 65). As discussed in the environmental innovation literature (e.g., Rennings, 2000) the attention of the firms in reducing their ecological footprint might concern areas such as the greenhouse effect and consumption of soil or other resources at a higher rate than natural renewal. Like economic and social upgrading, environmental upgrading has various dimensions from process improvement, to product innovation (through new design—eco-design,

the use of new components and materials, and a green communication strategy—eco-branding) and organizational enhancement through a firm's overall way of doing business and managing the organization (such as energy production and recycling) (see also De Marchi, Di Maria, & Ponte, 2013).

Specifically regarding environmental upgrading, De Marchi, Di Maria & Micelli (2013) discuss the relationship between the four forms of economic upgrading identified in the GVC literature and firms' environmental strategies. Environmental upgrading can be driven by multiple factors, such as buyer strategies and entrepreneurial vision. The impacts on the value chain from both economic and environmental upgrading might increase market power, upgrade strategic suppliers (e.g., through design), and deepen buyer–supplier relationships. These different paths have an impact on value chains, whose activities can be effective only through an integrated approach involving suppliers, retailers, and customers. An increasing number of studies, mostly in the field of management, have focused on the business case for environmental upgrading, providing evidence that improving the firm's environmental performance through appropriate sustainability strategies increases the productivity and competitiveness of itself and its suppliers (Orsato, 2009). Recent studies have shown linkages between economic upgrading and environmental strategies (De Marchi, Di Maria & Micelli, 2013). However, little is known, except at the conceptual level (see Bolwig, Ponte, du Toit, Riisgaard, & Halberg, 2010), about whether and how it might be possible to achieve economic, environmental, and social upgrading together (Seuring & Müller, 2008), especially in the EE setting.

Although earlier studies have identified multiple barriers to responsible entrepreneurship by small firms in developing countries (Azmat & Samaratunge, 2009), social entrepreneurs can become interesting economic players, cooperating with a wide range of partners—governments, NGOs, other firms—in order to achieve social improvements and sustainable development (Seelos & Mair, 2005). In this scenario of threats and opportunities for EE firms, we maintain that also those firms can develop strategies to combine economic, social, and environmental upgrading with positive consequences upstream and in their whole value chains.

7.3 Method and Empirical Context

To investigate the relationship between economic, social, and environmental upgrading in the context of EE firms, we conducted a qualitative analysis employing the case study methodology (Ozcan & Eisenhardt, 2009; Yin, 2003) and it seems a perfect fit for a study interested in examining characteristics of firms' strategies in organizing and structuring the value chain, the forms of governance adopted, and the upgrading outcomes achieved by the actors involved in the value chain.

Given the purpose of developing theory rather than testing it, in case study methodology the more appropriate sampling strategy is theoretical rather than random or stratified (Eisenhardt & Graebner, 2007). Accordingly, we selected a case study 'because it is very special in the sense of allowing one to gain certain insights that

other organizations would not be able to provide' (Siggelkow, 2007, p. 20), picking an example of a firm having headquarters and production in EEs having successfully fostered social, environmental and economic upgrading. In this paper, we analyze the company Industree Craft and its retail brand Mother Earth, an Indian company specialized in the home-furniture industry that put social and environmental concerns at the heart of their strategy, since their foundation. Indeed, Industree has been recognized by several qualified sources as being among the first retailers in India to invest in social and environmental sustainability, including social entrepreneurship foundations (such as Virtue Venture, the Skoll Foundation, and the Schwab Foundation for Social Entrepreneurship[1]), nonprofit foundations (e.g., Shop for Change) and Indian media organizations (e.g., retailindia.com). The Indian context is interesting because of its unique, dynamic internal EE markets (Bijapurkar, 2007) and its retail system, which couples traditional, independent small shops with new, large retailers (Biyani & Baishya, 2007). Additionally, the home-furniture industry seemed a particular interesting empirical setting, in that it is a traditional manufacturing industry, being increasingly wide-spread in developing countries: in 2012, 59% of the world furniture production came from middle/low income countries, being 25% in 2003. (CSIL, CEPS, Economisti Association, 2014). India has a long tradition in this industry, as confirmed in the same report: indeed, in 2012 it was the 5th country for furniture production, being the second developing country in the list after China (who is ranking 1st). India more than double its production between 2003 and 2012, (growing 1.87 faster than the world average) to satisfy the increasing demand for the domestic market (CSIL, CEPS, Economisti Association, 2014).

In order to improve the reliability of the analysis, we collected data from different data sources, each of them providing different insights but all contributing to a converging line of inquiry (Yin, 2003), i.e. describing the business model implemented by Mother Earth to achieve economic, social and environmental benefits. The most important data source used has been in-depth interviews with key players within Industree organization and its value chain (suppliers, design partner company, which have been complemented and triangulated with documentary evidence and direct observation. We run two waves of interviews, the first in January 2011, to collect the major information, and the second in January 2014, to ask for updates about the issues investigated (see Table 7.2 in the Appendix for more information).

Especially considering for the fact that Industree do not own any production facility but rely on an extensive network of local suppliers, we interviewed and visited both the lead firms and some of its suppliers, a strategy to improve the reliability of the data collected. Data gathered referred to the Industree strategy and its evolution over time, Industree business model, its supply chain organization and management also including social and environmental aspects. The first round of interviews took place at firm's facilities (therefore enabling also direct observation) allowed to (i) provide additional information about companies' characteristics such

[1] In 2011, the Schwab Foundation for Social Entrepreneurship, part of the World Economic Forum, named Industree's entrepreneur as India's Social Entrepreneur of the Year.

as entrepreneurial attitude and technological equipment and (ii) verify the social and environmental performance of firms. In particular, direct observations were conducted at the following sites: the Mother Earth Store in Bangalore, suppliers' factories in the production units in Bangalore (Ashraya SHG, United SHG), and suppliers' factories in the Dharmapuri District of Tamil Nadu (Greenland and one of its suppliers specializing in dyeing). Documentary sources analyzed include the firm's website, its internal documentation regarding social reports, training materials for suppliers, and electronic tools for supply chain management, so as journal articles and independent scientific reports focused on social audits and microfinance management.

7.4 Empirical Findings

7.4.1 Social Entrepreneurship in the Industree Case Study

Neelam Chhiber, an industrial designer, and Gita Ram, a craft activist, founded Industree Crafts Private (ICP) in Bangalore, India. Industree's mission is "to enhance and create artisanal owned rural livelihoods through marketing of contemporary designed artisanal produce for urban markets" (Miller, Dawans, & Alter, 2009). ICP offers three product categories: home (57% of total sales), fashion (33%), and foods (10%), and in 2010, its turnover was US$3 million. It employs approximately 130 people (100 in production units), including store teams. In 2013, ICP received a US$1.5 million donation from Grassroots Business Fund, Washington. The company is expected to reach the breakeven in the 2014–2015 fiscal year ending March 31, 2015). These positive sales, investments, and employment data result from an evolutionary process through which the company has translated its mission into precise strategic, governance, and organizational solutions which achieve the economic and social upgrading of craftspeople. The main driver of process has been a specific investment in design, which addresses environmental issues.

Founded in 1994, ICP first sold artisanal products through proprietary stores and other retailers. During its early first years of operation, entrepreneurs refined the business model to make it sustainable. They decided to focus on production of natural fiber products (Bijl, 2007), which offered promising market and product opportunities: an abundance of raw materials in India, the availability of highly skilled producers, links with fair trade organizations (the ICP is a member of the International Fair Trade), product positioning in the specific segment of handmade products, and design-driven product innovation (see below the paragraph focused on design).

The company initially suffered from the small market size, which increased the supply-side limitations associated with the production scale of craftspeople who cannot supply their wares on a regular basis or in line with ICP's requests related to the Indian market. Chhiber decided to invest in expanding production, involving NGOs in and redefining the production network and relying on government-funded projects. The

growth of the ICP supply base helped it to enter international markets; in 2000, it started to export products made with natural fibers to Japan, the United Kingdom, France, Spain, and Italy.

Entrepreneurs acquired knowledge related to upgrading and value chains through the initiatives of the United Nations Industrial Development Organization and other social entrepreneurial programs. The entrepreneurs also more precisely defined ICP's mission: to identify the drivers of the upgrading process for its suppliers or, as Chhiber puts it during the interviews, "how to increase the wages of producers". Artisans were open to process innovation and new forms of division of labor (a novelty in the artisan domain) as long as they lead to higher wages. Chhiber stresses that "artisans want to earn more, not just maintain memories of old works." The ICP entrepreneurs aimed not only to earn profits from their businesses but also to improve the conditions of small craft suppliers. These initiatives can be interpreted within the framework of social entrepreneurship. In fact, accordingly, in 2007, Chhiber enrolled in a professional development program for social entrepreneurs called Social-Impact International (now Dasra Social Impact), based in Hyderabad (Jain & Garderet, 2011).

To meet this difficult mission, ICP developed an original business model to manage its suppliers: the Self-Help Group (SHG) model. This model is designed to assist suppliers in economic and social upgrading through training and institutional support (i.e., financial intermediation), with a focus on increasing the skills and competences of ICP's producers. Through this strategy, ICP aims to increase suppliers' independence from lead firms—technologically, financially, in production definition, and in market knowledge. Indian craftspeople typically focus on small-scale production based on their skills and are completely decoupled from the market and customers' requests. Craft production faces difficulties meeting large orders and cannot be organized consistently enough to achieve higher rates of productivity. Consequently, craftspeople tend to be highly dependent on buyers. Therefore, ICP's entrepreneurs should aim to reduce this dependence and to strengthen their opportunities to enlarge their market by achieving more added value from their production activities. This policy has allowed ICP's suppliers a net profit margin of 6–7%, as discussed and agreed on with ICP in advance.

Industree has two distinctive, complementary units: the for-profit ICP and the non-profit Industree Crafts Foundation (ICF) (Fig. 7.1). The two units work on an integrated basis to provide support to rural producers, marking the second distinctive characteristic of Industree's business model and a key factor in its success. The SHG model is aimed at building producers' capacity through training in specific fields (firm organization and management, financial management, supplier selection, quality control, technical support).

Regarding the organization of the whole supply chain, ICP is supplied by approximately 2000–2500 artisans and more than 600 small companies, involving a total of 3000–5000 people. After being refined, the SHG model began to work properly in 2007. More recently, ICP decided to improve its supply chain management approach through supplier evaluation and ranking. In the SHG framework, ICP divides suppliers into groups according to their capabilities to organize their work and address new markets autonomously from ICP. The ICF carries out training, while the ICP's inputs determine market and production information. For instance, the for-profit company provides

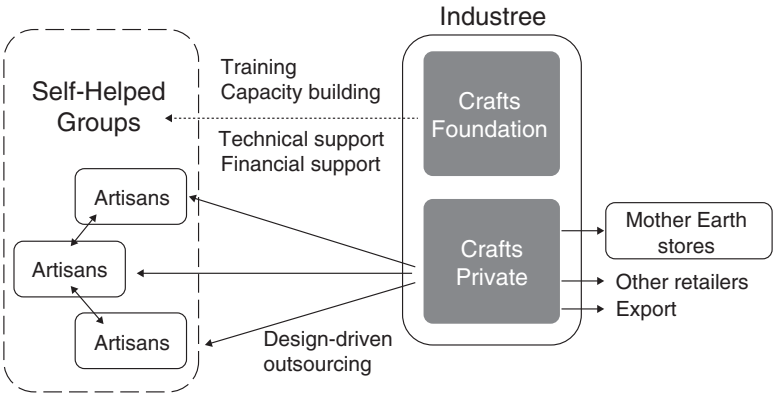

Fig. 7.1 The Industree's value system. *Source:* Authors' elaboration

suppliers with detailed budgets and cost descriptions of the products needed. This can be accomplished only because of ICP's for-profit profile ("a for-profit company is the key," Chhiber affirms): Companies that face the market on a stable basis, unlike NGOs, can understand costs, outline target prices, and provide them to craftspeople, who align their work with ICP's requirements.

The social and economic upgrading of craftspeople has become the core of the company's entrepreneurial efforts. As the name of the SHG model suggests, the training method is based on peer learning, with more experienced craftspeople training others. In addition, ICP assists and trains producers in organizing the production process following a low-capital-intensive approach more affordable for small, rural producers. The relationship starts with a signed agreement for a trial order, and the lead firm supports the rise of the new firm by becoming its main buyer. ICP also pushes producers to use information and communications technologies (e.g., email for order transfers and communication) and gives training to reduce the digital divide among craftspeople.

In addition to its 3-month training program, ICP sets the standards for cost and provides financial support to entrepreneurs through microfinancing and credit. ICP has become an incubator, providing an incubator plan with sizes, costs, prices, and other information needed to set up a new business. The SHGs set up by ICP also acts as saving groups, collecting money to be used by members in emergencies. ICP pushes group members to collaborate and set up new companies in which it can become a shareholder ("they can scale the market from outside" NC said). From 2006 to 2011, ICP set up and provided suppliers with common production facilities; dyeing support and instructions; access to raw materials; support with organization (e.g., division of labor, investment in low-capital processes); and access to funds (microfinancing at 16% interest rate). The artisans from the more advanced SHGs we interviewed (Greenland, Ashraya SHG, United SHG) confirm that they could achieve positive economic results, particularly growth of turnover, due to the support from ICF, as well as their own entrepreneurial attitudes.

7.4.2 The Launch of Mother Earth: Focus on Retail and Environmental Upgrading

In 2008, the ICP founders decided to focus more specifically on environmental sustainability and became a first mover in the Indian market when they launched the brand Mother Earth. ICP aims to gain value from the new market position of this new retail brand. According to Chhiber, Mother Earth was conceived "not [as] another craft shop" but as a retailer offering value through sustainable products in the fashion, home, and organic food industries. The brand was developed to control the value produced through a proprietary sales channel. With the development of the Mother Earth brand, ICP aims to extend control of activities downstream in the value chain through direct investment in design as a source of upgrading. The entrepreneurial idea behind the Mother Earth initiative is to increase the value offered to craftspeople through a retail-driven, design-based value chain. ICP has five stores under the Mother Earth brand in the most important Indian cities.

The main player and competitor of Industree in India has been Fabindia, a company founded 50 years ago that focuses on artisanal products supplied by 17 companies. Fabindia has set a market trend for crafts products, followed by department stores, such as the Pantaloons-owned by Future Group. Investing specifically in the company brand since the 1970s, Fabindia has established a large national retail network. However, unlike ICP, Fabindia's social orientation—achieved through a more explicit CSR approach—was developed only in the late 1990s with the specific, formal engagement by partner companies of approximately 40,000 artisans and craftspeople who had previously worked for Fabindia (Singh, 2010).

ICP emphasizes the "value in work" as NC stated in order to reduce its profit as a middleman and to increase artisans' role through groups. SHG leaders can expand their businesses, eventually become independent, and succeed in the domestic market. Mother Earth offers stability in order placements, thereby supporting the upgrading framework. This new strategy has proven to be a success; sales of branded products —"earth fashion," "earth home," and "earth food"—have increased from its foundation over the years (20% of ICP' sales are of products with natural fibers). The category of home products has most increased the variety offered, again due to the contributions of design. At present, only 5% of Mother Earth turnover comes from exports. ICP has tended to focus on Indian products for Indian tastes ("contemporary Indian taste products", NC said), targeting the wide internal market of the Indian upper middle class. Through the Mother Earth brand, ICP couples the retail customer-centric model with the producer-centric model, which takes into account artisans' needs and characteristics.

Launching a new retail chain is highly expensive, so Chhiber applied for funding from Indian and global venture capitalists. The most important sponsor was Future Group, owned by Kishore Biyani, the entrepreneur who developed modern distribution in India (Biyani & Baishya, 2007). Future Group provided not only capital but also key knowledge about retail. Industree's social entrepreneurship approach was also important to its success at fundraising. It secured US$1.5 million from Future

Group because of its high score on a third-party social audit report for the social conditions of its rural craftspeople and employees. Further proof of Industree's social efforts is its membership in the International Fair Trade Association since 2007 and receipt of the UNESCO Seal of Excellence for Handicraft Products in South Asia for design and cultural sustainability in 2004 and 2006.

7.4.3 The Role of Design in Economic, Social, and Environmental Upgrading

Design has played a fundamental role in upgrading for ICP. Organizational improvements and training have been extremely helpful in increasing the quality of production and improving the living standards of workers, but they have not increased added value (productivity) or boosted wages. This lack is exactly why Chhiber, a trained designer herself, turned to design, understanding its role in upgrading production and wanting to "go up ... the value chain." This idea, which could be considered a trivial decision from a Western perspective, had a tremendous impact for ICP and led it to deep changes in its business model and approach to the market. ICP decided to employ design in a very broad sense, close to what is defined in the literature as design thinking (Brown, 2008). In other words, design was not considered a way merely to improve the aesthetics of products but also to reconsider the purpose of ICP's business and role in Indian society. Chhiber decided to invent a new business with a specific identity, visibility, and the ability to attract the interest of Indian consumers: "To sustain [a] social business, I had to go for profit and establish a new business." This strategy produced two main results: the development of a brand (Mother Earth) capable of communicating the values about which ICP cared and the transformation of the company into a retailer. Both results redesigned ICP from a business-to-business trademark into a consumer brand, from a manufacturer to a retailer, from nonprofit to for-profit.

Two strategic partners made possible this transformation: Idiom, which was involved in branding, communication, and design, and Future Group, which was involved in retailing. Idiom provided strategic support to increase value through design and increase ME's internal competence in design. To scale up the business, the focus became design, and Idiom built the brand and visual identity, conducted communication, and developed the concept of the store. ICP also used design to rethink its processes and jobs. Idiom's proposed design helped the firm to set up its labor management system and planning. This approach supported creativity and the firm's new strategic view. Chhiber, as a designer, shared the same language as Idiom, which helped speed the process of strategic renovation and upgrading through design. Only internal designers worked on some products, while external and internal designers who acted as information consolidators collaborated. Design was used to develop new product concepts based on the information gathered from the retail stores, as well as the designers' experience.

Mother Earth's design-based approach and its implications highlighted the opportunity to enhance the brand's environmental dimension. Instead of stressing the company's link with products' artisanal origin, as does the traditional approach to handmade products, Biyani and Idiom suggested orienting the brand development toward a different position. In the brand management strategy, Mother Earth is positioned as a green brand, supported by the proposed concept of "sensible shopping." However, Chhiber felt that Indian customers would not understand the meaning of this phrase and changed it to "Mother Earth—natural way, the better way," which has evolved into "Mother Earth—looking good, doing good" in order to educate customers. Mother Earth positions its products as related to sustainable purchasing, leading to positive social and economic outcomes. As described in Industree's social audit report, all the raw materials and nearly all the components are biodegradable and environmentally friendly, while the production processes are generally sustainable, except for the dyeing (Shastry, 2008). In this social entrepreneurial approach, ICP has put its social and environmental goals at the heart of its economic behavior, so its operations and many of its decision-making processes are socially and environmentally driven. Through a design-based strategy, Industree has increased the positive connection between the production by artisans and the market, the value it achieves (net profit is 35% of retail price), and the value achieved by craftspeople.

7.5 Discussion

Despite the contextual factors that increase EE firms' difficulties in adopting a social and environmentally responsible approach to business activities (Azmat & Samaratunge, 2009), the case of Industree demonstrates that it is possible also for EE firms to pursue a combination of economic, social, and environmental upgrading through their value chains, especially by adopting a clear social entrepreneurial approach. Table 7.1 presents the main insights we can learn from the Industree case study.

An important early driver for a complete upgrading strategy is the strategic approach followed by Industree's entrepreneurs, which can be explained in terms of social entrepreneurship. The firm's explicit goal became to increase the value produced and shared within the value chain, putting social upgrading at the very origin of the entrepreneurial initiative. At the same time, Industree's upgrading strategy was adapted to the specificities of the Indian market and industrial structure (i.e. the SHG group organization), suggesting that the social upgrading pursued by EE firms might be specific to the realities of EE in which they are embedded. In addition, the business model implemented by the firm based on the SHGs and Industree's nonprofit unit describes a specific path of for-benefit firms (Sabeti, 2011) oriented to support social and economic upgrading for firms. Industree's experience shows that an EE firm can identify original strategic paths to merge upgrading processes adopted by Western firms in a manner consistent with the characteristics of its EE context.

Table 7.1 Integrating economic, social, and environmental upgrading: insights from the industree case study

Strategic approach	Social entrepreneurship
Business model	Mix of for-profit and not-for-profit (supported) self-organization of suppliers
Economic upgrading	Design-driven product and process innovation (product and process upgrading) Investment in retail brand (functional upgrading)
Social upgrading	Training activities oriented to increase craftsmen's wages (development of craftsmen's technological skills) Capacity building initiatives to increase craftsmen's profits (development of craftsmen's managerial competences) Formal social accounting and audit process
Environmental upgrading	Use of natural, bio-degradable raw materials Local value chains Eco-branding

Source: Authors' elaboration

From the beginning, ICP entrepreneurs stressed the need to outline a distinctive strategy and business model which effectively support the process of value creation for rural artisans and local communities. An analysis of how Industree leads its value chain highlights the relevance of coupling for-profit and nonprofit models to achieve positive economic (and social) results. In other words, not only is it possible to achieve both dimensions of upgrading, but also the pursuit of one dimension (economic) might be necessary for the achievement of the other (social). This approach suggests that, in addition to an upgrading process lead by NGOs which fund specific projects, an alternative form of governance using market-based mechanisms, as in the case of ICP, can increase the economic and social conditions of small entrepreneurs and workers in EEs.

Due to this innovative business model, Industree achieved positive results in social upgrading regarding enabling rights and fulfilling measurable standards, including increased wages and quality of work (Barrientos et al., 2012). Enabling rights is measured in freedom of associations (as occurs in the SHG model), collective bargaining, and the absence of discrimination and in increases in the skills and knowledge base of entrepreneurs and suppliers' employees. Through formal participation in SHGs, entrepreneurs and workers obtain a certification of their status as ICP stakeholders, demonstrating that they have benefitted from ICF's training efforts and commercial stability. This certification increases suppliers' competitiveness and allows them to enter new markets. This tendency highlights the strong interlink between the social and the economic upgrading of suppliers.

Through the Mother Earth brand, Industree emphasizes its role in shaping and managing its value chain by investing in two key drivers of economic functional upgrading: design and retailing. This strategic path highlights that also EE firms can focus on value-added activities usually considered by the literature and internationalization areas of specialization for developed country firms. The development of

internal competences in design allowed the firm to construct an innovative, up-to-date product portfolio of craft products. At the same time, by becoming a retailer, Industree moved downstream in the value chain, adopting the logic of a customer-centric firm and increasing its capacity to absorb and transfer market knowledge upstream. From this point of view, this case study indicates that economic upgrading via design and retail can produce positive economic results; however, only through a dedicated social-oriented strategy at the value chain level can the firm achieve social upgrading upstream.

Regarding environmental upgrading, this process was intertwined with Industree's innovation activities based on a design-driven strategy (Verganti, 2009) and on supply chain management strategies (Seuring & Müller, 2008). In particular, Industree emphasized local value chains which could be easily managed both in terms of control (also for social purposes) and environmental savings. In addition, the company's marketing efforts explicitly addressed environmental upgrading in brand and retailing by differentiating the firm's positioning through environmental- and social-related messages. Although Industree has well-developed social and economic upgrading strategies, its environmental upgrading remains in the early stages. The firm has decided to use environmentally friendly raw materials but has taken no steps in some of the most harmful steps of its operations, such as dyeing, where no competitive alternatives to the polluting process exist. The company has invested in building a brand based on the values of nature and the environment (eco-branding). The Mother Earth brand attaches green meanings, highlighting the use of natural materials and local value chains, to the products offered through proprietary stores. This sustainability strategy seems limited. It has not included the deeper transformations necessary to bring products and processes in compliance with international standards or certifications. Overall, ICP encourages production through environmentally sustainable means but has not developed a process for the control or evaluation of suppliers or adopted an environmental standard for its sourcing (Ivarsson & Alvstam, 2010). This evidence suggests that, given the potential trade-offs and difficulties in simultaneously achieving the three dimensions of upgrading, firms might prefer to adopt a stepwise approach.

7.6 Conclusions

This chapter proposes an original, integrated approach to economic, social, and environmental upgrading and discusses how EE firms can be active players in leading their value chains. EE firms can invest in long-term relationships with selected groups of suppliers in order to upgrade the firms' position in the value chain and increase their independence. Through a new business model mixing a social entrepreneurship approach with design-driven strategies, the Indian firm Industree has improved the social and economic conditions of its suppliers while increasing its competitiveness and reducing the environmental impact of its products.

Those results offer interesting managerial implications for how to organize and develop relationships within the value chain for a socially and environmentally responsible firm. The mix of nonprofit and for-profit is important in order to concretely support the social upgrading of suppliers, as well as their business capabilities (economic upgrading). Moreover, our analysis shows that, although external (international) stakeholders play a role in supporting the strategic process of upgrading for EE firms, the entrepreneurs' active role is crucial in determining the firm's and value chain's trajectories.

Future research should further explore in detail the synergies between economic, social, and environmental sustainability strategies in the organizational processes implemented, the role of players within the value chains, and the evaluation of the impacts.

Appendix

Table 7.2 Interviews used for the case studies

Firm	Interviewees' profile	Interviewees' name	Number of interviews
Industree (focal firm)	Co-founder	Neelam Chhiber	5
	Enterprise incubator	Mervin Joseph	3
	Supply chain manager	Vrnda Dalal	1
Idiom (design partner)	Designer	Jacob Mathew	4
Greenland (Industree supplier)	Industree SHG leader	Selvam	1
Ashraya (Industree supplier)	Industree SHG leader	Rajendra K.M	1

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Chapter 8
The Relationship Between Revenue and Environmental Responsibility: A Causal Study Using Reputation in the Hotel Industry

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Abstract The tourism sector and, in particular, the hotel industry are aware of the environmental problems generated by their activities. This industry now must take into account the progressively deeper sensitisation of stakeholders to the environment and the exigencies that result from implementing responsible strategies when managing hotel activities' settings. Hotels thus need to remain alert to their stakeholders' demands in order to offer products and services compatible with these requirements. The long-term benefit of this awareness is more competitive and profitable companies. This study focused on determining to what extent hotels' consciousness of environmental responsibility generates a positive impact on profitability, as represented by RevPAR, a performance metric specific to the hotel industry. The research also included examining to what extent hotels' reputation has a mediating effect in this relationship. The proposed model was tested with a sample of 230 hotels located in Spain, using the partial least squares method of assessing structural equation models. The results reveal that environmental sustainability has a significant positive impact on RevPAR and that reputation acts a mediating factor in this context. Thus, hotel companies need to bear in mind that corporate social responsibility policies regarding the environment are not an undesirable cost but rather an investment that ensures long-term, sustainable financial returns.

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8.1 Introduction

Corporate social responsibility (CSR) is based on the premise that companies need to justify their existence through community service rather than just by their ability to generate a profit. This is a basic principal that determines the modus operandi of organisations since CSR is a course of action that not only influences decision-making processes but also facilitates company management (Bohdanowicz & Zientara, 2008) through voluntary social and environmental goals (Esen, 2013).

The importance of CSR in the tourism sector has increased in recent years, along with an awareness of environmental issues such as degradation, climate change and depletion of natural resources, as well as human rights and fair trade issues, which stimulates more responsible corporate behaviours. Thus, the literature on CSR in tourism has expanded recently as a result of the sector's dependence on sociocultural and environmental resources, stimulating, in turn, a greater interest in sustainability (Sheldon & Park, 2011).

However, despite this growing interest in CSR in the travel industry, studies on CSR in the tourism sector and, in particular, hotels are still relatively few (Bohdanowicz & Zientara, 2008; Cherapanukorn & Focken, 2014; Sheldon & Park, 2011), even though research along these lines has intensified in recent years (e.g. Benavides-Velasco, Quintana-García, & Marchante-Lara, 2014; Garay & Font, 2012; García & Armas, 2007; Inoue & Lee, 2011; Kang, Lee, & Huh, 2010; Levy & Park, 2011; Martínez, Pérez, & Rodríguez del Bosque, 2014).

The scientific literature in this field reveals two streams of research. The first is more extensive and is related to the measurement of CSR's influence on performance (e.g. García & Armas, 2007; Inoue & Lee, 2011; Kang et al., 2010; Zhu, Sun, & Leung, 2014). The second and smaller stream focuses on analysing the effects of socially responsible decisions on marketing variables such as trust, image, loyalty, reputation or satisfaction (e.g. Levy & Park, 2011; Martínez & del Bosque, 2013; Zhu et al., 2014). The latter research has carried out studies integrating both research perspectives because of the importance of analysing the combined effects of marketing variables and performance through socially responsible activities.

In addition, these studies have specifically focused their attention on companies' attitudes towards the environment, a dimension often classified as part of other broader fields such as CSR (García & Armas, 2007). Nonetheless, despite the advantages of implementing environmental responsibility in business strategies, little research has been conducted on this narrower subject thus far (Ayuso, 2006).

Within the tourism sector, the role of CSR's environmental dimension is particularly important in the hotel industry, as this component is considered a necessary and significant aspect whose management is intrinsically linked to the quality of tourist products (Benavides-Velasco et al., 2014; García & Armas, 2007). Consequently, this dimension has become a determining factor in hotel companies' competitiveness rather than just a legal requirement (García & Armas, 2007). Given these trends in the literature, the present study chose to focus on CSR's environmental dimension as it is applied in the hotel industry.

Another particularity of this industry becomes clear when researchers analyse hotel performance and the performance measures used, which are essentially based on metrics such as return on assets or Tobin's Q ratio (e.g. Inoue & Lee, 2011; Kang et al., 2010). Rather than use these approaches to measurement, the present study proposes the use of revenue per available room (RevPAR) to assess performance, as this is a metric specially created for the hotel industry.

The present analysis of the relationship between environmental responsibility and performance via RevPAR also included the impact of reputation on this relationship. In economic crises, reputation takes on a special importance in business activities. The most recent economic crisis created a greater incentive for researchers to focus their attention on this variable in terms of its definition, measurement and other aspects (Martínez & Olmedo, 2009).

The present study, therefore, concentrated on examining to what extent the implementation of environmentally responsible initiatives has a positive impact on revenue. This relationship was studied using RevPAR—since this is a performance metric created specifically for the hotel industry. The study also included the degree of influence reputation has on this relationship. The empirical analyses were carried out on a sample of hotel companies based in Spain.

The following paper is organised into five sections. The first presents the topic studied, including the investigation's justification and objectives. Next, the study's theoretical background is discussed, along with the research hypotheses. After the methods used to test the proposed model are described, the results and conclusions are presented.

8.2 Environmental Responsibility as a key Element of the Hotel Industry and Its Effects on Hotels' Reputation and Revenue

8.2.1 Environmental Responsibility: A Competitive Advantage for Hotel Companies

Sustainable development and responsible management are increasingly important in all sectors. The tourism sector, in particular, can potentially contribute to the degradation of natural and cultural assets. Thus, it has a responsibility to focus on the conservation and protection of natural resources by implementing sustainable practices and minimising the effects of its activities (Cherapanukorn & Focken, 2014). This awareness of environmental issues has strengthened the relationship between CSR and sustainability in the sector, especially in the travel industry in which some activities, such as airlines, ground transportation and tour operators, depend heavily on natural assets (e.g. fossil fuels). In contrast, accommodations, travel agencies and restaurants are less dependent on these assets (Sheldon & Park, 2011).

CSR has been implemented in tourism industries as a sustainability strategy, introducing social and environmental issues as a way to foster competitive advantages (Cherapanukorn & Focken, 2014). Currently, tourism companies operate in a society that judges their success based on their business ethics, social responsibility and financial results. As concerns about global warming and climate change have grown stronger worldwide, stakeholders have come to expect that businesses and, more specifically, hotels will behave responsibly (Lee, Hsu, Han, & Kim, 2010). This trend has been reinforced by pressure from professional ethics, government regulations, changes in consumer demand and initiatives promoted by professional associations and international and non-governmental organisations (Erdogan & Baris, 2007).

The hotel industry first began to incorporate environmental practices in their business activities, in the 90s, with ecolabels and eco-friendly management practices. Initiatives promoting the use of environmental indicators also appeared at the end of that decade (Ayuso, 2006). This trend in favour of environmental responsibility was based on a new segment of consumers who were more deeply concerned about environmental problems and who began to realise that their purchase decisions could directly influence the environment. As a result, the number of individuals interested in buying eco-friendly products also increased (Lee et al., 2010).

Environmental management in the hotel industry first began to develop in compliance with government regulations, as well as a way to reduce costs through the minimisation of waste and energy consumption (Lee et al., 2010). However, the aforementioned growing pressure to respect the environment has resulted in managers' better understanding of how important the relationship is between long-term economic sustainability and environmentally friendly policies (Erdogan & Baris, 2007).

Environmental management in the hotel industry is considered a necessary and important tool intrinsically linked to the quality of tourism products, since a clean, well-maintained setting is a basic component of service quality (Benavides-Velasco et al., 2014; Erdogan & Baris, 2007; García & Armas, 2007). Environmental conservation in destinations has been shown to be a key factor in hotels' competitiveness, helping to maintain destinations' attractiveness and, thereby, attract tourists. To this end, hotels have had to adopt a proactive attitude towards environmental management in order to ensure their destination's sustainability and increase their competitiveness (Tarí, Claver-Cortés, Pereira-Moliner, & Molina-Azorín, 2010). This strategy has, consequently, become a determining factor in the competitiveness of hotel companies rather than just a legal requirement (García & Armas, 2007). Notably, the hotel industry—due to its functions, characteristics and services—consumes large quantities of energy, water and nondurable goods (Erdogan & Baris, 2007), which means this industry's policies have a significant impact on environmental concerns.

The competitive advantage of environmental responsibility in hotel companies comes from the benefits that are generated by implementing this strategy. Table 8.1 summarises the benefits identified in Ayuso (2006) and García and Armas's (2007) studies.

Table 8.1 Benefits of environmental responsibility

Ayuso (2006, p. 212)	García and Armas (2007, p. 828)
• Improvement of company image • Delivery of specific services • Cost savings in the medium/long term • Better relationships with public authorities • Increased staff motivation • Compliance with legal requirements	• Improvement in efficiency • Higher product quality • Increased market share • Reduced responsibilities • Access to new markets • Employee motivation and satisfaction • Improved relations with the community • Access to financial aid • Advantages ensuing from anticipating competitors or legislation'

Source: Ayuso (2006, p. 212) and García and Armas (2007, p. 828)

The advantages shown in Table 8.1 provide incentives for companies to pay attention to the environment (García & Armas, 2007). However, Ayuso's (2006) study revealed that hotel managers, specifically those in Spain, have a confused understanding of the concept of sustainable tourism. They also are largely unaware of businesses' contributions to environmental sustainability, a finding that confirms previous studies' results for other countries. Erdogan and Baris's (2007) research, nonetheless, underscores that the tourism industry is strongly aware of its environmental responsibilities and the need for conservation and responsible usage of resources. In addition, tourism managers who defend environmental sustainability assert that natural and tourism resources should not only be used but also protected so that future generations can benefit from them.

8.2.2 Environmental Responsibility and Its Impacts on Profits in the Hotel Industry as Shown by RevPAR

RevPAR is a well-known, widely-used and relevant metric that is applicable only to the accommodations sector (Chen, Koh, & Lee, 2011). RevPAR also is unique in uniting room price and level of occupancy in one measure (Sainaghi, 2011). However, only a limited number of empirical studies have analysed RevPAR's usefulness when measuring the performance of accommodation businesses compared with other traditional methods such as earnings per share, return on assets and return on equity (Chen et al., 2011). Thus, the current understanding of how RevPAR functions as a performance indicator in the hotel industry needs to be improved.

Despite its extensive use, neither RevPAR nor other performance measures are universally considered to be accurate indicators. RevPAR, in particular, has its limitations and critics (Chen et al., 2011), including those who find it to be unreliable (Slattery, 2002). Researchers have criticised RevPAR for obviating recognition of revenues generated by other departments or for only taking into account revenue instead of benefits (Chen et al., 2011). Nonetheless, because of its popularity in the

hotel industry and the need for more extensive research on this indicator, RevPAR was included as the final variable and performance measure in the present study's proposed model.

According to García and Armas (2007), the literature includes a large amount of research that has found a relationship between environmental concerns and companies' revenues, both in a positive and negative sense. However, the results of these empirical studies have not been conclusive. The cited authors also argue that a series of factors need to be taken into account when analysing the relationship between environmental protection and company results. In addition, García and Armas (2007) underscore the difficulty of making generalisations about this relationship when analysing companies from different sectors. The findings of numerous studies of environmental protection and, in particular, its relationship with financial performance have varied considerably from one sector to another.

Improved financial performance is considered to be a key benefit that encourages tourism-related companies to implement CSR strategies (Cherapanukorn & Focken, 2014). The present research, therefore, sought to analyse the specific repercussions of CSR's environmental dimension for company revenue and reputation, specifically within the hotel industry. In CSR research, various studies have previously examined the relationship between CSR and performance. For instance, Kang et al. (2010) indicate that a significant relationship exists between CSR and company performance in the hotel industry. The cited study looked at airlines, casinos, hotels, restaurants and other tourism businesses and identified differences between these industries.

Inoue and Lee (2011) analysed the relationship between specific dimensions of CSR and financial performance, breaking CSR up into five dimensions based on their stakeholders. These are (1) relationships with employees, (2) quality of products, (3) relationships with communities, (4) environmental aspects and (5) other diverse aspects. The cited authors examined how each dimension affects financial results for different types of tourism businesses, once again including airlines, casinos, hotels and restaurants in their analyses in order to extend Kang et al.'s (2010) study. The results reveal that each dimension has a different effect on short- or long-term benefits and that financial impacts vary in function of the four types of businesses studied. This highlights the importance of conducting studies that are more specific and applicable in terms of dimensions and tourism activities.

In their work, Zhu et al. (2014) show that the research results thus far obtained on CSR's impact on company performance are inconsistent. The cited authors, thus, call for more extensive research in this area. In an earlier study, García and Armas (2007) had also characterised previous results on this topic as contradictory.

García and Armas (2007) analysed the importance of social and environmental responsibility and its relationship with performance. They conclude based on their results that higher levels of both kinds of responsibility in hotel companies improve the level of benefits received. These results are in line with those reported by Tarí et al. (2010), who confirmed that environmental management has a positive effect on hotel companies' revenue. Given these findings and the need to shine more light

on these issues, the present study analysed this relationship, specifically using RevPAR as a performance metric. Therefore, we formulated our first hypothesis as follows:

H_1: The adoption of environmentally responsible policies has a positive effect on RevPAR results for hotel companies.

8.2.3 Reputation and Its Relationship with Environmental Responsibility and RevPAR

Reputation has been defined as the 'overall perceptions and beliefs of stakeholders about firms' past and present activities' (Esen, 2013, p. 144). Thus, it 'may be associated with organisations' credibility' (Esen, 2013, p. 137). Reputation, therefore, determines the way that an organisation is perceived and plays a role in companies' success or failure (Aksak, Ferguson, & Duman, 2016).

The conceptualisation of reputation appears to generate some confusion since some researchers use image, identity and reputation as synonyms, while others identify these as different but closely related concepts (Esen, 2013). Alvarado and Schlesinger (2008) assert that reputation has previously been confused with—or considered a synonym of—image. In addition, the cited authors found that the literature separates the theories about reputation into the analogous and differentiated schools of thought. While the first school of thought proposes that image and reputation are identical concepts, the second believes that these are related but distinct concepts. Alvarado and Schlesinger (2008) prefer the latter approach as the most recently developed and most extensively supported. Therefore, they define reputation as 'a conceptual framework that synthesises, organises and simplifies the clues offered by the multiple images projected by businesses and that provides a contextual and perceptual interpretive filter to the consumer that is a direct result of image' (Alvarado & Schlesinger, 2008, p. 43). In addition, Zhu et al. (2014) argue that reputation is shaped by four key elements: trustworthiness, reliability, responsibility and credibility.

Although the number of studies regarding the relationship between CSR and reputation is limited (Aksak et al., 2016), a consensus has been reached in the literature about how CSR activities translate directly into organisational reputation (Zhu et al., 2014). The literature on marketing shows that CSR initiatives can improve businesses' image and reputation and that these initiatives are an important source of competitive advantage (Alvarado & Schlesinger, 2008). Along the same lines, Paek, Xiao, Lee, and Song (2013) argue that CSR can affect marketing practices, improving both reputation and image, as well as customer loyalty and relationships with clients. Cherapanukorn and Focken (2014) affirm that some studies provide evidence for positive effects on employee and customer satisfaction and company reputation as important outcomes of CSR, in addition to better financial perfor-

mance. Esen (2013) asserts that some researchers consider CSR to be the most important driver of reputation, confirming CSR's positive effect on reputation. Thus, companies' attractiveness is based on their reputation as determined by their CSR strategies. The cited research shows managers must recognise how they can create and maintain their firm's reputation by taking into account the CSR factors that enhance reputation.

Zhu et al. (2014) examined CSR's antecedents and results and the moderating effect of ethical leadership on these. The cited authors' data were collected from a sample of hotels and travel agencies in China, producing results that reveal that CSR—including environmental awareness, among other dimensions—has a positive relationship with company reputation. In regard to environmental responsibility, (Chan, 2013, p. 1042) study identified a general agreement among managers and clients that 'green hotels can elevate industry members' image and reputation to attract green tourists who demand green accommodation when travelling'. In light of the above suggestions regarding reputation's significance as a positive result of implementing environmentally responsible strategies, we formulated our second hypothesis as:

H_2: The adoption of environmentally responsible policies has a positive effect on the reputation of hotel companies.

Esen (2013) asserts that reputation can act as a moderator or mediator between CSR and financial performance, implying that reputation influences performance. According to Zhu et al. (2014), it is thus important to examine the mediating effect between companies' reputation and their understanding of the mechanisms by which CSR affects companies. The results of the cited research indicate that company reputation has a positive relationship with performance. Therefore, the relationship linking reputation and RevPAR needs to be examined, which led to the following hypothesis:

H_3: Reputation has a positive effect on the RevPAR of hotel companies.

Figure 8.1 presents the theoretical model proposed in this research.

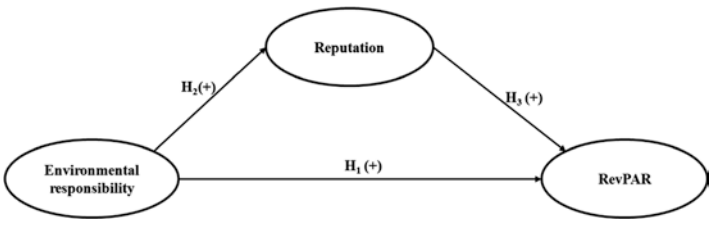

Fig. 8.1 Theoretical model. *Source:* Authors

8.3 Methods

8.3.1 Selection of Scales

To test the proposed model, scales and indicators were selected from those found in the above review of the relevant literature, although, in some cases, these had to be adapted to suit the present research context. Environmental responsibility was measured using Martínez et al.'s (2014) scale. Reputation was measured based on Alvarado and Schlesinger's (2008) scale, although, in the present study, this scale was adapted for a hotel context. The construct of financial returns was composed of indicators selected from studies by Chavarría (2013), Garay and Font (2012) and Grissemann, Plank, and Brunner-Sperdin (2013), and, subsequently, these indicators were adapted to measure RevPAR.

To assess each indicator, seven-point Likert scales were used, based on Preston and Colman's (2000) findings about their greater reliability. The content validity of these scales was confirmed by academic experts on management and tourism marketing.

8.3.2 Research Context

The present study was conducted in Spain, the third most important tourism destination in the world according to the World Tourism Organisation's data for 2014. Spain had 83.7 million tourist arrivals in that year, second only to France and the United States (US), and Spain came in second for international tourism revenues, which totalled 65.2 million US dollars in 2014, with only the US taking in more.

According to the Instituto Nacional de Estadística's (National Institute of Statistics) Survey of Hotel Occupancy in Spain, the data for December 2014 shows 12,572 hotels with room for 1,078,956 guests. The majority of these hotels (6,402) are categorised by gold stars, and, within this group, the largest number of establishments have three stars (1,914), followed by those with four stars (1,722).

In regard to the profitability of the above hotels, according to the cited survey, the national average RevPAR is €44.10, with above average figures recorded for higher category hotels. The year-on-year change for RevPAR reveals that this indicator is rising for this sector. Given the economic importance of Spain's tourism and hotel industry, this country was judged to be an excellent context for the present study.

8.3.3 Fieldwork and Data Analyses

Once the online questionnaire had been developed, the fieldwork began with the distribution of this survey. To this end, emails were sent out to Spanish hotels, most of which were followed up by telephone calls to improve the chances that the

Table 8.2 Technical specifications

Universe	Hotels and similar establishments
Scope	Spain
Data collection method	Online survey
Database	2014 Survey of Hotel Occupancy in Spain (National Institute of Statistics)
Sampling unit	Hotel managers
Population size	12,572
Sampling	Non-probability convenience sampling
Fieldwork	From 8 April to 1 September 2015
Number of questionnaires gathered	519
Valid responses	230

Source: Authors

questionnaire would be completed via the link provided in the email. To improve the response rate further, a reminder was also emailed to the hotels.

As a result of these distribution methods and reminders, 519 questionnaires were completed, from which those missing answers and those not corresponding to the required hotel accommodation profile defined for this study were eliminated, resulting in 230 valid questionnaires. The data collection in this fieldwork is summarised in the fact sheet in Table 8.2.

The descriptive analysis of the data was conducted using the IBM SPSS Statistics Version 19 software programme. To analyse the measurement and structural model of the proposed theoretical model, the Smart PLS 2.0 statistical software programme was used since it is appropriate for evaluating structural equation models. Thus, the technique selected to test the proposed model was partial least squares (PLS), with the primary purpose of carrying out a causal analysis focused on maximising the explained variance of the latent dependent variable. Given that this research was exploratory and the data is from a relatively limited sample, this technique was considered appropriate for this context (Hair, Ringle, & Sarstedt, 2011). The following section presents the results of these analyses.

8.4 Results

8.4.1 Sample Description

This subsection describes the profile of the sample of hotels that participated in this study. These companies represent almost all Spanish regions, with 33.9% of the hotels categorised as four stars, followed by those with three stars (29.1%). Other aspects of interest are that 5.7% of the sample consists of rural hotels and 10% is another type of accommodation (i.e. aparthotels, apartments and hostels).

Regarding the type of management, 101 hotels are independent, followed in number by family-run hotels (81). The third largest group is hotels belonging to large chains or franchises (40). In addition, the majority of the hotels can be defined as urban hotels (101). Those located in rural and/or natural settings also make up a substantial segment of the sample (78). Forty-five hotels in the sample can be described as focused on sun and beach. Based on the data obtained, the sample was considered quite representative of the hotel industry in Spain.

8.4.2 Evaluation of the Measurement Model

The measurement model was evaluated next. Based on MacKenzie, Podsakoff, and Jarvis's (2005) suggestions, this model's constructs were regarded as being made up of reflective indicators. According to Hair et al. (2011), models that use constructs with this type of indicator need to be evaluated for their reliability and validity.

To analyse individual indicator reliability, indicators' loadings—whose value should be equal to or above 0.707 (Barclay, Higgins, & Thompson, 1995; Hair et al., 2011)—need to be examined. In the initial phases of scale development or when scales are applied in different contexts, loadings of 0.50 or 0.60 are acceptable (Barclay et al., 1995). All the indicators in the present study have values above 0.707, with the exception of ENV5 (0.6397), although this value is within the aforementioned tolerance threshold. Model constructs' internal consistency can be verified through composite reliability, whose value needs to fall between 0.60 and 0.70 for exploratory studies (Nunnally & Bernstein, 1994). The composite reliability values for this model range from 0.9045 to 0.9535, which makes them adequate. Convergent validity is evaluated using average variance extracted (AVE), which needs to be above 0.5 (Hair et al., 2011), a guideline that is satisfied by the present model's constructs (see Table 8.3).

Discriminant validity is analysed by demonstrating that the correlations between the constructs are lower than the square root of the AVE (Barclay et al., 1995). In Table 8.4, the square root of the AVE is shown along the diagonal in bold. These results confirm that discriminant validity exists in the proposed model.

Based on the above analyses, the measurement model was found to be reliable and valid. Therefore, we were able to proceed with the analysis of the structural model.

8.4.3 Evaluation of the Structural Model and Discussion of Results

To evaluate the structural model, the R^2 was analysed for each dependent construct and the significance of the paths was analysed using bootstrapping (Hair et al., 2011). The purpose of analysing structural equation models with PLS is to enable predictions that explain the variance of the endogenous latent variables (i.e. R^2

Table 8.3 Measurement model assessment

	Mean	Standard deviation	Loading	*T*-test[a]	Composite reliability	AVE
Environmental responsibility *(When applying CSR, our hotel…)*	–	–	–	–	**0.9045**	**0.5762**
[ENV1] Insert before each indicator its code as indicated collaborates in protecting the environment.	5.59	1.555	0.7617	11.5575	–	–
[ENV2] tries to reduce its consumption of natural resources.	5.56	1.573	0.7549	11.5141	–	–
[ENV3] recycles.	5.65	1.572	0.7406	11.2831	–	–
[ENV4] communicates to our customers about its environmental practices.	5.04	1.733	0.7992	18.8967	–	–
[ENV5] uses renewable energy.	4.33	2.04	0.6397	10.3418	–	–
[ENV6] conducts annual environmental audits.	3.9	2.119	0.8195	21.9628		
[ENV7] possesses environmental certifications.	3.82	2.21	0.7843	17.6543		
Reputation *(Our hotel is…)*	–	–	–	–	**0.9314**	**0.7726**
[REP1] a well-known establishment.	5.8	1.278	0.8191	22.0703	–	–
[REP2] a respected establishment.	5.92	1.107	0.8815	38.694	–	–
[REP3] an admired establishment.	5.5	1.337	0.9039	62.4872	–	–
[REP4] a prestigious establishment.	5.39	1.409	0.9085	68.1511	–	–
RevPAR *(In the last three years, our revenue per available room [RevPAR]…)*	–	–	–	–	**0.9535**	**0.837**
[REV1] has improved over previous years.	5.4	1.663	0.9216	63.5144	–	–
[REV2] has improved compared with our competitors.	5.28	1.451	0.8704	32.2411	–	–
[REV3] has reached our established objectives.	5.16	1.592	0.9342	92.3165	–	–
[REV4] has been satisfactory.	5.29	1.661	0.9318	89.4126	–	–

Source: Authors.

[a]Critical *t*-values: $*p < 0.05$; $**p < 0.01$; $***p < 0.001$; ^{ns} not significant (based on $t(4999)$, one-tailed test) $t(0.05; 4999) = 1.645$; $t(0.01; 4999) = 2.327$; and $t(0.001; 4999) = 3.092$

Table 8.4 Discriminant validity analysis

	RevPAR	Reputation	Environmental responsibility
RevPAR	**0.9149**	0	0
Reputation	0.5888	**0.8790**	0
Environmental responsibility	0.4193	0.3575	**0.7591**

Source: Authors

Table 8.5 Effects on endogenous variables

	R^2	Direct effect (β)	Correlation	Explained variance (%)
RevPAR	**0.3967**	**–**	**–**	**39.7**
H_1(+): Environmental responsibility→ RevPAR	–	0.2394	0.4193	10.0
H_3(+): Reputation→ RevPAR	–	0.5032	0.5888	29.6
Reputation	**0.1278**	**–**	**–**	**12.8**
H_2(+): Environmental responsibility → Reputation	–	0.3575	0.3575	12.8

Source: Authors

Table 8.6 Structural model result

Hypothesis	Path coefficient (β)	t-value (bootstrap)[a]	Support
H_1(+): Environmental responsibility→ RevPAR	0.2394***	8.5775	Yes
H_2(+): Environmental responsibility→ Reputation	0.3575***	5.1874	Yes
H_3(+): Reputation→ RevPAR	0.5032***	9.3528	Yes

Source: Authors

[a] Critical t-values: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ^{ns} not significant (based on $t(4999)$, one-tailed test) $t(0.05; 4999) = 1.645$; $t(0.01; 4999) = 2.327$; and $t(0.001; 4999) = 3.092$

levels). The results show that the model's endogenous latent variables explain 39.7% of the variance for RevPAR and 12.8% of the variance for reputation.

In addition, it is important to explain to what extent the predictor variables contribute to the explained variance of the endogenous variables. This value can be calculated by finding the absolute value of the result obtained by multiplying the β by the coefficient of the correlation between both variables (Falk & Miller, 1992). The results for this statistic confirm the significant influence of reputation on RevPAR (29.6%), which is greater than the impact of environmental responsibility on this metric (10.0%) (see Table 8.5).

The analysis of the significance of the paths using bootstrapping revealed that the proposed hypotheses have empirical support from the results at a 99% confidence level (see Table 8.6).

The graphical results of the model assessment can be seen in Fig. 8.2.

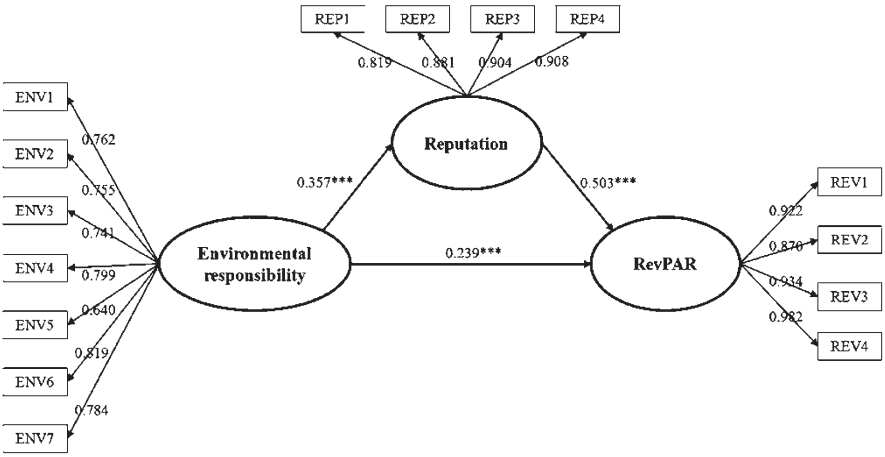

Fig. 8.2 Graphical results. *Source:* Authors

Based on this evaluation of the proposed model, environmental responsibility can be said to have a significant role as an antecedent of performance when this is measured using RevPAR. The relationship expressed by the first hypothesis (H_1) was shown to be significant and to possess an explanatory capacity in the model of 10.0%. This result is in line with those of previous CSR research and, more specifically, environmental responsibility (e.g. García & Armas, 2007; Kang et al., 2010; Tarí et al., 2010).

The second hypothesis (H_2), which links environmental responsibility and reputation, also was shown to have significant support, which agrees with Chan (2013) and Zhu et al.'s (2014) results. This explains 12.8% of the variance and, thus, has an indirect effect on RevPAR.

However, the direct impact of environmental responsibility on RevPAR (H_1, 10.0%) is clearly less than the effect exerted by reputation (H_3, 29.6%), although reputation captures some part of the influence of environmental responsibility (H_2, 12.8%). These results are consistent with those reported by Zhu et al. (2014) in relation to the sequence environmental responsibility-reputation-RevPAR. Thus, the present verification of this sequence confirms its significant importance to reputation in the hotel industry. The relationship between CSR and reputation has also been corroborated in other fields. For instance, Fatma, Rahman, and Khan (2015) confirmed this relationship in the banking sector, and Kim, Hur, and Yeo (2015) found proof for this among consumers of four international brands. In this way, the results for the proposed model expand the understanding of the relationships between CSR, corporate reputation and performance, specifically regarding environmental responsibility and performance as measured by RevPAR.

In summary, the present study's results corroborate the importance of environmental responsibility for hotel companies. In addition, this research confirms the significant repercussions that these strategies have for these businesses' reputation and improved revenue as measured by RevPAR.

8.5 Conclusions

This research sought to concentrate on the role of CSR's environmental dimension in the hotel industry and CSR's relationship with revenue, using RevPAR—a performance metric specifically formulated for the hotel industry. This study also focused on this dimension's relationship with hotels' reputation, in view of a lack of adequate theoretical frameworks and relevant, specific studies on this topic.

Regarding the theoretical contributions of this research, three results can be considered significant. The first is the importance of treating environmental responsibility within CSR as a key driver of profitability, especially in the hotel industry. The second is the significant role played by environmental responsibility in hotel companies, including its relationship with these businesses' reputation, in which environmental responsibility has a significant effect on their RevPAR. Last, this study examined performance through a seldom explored focus on RevPAR, thereby providing a new way to measure revenue. This constitutes a novel way to estimate the outcomes of hotel operations with a measurement tool that has produced good results in this research.

Regarding practical implications, the findings indicate that hotel managers need to put more effort into demonstrating a greater concern for the environment in their policies at the level of operations and management strategies. These policies have repercussions for the long-term sustainability of these businesses and, in the end, for the entire industry. This recommendation is in line with García and Armas's (2007) results, which show that hotel companies must plan their environmentally responsible activities strategically, taking into account their impact on day-to-day operations.

In addition, given Cherapanukorn and Focken's (2014) findings regarding the importance of managing not only hotels but also tourism destinations in a sustainable way, the present study's results highlight the need to extend these findings about the importance of environmental responsibility from hotels to destinations in general. Environmental responsibility is important when building a sustainable destination and improving its reputation and the performance of its tourism companies. As Sheldon and Park (2011) suggest, a sustainable destination also requires coordination between the private and public sectors, in which the correct use of CSR can generate a common point of view.

According to Khojastehpour and Johns (2014), it is not enough to look at how environmental responsibility affects reputation and profitability. This CSR dimension's impacts have to be assessed in terms of health and life expectancy. Thus, the practical implications of the present study's results can be expanded to include a focus on the importance of community benefits from the environmental responsibility of companies operating in destinations. This means investing in the sustainable development of tourism destinations, which exerts a positive effect on revenues and residents' quality of life.

This study's limitations are chiefly due to the narrower focus of this research, which centred on CSR's environmental dimension as this applies specifically to the Spanish hotel industry. To corroborate the findings and improve the empirical

understanding of this topic, similar analyses need to be extended to include other tourism companies with a strong impact on the environment (e.g. transport and restaurants). The proposed approach also can be used to analyse businesses in other geographical contexts.

In addition, interesting results could be attained through comparative analyses by category of accommodation establishments (e.g. hotels, apartments and tourist campgrounds), differentiating by hotel categories (i.e. stars), company size or location (e.g. rural, urban and beach-side hotels). The focus in this future research could be to identify the impact of environmental strategies on companies' reputation and RevPAR scores. This line of research definitely needs to be continued because it offers tools to improve the management of tourist accommodations in terms of their environmentally responsible strategies, thereby enhancing the long-term sustainability of these businesses.

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Chapter 9
Green Consumer Segmentation: Managerial and Environmental Implications from the Perspective of Business Strategies and Practices

Carolina Afonso, Diana Gavilan, Jesús García-Madariaga, and Helena Martins Gonçalves

Abstract With the new millennium, environmental concern entered a new phase, with stricter governmental regulations and incentives. Currently, within environmental issues, there is a broader challenge to commitment with economic and social goals. This is motivating companies and organizations to participate in transformation processes with the aim of minimizing the negative impacts of their activities. Within this context, new business philosophies, emerged empowering organizations to consider sustainability issues that have come to be viewed as an innovative and differentiating factor, providing competitive advantages (Fraj-Andrés, Martinez-Salinas, & Matute-Vallejo. Journal of Business Ethics, 88, 263–286, 2009; Leipziger. The corporate responsibility code book. Greenleaf Publishing Limited, 2016; Leipziger. The corporate responsibility code book. Greenleaf Publishing Limited, 2016). Therefore, organizations have begun incorporating these concerns in their processes, adopting green management policies, and including green marketing strategies in order to remain competitive (Straughan & Roberts. Journal of Consumer Marketing, 16(6), 558–575, 1999; Rivera-Camino. European Journal of Marketing, 41, 1328–1358, 2007). From the marketing perspective, the importance of understanding green consumer behaviour in order to develop better segmentation and targeting strategies is highlighted. Green consumers are changing significantly. Consumers, although with some reluctance, are moving to greener products. The Mintel organization reported that the number of consumers buying green has tripled

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in recent years. Furthermore, it found that the number of consumers that never bought green products have decreased. These results show that widespread environmental awareness had an important role in purchasing behaviour, with more consumers considering the environmental impact of their buying decisions and looking for a greener alternative to their conventional purchasing options. The existing literature suggests that previous research regarding the green consumer profile has different perspectives. The first group of researchers attempted to characterize green consumer profile using sociodemographic variables such as age, gender, education, income and occupation. In turn, the second group of researchers used psychographic variables instead of sociodemographic ones (Mainieri, Barnett, Valdero, Unipan, & Oskamp. Journal of Social Psychology, 137(2), 189–204, 1997). This chapter aims to better explore the importance of green consumer segmentation and its implications from a management point of view. More specifically, the aim is to analyze which variables better characterize green consumers (sociodemographic and psychographic). At the end, a theoretical framework is proposed to enable and support organizations to better understand green consumer profile. It also enables managers and marketers to target and develop better marketing strategies for these segments.

9.1 Introduction

In the last few decades, environmental concern has become prevalent, and consumers began looking for more environmentally friendly alternatives to their traditional purchases.

The National Geographic and GlobeScan conducted a study, Greendex (2010), which evaluated the sustainability of international consumerism. This study, which included a survey of 17,000 consumers from 17 countries, revealed that consumers are very concerned about the environment, and this is reflected in their daily consumer preferences.

Ecologically conscious consumers are defined as "individuals who seek to consume only products that cause the least—or do not exercise any—impact on the environment" (Roberts, 1996). According to Hailes (2007), a "green consumer is the one who associates the act of purchasing or consuming products with the possibility of acting in accordance with environmental preservation". The green consumer knows that by refusing to purchase products that are harmful to the environment, they are contributing to environmental preservation. Therefore, green consumers avoid buying products that they perceive as risky to health, damaging the environment during production, use or final disposal, consuming much energy, having excessive packaging, and containing ingredients from threatened habitats or species (Hailes, 2007).

The existing literature suggests that the previous research regarding green consumer profile can be viewed from different perspectives. The first group of researchers made an attempt to characterize green consumer profile using sociodemographic variables such as age, gender, education, income and occupation. For

instance, Roberts (1996) identified a general ecological consumer profile: high income and education, as well as a prestigious profession. According to the author, higher education and a higher level of income significantly explain green consumer profile and behaviour.

In turn, the second group of researchers used psychographic variables instead of sociodemographic ones (Mainieri, Barnett, Valdero, Unipan, & Oskamp, 1997). These variables include values, interests, attitudes and other characteristics related to personality. Some years later, also explored these variables. In their research, the authors made an effort to categorize consumers according to their behaviour and attitude towards the environment. As a result, four segments were identified: committed environmentalists, mainstream environmentalists, occasional environmentalists, and non-environmentalists. The conclusions showed that a committed environmentalist tends to be older, middle class, active within the community, and politically involved.

The authors accomplish that although sociodemographic variables are important, individual values and attitudes also play a key role in distinguishing environmentalists from non-environmentalists. People with environmentally friendly behaviour tend to be more altruistic and less hedonistic. The study states that focusing on psychographic factors is more relevant to profiling green consumers than sociodemographic variables, since, with the passage of time, people change their attitudes. Such a change in attitudes might result in behavioural change as well.

9.2 Green Marketing: Definition and Evolution

The emergence of green consumers has contributed to the development of a new approach in marketing, viz., the so-called green marketing. Although green marketing has been discussed since the 60s, it was in the late 80s and early 90s that the concept began to be generalized. The American Marketing Association held the first workshop on the topic in 1974. Here, green marketing was defined as "the study of positive and negative aspects of pollution and depletion of energy sources" (Kinnear & Taylor, 1973).

By the 70s, a few authors had published their first articles on the theme (Kassarjian, 1971; Fisk, 1973; Kinnear, Taylor, & Ahmed, 1974). According to Kilbourne and Beckmann (1998), in these first definitions, the focus was on environmentally concerned consumer profiles. In turn, van Dam and Apeldoorn (1996) state that, by that time, the efforts were to develop an approach focusing on social marketing. These attempts revealed the possibility of a more active response to social and environmental problems (Fisk, 1974).

Ottman (1993) believes that the emergence of green marketing is a result of the finding that companies are being evaluated on their product/service performance, as well as their social and environmental responsibility.

Green marketing appears to be part of a solution not only for seeking and satisfying consumer needs and desires, but also for monitoring them within a context of environmental responsibility.

According to Polonsky (1994), green marketing consists of "all planned activities to generate and facilitate exchanges in order to satisfy human needs and desires with the least impact possible on the environment". This statement adds an important dimension: a more humanistic marketing concept that includes ecological and social aspects based on the minimization of environmental damage. Crane (2000) argues for the existence of a relation between morality and green marketing, because the environment implies some ethical questions that marketing has to align with.

As stated by Peattie (2001), there is a need to approach green marketing in a dynamic way. In the beginning, the concept was more focused on an ecological perspective, but as the interaction between the economy and the environment developed, the concept evolved to include sustainable marketing.

Green marketing, argues Peattie (2001), can be characterized into three "ages". The first age was the 70s, where the focus was on ecological marketing because the emphasis was on particular environmental problems, such as air pollution, depletion of oil reserves, and the impact of pesticides on the environment. The second age was the 80s, which is stated by the author as environmental marketing. The main concerns at this point were regarding clean technology, understanding and targeting the "green consumer", and observing socio-environmental performance as a source of competitive advantage. The current, third age, is sustainable marketing, which focuses on creating sustainable development and a sustainable economy. Aligned with these principles, Peattie and Charter (2003) defined green marketing as "an holistic management process responsible for identifying, anticipating and satisfying customer needs and society in a profitable and sustainable perspective".

In this sense and according to these authors, marketers should not only look for internal processes of production, but also for the impact that production and consumption have in the development of a sustainable society.

Sustainable development is an orientation that aims to "meet the needs of the present without compromising the ability of future generations to meet their own needs" (UNWCED, 1987).

For Bridges and Wilhelm (2008), sustainability movement may be viewed as incorporating a diverse group of social activist organizations whose goals, policies, ideologies, and action plans share a common "worldview". This worldview incorporates ecological (environmental), social (equity), and financial (economic) sustainability, which are often referred to as the "three Es" that constitute the "triple bottom line" (Savitz & Weber, 2006). Consistent with the triple bottom line, Peattie (2001) indicated that sustainable economic development poses major challenges for marketing. The author points out that the aim should not focus only on customers' satisfaction and profits to investors in the current generation, but should also include future generations. There is also an equity challenge that includes encouraging fair distribution across nations of the costs and benefits of economic development. Another challenge is what the author called "needs/wants challenge". The objective is to focus more on goods and services that meet the "basic survival needs" of poor nations instead of the "wants" of wealthy nations.

Thus, since green marketing is considered a major trend, it is important to understand the emergence of green consumers and their profile.

9.3 Green Consumers: Sociodemographic Characterization

Sociodemographic characterization was very popular in the 70s and in the 80s, when the first studies attempting to profile the green consumer were conducted.

Berkowitz and Lutterman (1968) and Anderson and Cunningham (1972) were pioneers in studying the profile of greenconsumers. Anderson and Cunningham (1972) characterized green consumers as individuals who, besides satisfying their personal needs, are also concerned about the welfare of society and the environment. These authors also state that they belong to a socio-economic class above the average and professional occupations of recognition and status. In a few words, they typified the green consumer as female, 40-years-old, with higher education level and socio-economic status than average.

Other researchers also arrived at similar conclusions, highlighting that women tend to be more environmentally conscious than men (Banerjee & McKeage, 1994). In turn, Reizenstein, Hills, and Philpot (1974) found that only men were more willing to pay more to control air pollution; Balderjahn (1998) also concluded men tend to have a more intense relation between attitudes and use of environmentally conscious products than women.

Despite the wide range of sociodemographic variables used by several authors, the ones that proved to be more significant to profiling green consumers are:

- Age: Several authors have explored the relation between age and other variables. However, results are contradictory. Some found non-significant relations between age and green behaviour (Do Paço, Raposo, & Filho, 2009; Kinnear et al., 1974; Straughan & Roberts, 1999) while others found significant positive relations (Samdahl & Robertson, 1989; Memery, Megicks, & Williams, 2005
- Gender: This was also explored by several authors (MacDonald & Hara, 1994; Roberts, 1996; Roberts & Bacon, 1997; Samdahl & Robertson, 1989; Stern, Dietz, & Kalof, 1993; Straughan & Roberts, 1999). Most researchers argue that women are more likely to act in a more environmentally friendly way than men. However, final results are not conclusive. Empirical studies show that women are more sensitive to environmental issues and perceive them better than men do, therefore, become green consumers more often (Do Paço et al., 2009; Memery et al., 2005; Ottman & Reilly, 1998). On the other hand, some researches indicate that men possess a deeper environmental knowledge, while women care more about the environmental quality (D'Souza, Taghian, & Lamb, 2006).
- Income: According to Awad (2011), income was always perceived to have a positive relation to green consumer behaviour because it is assumed that green products cost more than conventional ones. Although this variable was taken in consideration by several authors, results are not convincing (Anderson & Cunningham, 1972; Kassarjian, 1971; Kinnear et al., 1974; Roberts, 1996; Roberts & Bacon, 1997; Samdahl & Robertson, 1989). Ottman and Reilly (1998) argue that consumers who have higher purchasing power than average are more sensitive to environmental issues in comparison to those who receive average or

low income, which is why green product prices are not a barrier for them. However, general findings are not conclusive.
– Education has a positive relationship with green consumer behaviour in the majority of the performed studies (Aaker & Bagozzi, 1982; Roberts, 1996; Schwartz & Miller, 1991). Consumers with higher literacy level better perceived environmental issues and tend to act in accordance (Ottman & Reilly, 1998; Memery et al., 2005; Do Paço et al., 2009). In turn, Samdahl and Robertson (1989) and Straughan and Roberts (1999) observed that education did not have a positive relation with green consumer behaviour.

As stated before, sociodemographic variables were commonly utilized in the 80s and 90s mainly due to the fact that green consumers were too niche, and variables like higher education or higher income were determinant to profiling these consumers. From the 90s onwards, psychographic and behavioural variables began to be considered by researchers.

9.4 Green Consumers: Psychographic Characterization

Despite the identification of the green consumer profile through social, economic and demographic characteristics, as previously mentioned, several authors argue that psychographic variables provide more relevant insights into green consumer behaviour (Akehurst, Afonso, & Gonçalves, 2012; Anderson & Cunningham, 1972; Awad, 2011; Banerjee & McKeage, 1994; Chan, 1999; Kassarjian, 1971). The most prominent psychographic variables taken into consideration by the existing studies are:

– Altruism: It is defined as "the concern about the welfare of society and others". It was analyzed by Stern et al. (1993) and Straughan and Roberts (1999)). Altruism plays an important role in political activism, but sometimes is inconclusive if there is a direct cost involved. Straughan and Roberts (1999) examined this variable and found a positive correlation with green consumer behaviour. This means that the green consumer is likely to be more altruistic than conventional consumers, and this variable seems relevant to explain green consumer behaviour. Altruism is somehow related to another psychographic variable taken into consideration in several studies, i.e., collectivism. In terms of definition, collectivism is similar to altruism, but it is understood as a cultural value, as a sense of interdependence among people. Several authors argue that collectivistic individuals tend to have more pro-environmental attitudes and behaviours (Chan, 2001; Gupta & Ogden, 2009; Kim, 2011; Kim & Choi, 2005; McCarty & Shrum, 2001).
– Environmental concern: It is commonly defined as the individual's awareness of environmental problems and their willingness to be part of the solution (Chan & Lau, 2000; Dunlap & Jones, 2002). Several authors correlated this variable with environmental friendly behaviour (Kinnear et al., 1974; Roberts & Bacon, 1997;

Straughan & Roberts, 1999). According to Maloney, Ward, and Braucht (1975), environmental concern is related to the emotions and knowledge level, as well as to a readiness to change behaviour. Bang, Ellinger, Hadjimarcou, and Traichal (2000) and Kim and Choi (2005) argue that the level of a consumer's environmental concern is strongly linked to their willingness to buy green products.

– Perceived consumer effectiveness (PCE): It can be considered the most important variable in green consumer profile analysis and can defined as "the consumer's perception of the extent to which their actions can make a difference in solving environmental problems" (Ellen, Wiener, & Cobb-Walgren, 1991). In other words, it is the extent to which consumers believe that they, as individuals, can make a difference, through actions such as purchasing green products, recycling, subscribing to e-invoices, among others, in contributing to environment protection. PCE predicts a variety of purchase decisions (Ellen et al., 1991), for example buying biodegradable products (Berger & Corbin, 1992) and sustainable dairy products (Vermeir & Verbeke, 2007). Consumers will act proactively if they perceived their actions as effective for environment preservation (Moisander, 2007). PCE has been included in several studies and is assumed to be an important predictor of pro-environmental consumer behaviour, outstanding all other sociodemographic and psychographic variables (Kinnear et al., 1974; Balderjahn, 1988; Ellen et al., 1991; Berger & Corbin, 1992; Roberts, 1996; Roberts & Bacon, 1997; Straughan & Roberts, 1999; Joonas, 2008; Gupta & Ogden, 2009; Young, Hwang, McDonald, & Oates, 2010; Kim, 2011; Tan, 2011; Albayrak, Caber, & Moutinho, 2011; Akehurst et al., 2012).

9.5 Green Consumer Segmentation

The green market and green consumers are subject to segmentation and it is important to identify which similarities and differences between the various types of green consumers can be used to group them in a particular green segment based on their characteristics, buying behaviour, demanding, expectations and marketing mix.

As we have seen previously, in recent decades, a number of studies and surveys have been conducted with the aim of increasing knowledge about the green consumer. With regard to market segmentation, investigations show that there are many "shades of green".

Several market research consulting groups have developed studies regarding green consumers' segmentation, namely: Natural Marketing Institute, Mintel, Yankelovich, GfK Roper Consulting e Insight and Research Group. Most of them classify green consumers into five segments:

– True Green Consumers: These consumers are more active and demonstrate greater commitment to the environment and translate it into their purchases. They are generally environmental leaders and activists. As depicted in Table 9.1, they are named Lohas (Lifestyles of Health and Sustainability, Natural Marketing

Table 9.1 Green market segmentation (USA)

Natural Marketing Institute (2006)		Mintel (2006)		Yankelovich (2007)		GfK Roper Consulting (2007)		Insight Research Group (2007)	
Lohas	17%	Super Greens	12%	GreEnthusiasts	13%	True blue	30%	Green gurus	17%
Naturalities	21%	True Greens	68%	GreenSpeaks	15%	Green black	10%	Conscientious citizens	24%
Drifters	19%	Light Greens		GreenSteps	25%	Sprouts	26%	Guidance seekers	24%
Conventionals	20%			GreenBits	19%	Grousers	15%	Bystanders	17%
Unconcerned	21%	Never	20%	GreenLess	29%	Apathetics	18%	Hype haters	18%

Source: City Manager Weekly (2008)

Institute), Super Greens (Mintel), Greenthusiasts (Yankelovich), True Blue (GfK Roper Consulting), and Green Gurus (Insight Research Group);
- Ecologically Concerned Consumers: Those consumers are willing to pay more for green products, but there are some obstacles related to their behavior (e.g., green products are not available in all stores and many consumers don't want to change their routines and make extra effort to buy the products. Therefore, convenience and time are main barriers). In Table 9.1, they are classified as Naturalities (Natural Marketing Institute), True Greens (Mintel), Greenspeaks (Yankelovich), Green Back (GfK Roper Consulting) and Conscientious Citizens (Insight Research Group).
- Moderately Green Consumers: These purchase only green products if they meet their main needs. They care about the environment, but would only spend a little more to buy green. In Table 9.1, they are named Drifters (Natural Marketing Institute), Light Greens (Mintel), GreenSteps (Yankelovich), Sprouts (GfK Roper Consulting) and Guidance Seekers (Insight Research Group).
- Occasional Green Consumers: They are concerned about the environment, but believe that individual behaviour can contribute very little to solve environmental problems. They rarely buy green products based on ecological attributes. In Table 9.1, they are identified as Conventionals (Mintel), GreenBits (Yankelovich), Grousers (GfK Roper Consulting), and Bystanders (Insight Research Group);
- Apathetic Consumers: These consumers are not concerned about the environment and do nothing to contribute to a change in consumption patterns. They essentially "don't buy and don't care". In Table 9.1, they are named Unconcerned (Natural Marketing Institute), Never (Mintel), Greenless (Yankelovich), Apathetics (GfK Roper Consulting) and Hype Haters (Insight Research Group).

As indicated in Table 9.1, there is a core of committed consumers who are aware of environmental problems and proactively buy green products regularly. Depending on the consultant group, the group of green consumers comprise 10–12% of adult consumers. Another group that occasionally buys green products represents 8–24% of all consumers. About 19–25% of the consumers are aware of the existence of green products and tried to buy them, but do not buy them often. Moderated green consumers are those who care about the environment to some extent, but this is not translated into action. They are too busy to buy green products and complain about the cost of products and quality. This group ranges from 14 to 20% of adult consumers who might be persuaded to buy green products based on quality, cost and availability. About 53–65% of all consumers have purchased green products at some point.

GfK Roper Green Gauge reported, as shown in Table 9.2 that within the scope of a decade, truly green consumers grew and the apathetic decreased.

To sum up, green consumers are an increasing segment. Investigations and market surveys indicate that consumers are increasingly expressing concerns about the environment.

Many of the studies aimed at identifying typical demographic qualities of the green consumer. For example, females, young people and people with a relatively

Table 9.2 Green segmentation evolution (1996–2007)

	1996 (%)	2007 (%)
True blue	10	30
Green back	5	10
Sprouts	33	26
Grousers	15	15
Apathetics	37	18

Source: GfK Roper Consulting (2007)

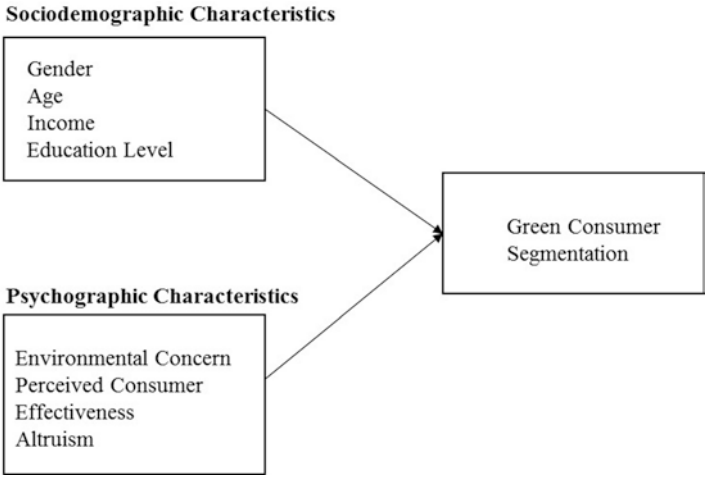

Fig. 9.1 Conceptual model

high education and income were identified as most likely to engage in green consumer behaviour. However, many contradictory views of the probable green consumer were put in evidence.

Other research, notably more recent ones, have used psychographic characteristics such as environmental concerns to identify the green consumer. Such characteristics turned out to be better at explaining variations in green consumer behaviour than demographic criteria. Perceived consumer effectiveness has been particularly highlighted as being useful in predicting actual buying behaviour.

Within this context, derived from the literature review and with the objective to propose a model to help managers and marketers better segment green consumers, the following research framework is proposed (Fig. 9.1).

9.6 Conclusions and Implications

The contribution of this chapter is the proposition of a model derived from literature that enables academic scholars and marketing managers to identify segments of similar green customers and potential customers to prioritize the groups to address, understand their behavior, and respond with appropriate marketing strategies.

According to the literature, there is a growing awareness that businesses need to incorporate economic, social and environment pillars into their core (Fraj-Andrés et al., 2009); Leipziger, 2016); Rivera-Camino, 2007). Corporate leaders are responsible for their organizations' impact on society and the environment beyond legal compliance and the liability of individuals.

Companies and organizations around the world are struggling with a new role, which is to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. Organizations are being addressed to take responsibility for the ways their operations impact societies and the environment.

Green marketing has evolved within this context, and it is now crucial to rethink marketing strategies: from targeting green consumers with green products to broadening the targeted consumer group and including green claims of the products as one of the appeals when compared to conventional ones. This will require an extended set of marketing tools for strategy and planning, as well as a more active role for businesses.

There are companies that develop green marketing strategies as part of their social corporate responsibility. Most often, these activities are not incorporated in the business, since top managers associate the relation between environment and business as extrinsic to the business itself. Therefore, the first step is for managers and marketers to realize that green marketing can be profitable, rather than purely altruistic.

In agreement with, there are two basics requirements of green marketing: top management involvement and long-term objectives, which includes consumers' education.

Thus, one of the challenges that green marketing faces is to incorporate environmental issues into business and to invest in research and development in order to create products that are environmentally friendly, but at the same time retain their functionality, while also being profit-driven. Then, the challenge for marketers will be to develop strategies targeting the environmental consumer.

Enterprises and managers often claim that "there is no market for green products". They indicate that the process of greening production and consumption should start with consumer demand. So, it becomes essential to understand who the green consumers are, which variables better describe their profile, and then group them into segments.

The research framework proposed unveils two complementary perspectives on green consumer segmentation: the first is based on sociodemographic variables (gender, age, income, and education level) and the second, that has been prominent

in more recent researches, takes into consideration the most relevant psychographic variables (environmental concern, perceived consumer effectiveness, and altruism). Previous studies have shown that certain demographic and psychographic variables are significant for differentiating between the "greener" segment and other segments.

The combination of both perspectives is proposed to be the yardstick to segment green consumers into groups, taking into account the most relevant variables for differentiating them.

Intersections among sociodemographic research and psychographic research are expected to bring originality into the segmentation of green consumers. The segmentation of green consumers will also contribute to practical considerations, such as how to communicate successfully with the green consumer in the context of corporate marketing or public policy communications.

Corporate social responsibility is becoming a leading principle of top management and entrepreneurs. Organizations can reexamine their pattern of behaviours. Knowing their consumers is fundamental to better understanding their journey toward a sustainable approach.

It would be interesting to perform further research to validate the model empirically. In terms of limitations, the model presented is a generic one, and some variables depending on the green product category of a specific business might be added to enrich the analysis.

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Chapter 10
How Strong Might Be a Carbon Tax on Electricity Consumption to Reach Spanish H2020 Targets?

J.M. Cansino, M.A. Cardenete, M. Ordóñez, and R. Román

Abstract This chapter evaluates the cumulative impact (2014–2020) that a tax on electricity consumption would have on it consumption in Spain. Changes in electricity consumption are caused by increasing purchasing prices due to tax. Impact on revenues and CO_2 emissions are also assessed through a model price. Tax reform is inspired on final report presented by a Group of Experts commissioned by the Government of Spain in 2014. The evaluation has been performed by considering two scenarios, without (Scenario 1) and with tax recycling between the new tax and employer-paid Social Security benefits or with tax using a price stability tool (Scenario 2). Data comes from the Social Accounting Matrix at purchase prices for Spain in 2006 (SAMESP06). Right rates of a carbon tax designed on electricity consumption would range between 6.24% and 5.52% to reach the total target.

10.1 Introduction

On March 2015, the European Union (EU) submitted to the United Nations Climate Change Conference (UNFCCC) its Intended Nationally Determined Contribution (INDC) regarding Conference of Parties (COP21) at Paris. EU's INDC settled down that Member States (MSs) were committed to a binding target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990, to be fulfilled jointly, as set out in the conclusions by the European Council of October 2014. The relevant period for this commitment is from 1 January 2021 to 31 December

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2030. As EU recognized in the document this target represents a significant progression beyond its current undertaking of a 20% emission reduction commitment by 2020 compared to 1990. Target is also in line with the EU objective, in the context of necessary reductions according to the IPCC by developed countries as a group, to reduce its emissions by 80–95% by 2050 compared to 1990. Furthermore, it is consistent with the need for at least halving global emissions by 2050 compared to 1990. Key sectors to receive main measures oriented to reach the target include Energy industries (for the relevance of Spanish electricity sector see Alcántara, del Río, & Hernández, 2010). Finally, specific tools to achieve it are not in the document nor in Paris Agreement (UN, 2015) so MSs might decide on this issue. Carbon taxes represent one of the carbon mitigation tool marked oriented largely used by countries.

The implementation of economic instruments like carbon taxes leading to the internalization of the CO_2 externality and an increase in energy prices could be expected to encourage manufacturing firms and households to adopt energy-saving technologies and practices with consequences for utilities. If an effective mitigation policy is to be pursued, then economic instruments providing a price signal to reduce energy demand should be applied (Tarancón, del Río, & Callejas, 2010). When energy prices fail to reflect the real cost of energy, consumers under-invest in energy efficient-equipment.

These type of taxes are called environmental Pigouvian taxes. An environmental tax, following the double dividend approach (Goulder, 1995), would produce an improvement in the environment through enhancing energy efficiency. It must be considered that as one of the EU Members States, Spain's authorities have to face staunch commitments derived from what is known as the H2020 strategy, which is the more ambitious EU package to fight against global warning. It includes a specific target of 20% for energy efficiency improvement that could affect utilities' decisions. In terms of energy efficiency, Spanish commitment for the 2020 implies that there must be a cumulative reduction in energy consumption of 15,979 ktoe for 2014–2020 (EU, 2012; Spanish Industry Ministry, 2014).

Together with this an environmental Pigouvian tax could also generate other positive economic impacts associated with tax recycling (Manresa & Sancho, 2005; Sancho, 2010). Thus, the revenues generated by this tax might be used to reduce other existing taxes, such as social contributions (Cardenete & Sancho, 2002; Cardenete, 2004; Llop & Manresa, 2004).

Just few months before submitting EU's INDC, in February of 2014, a Group of Experts commissioned by the Government of Spain presented its final report with the measures that could inspire an in-depth tax reform (Spanish Department of Finance, 2014). This report included the use of taxes to contribute to the battle against Climate Change and to reduce others taxes such as Social Security payments. Others words, report would support a tax reform based on the establishment of an environmental Pigouvian tax.

In order to best design this reform uncertainty linked with its possible impacts might be reduced by assessment main impacts on prices, revenues and private spending. Others effects on energy consumption and CO_2 emissions avoided have to be simulated. Cansino, Cardenete, Ordóñez, and Román (2016) did it but only con-

sidering short run effects but without regarding H2020 Spanish commitments. This is the contribution of the chapter.

Based on the recommendations presented by the Committee of Experts aforementioned, this chapter goes in line with Cansino et al. (2016) proposing an environmental tax levied on electricity consumption at the same level as the tax applied on the products consumed by the economic sectors. As was mentioned above, energy industry is one of the key sector considered in the EU's INDC and power industry is included in it. This tax would differ from Spain's current electricity consumption tax, the essential aim of which is to collect revenue.[1] It is actually inspired by the British Climate Change Levy[2] (CCL), which strives to promote the reduction of GHG emissions and where the tax burden is offset by a reduction of social contributions (Pearce, 2006).

Spain's energy sector is a high energy intensity one and responsible for most of the GHG emissions released into the atmosphere. The energy processing sector accounted for 77% of the total GHG emissions in Spain with the energy and transport industries producing the highest emission volumes.[3]

Chapter evaluates the cumulative impact (2014–2020) that a tax reform based on the introduction of an environmental tax of the aforementioned characteristics would have mainly on electricity consumption and also on the rest of the rest of variables. The evaluation has been performed by considering two scenarios, without (Scenario 1) and with tax recycling between the new tax and employer-paid Social Security benefits or with tax using a price stability tool (Scenario 2). In Scenario 2, the tax reform is subject to two alternative restrictions. Firstly, a restriction would be imposed to ensure revenue neutrality (2-I). Secondly, another restriction would require that the tax reform guarantees price stability (2-II). Scenario 2-II does not properly implies a tax recycling process. It focus on price stability as another political target which could be in the policy-maker agenda.

For this analysis, the Social Accounting Matrix (SAM) at purchase prices for Spain in 2006 (SAMESP06) developed by Cansino, Cardenete, Ordóñez, and Román (2012) has been used. Although this is not the latest available SAM for the economy of Spain using SAMESP06 makes easier to compare obtained results with those derived for previous analysis in Cansino et al. (2016). The Matrix was constructed with the data from the origin and destination tables of the Input-Output (IO) framework and from accounting tables published by the National Statistics Institute (INE, 2009a, 2009b). The SAM serves as the database for a pricing model that includes the new tax.

The pricing model is an IO methodology model introduced by Leontief (1946) to study the relationship between wages, profits and prices in the U.S. economy of 1939. This methodology has been widely developed in relation to Spain's economy at both the domestic (Llop, 2008; Roland-Holst & Sancho, 1995; Sancho, 1988; and

[1] The electricity tax was implemented by Law 66/1997 of 30 December 1997 on Fiscal, Administrative and Social Order Measures, and had the basic objective of obtaining revenue to counterbalance the removal of an electricity billing surcharge that was meant to provide support to the coal industry.

[2] Reactions to CCL partly explain current improvements in Britain electricity systems (Lockwood, 2016).

[3] Spain's Ministry of the Environment and Rural and Marine Affairs (MMARM, 2011).

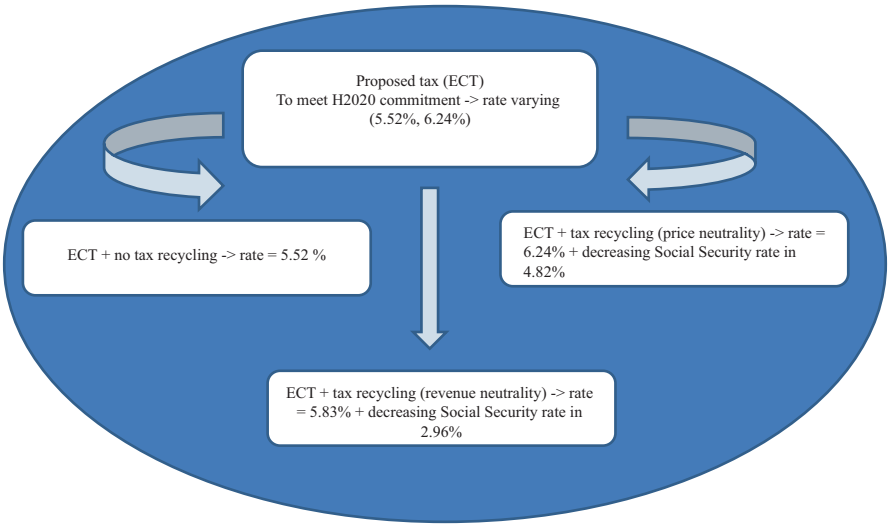

Fig. 10.1 Major findings of proposed tax (ECT)

more recently Tarancón et al., 2010). This model is an analytical method that is complementary to both the econometric approach (Buñuel, 2011; Labandeira & Labeaga, 1999, 2000) and the general equilibrium models developed in the field of environmental taxation by Bovenberg and Goulder (1996), Böhringer (2002), Kumbaroğlu (2003) and O'Ryan, de Miguel, Millar, and Munasnighe (2005), at the international level by Gómez and Kverndokk (2002), André, Cardenete, and Velázquez (2005), Manresa and Sancho (2005), De Miguel, Cardenete, and Pérez-Mayo (2009) and Labandeira, Labeaga, and Rodríguez (2004), for the case of Spain.[4] Figure 10.1 offers an overview of major findings.

Chapter is structured as follows. After the introduction, Sect. 10.2 describes both the methodology and the tax on energy consumption. Obtained results are shown and discussed in Sect. 10.3 from the two scenarios. The fourth section presents the conclusions and implications.

10.2 Methodological Approach

10.2.1 The Basic Model

The empirical basis upon which the model stands is found in each of the columns of the SAMESP06 at purchase prices that correspond to the 26 productive sectors considered. Each column represents the intermediate consumption of each of the

[4] The latter work integrates a micro-econometric model and a general equilibrium model.

activity areas or productive sectors while the other offers the primary factors used for the production of a single good.[5] The combination of various productive factors and intermediate consumptions, in fixed proportions and under the assumption of constant returns, results in each of the goods produced by each of the sectors indicated. This procedure isolates the price effects of the substitution effects, so that partial information is available but let us see what the effect of the current structure in the technology. It is a methodology for identifying price effects without any interference from the substitution effects, which require a different methodology, such as Computable General Equilibrium (CGE). A CGE cannot distinguish these two elements (prices and substitution effects because they are linked) so that the linear model provides a methodological advantage that is we exploit in this work.

In each column of the Primary Factors Matrix of the SAM at purchase prices, trade and transport margins are also shown, as well as the indirect taxes net of subsidies paid by the economic agents when demanding the goods and services required by companies that produce said goods/services (final demand). Hence, when combining the different components used to define the prices in the model, it is necessary to take into account the existence of two price types: one is the production price for each productive sector and the other is the purchase price or final price for each good produced.

A series of intermediate consumptions reflected in the Intermediate Consumption Matrix of the SAMESP06 have been used to define a standard product. Along with them, a series of production, labor and capital factors have also been employed, to which imports must be added as another productive factor (Manresa, Polo, & Sancho, 1988). The labor factor is represented by the gross wages and salaries paid by businesses, and the capital factor by the Gross Operating Surplus and the Gross Mixed Income. These three production factors are included in the Primary Factors Matrix under the SAMESP06 headings Labor (27), Capital (28) and Imports (42). When calculating the production price, both indirect taxes net of subsidies on products (36) and production (37) and employer-paid Social Security contributions (34) must be added to these intermediate consumption and productive factors. From these data, the cost per unit of each good produced by each industry can be estimated (Cardenete & Sancho, 2002). Following this scheme, the production price[6] of the good produced by sector j, p_j, is contained in the following expression:

$$p_j = \left(1+t_j\right)\left[\sum_{i=1}^{26} a_{ij}\cdot p_j + \left(1+ss_j\right)\cdot w\cdot l_j + r\cdot k_j + p_m\cdot m_j + ipr_j\right] \qquad (10.1)$$

where t_j, ipr_j and ss_j are the tax rates of net indirect taxes on products, production and employer-paid social contributions, respectively; a_{ij}, l_j, k_j and m_j represent,

[5] In IO analysis, each area of activity considered produces a single good, employing the same production technology.

[6] Each area of activity purchases the intermediate goods that it requires at their purchase prices, taxes included. However, the burden of indirect taxes does not fall on the producer but rather on the final consumer. Therefore, the price that must be taken into account is the production price.

respectively, the technical coefficients of intermediate consumption, the labor factor, the capital factor and the imported goods; w and r are the unitary remuneration for labor (wage rate) and capital, respectively; p_m is a price index for the imported goods. Thus, the last four summands on the right of expression ((10.1)) represent the contribution of each of the inputs required for the production of one good by each industry. Social contributions represent a portion of the remuneration for wage earners and indirect taxes represent a part of the production price.

The value of each parameter representing the technical coefficients was obtained from the SAMESP06. In the case of the technical coefficients referring to the intermediate consumption for each area of activity, it has been calculated from the following expression:

$$a_{ij} = \frac{A_{ij}}{XIP_j} \tag{10.2}$$

where A_{ij} is the element taken from the Intermediate Consumption Matrix, i.e. the input consumption that sector j makes from sector i, and XIP_j is the total output of sector j.[7] In the case of the productive factor, l_j, its calculation is based on the following expression:

$$l_j = \frac{L_j + CSS_j}{XIP_j} \tag{10.3}$$

where L_j represents the salaries and wages of sector j and CSS_j, the employer-paid social contributions. For productive factor k_j, the following expression has been used:

$$k_j = \frac{K_j}{XIP_j} \tag{10.4}$$

where K_j is the Gross Operating Surplus of sector j. Finally, parameter m_j is calculated as follows:

$$m_j = \frac{M_j}{X_{IPj}} \tag{10.5}$$

where M_j stands for the imports made by sector j.

The tax rates of net indirect taxes on intermediate products, production and employer-paid social contributions, and the technical coefficients have been obtained from the SAMESP06 through the following expressions:

[7] The total output of sector j does not correspond with the total number of uses or resources of the SAM, since it does not include the net indirect taxes (38) levied on the products making up the final demand or the trade and transport margins (39) on those same products.

$$t_j = \frac{IP_j}{XIP_j - IP_j} \tag{10.6}$$

$$ipr_j = \frac{IPR_j}{XIP_j} \tag{10.7}$$

$$ss_j = \frac{CSS_j}{CSS_j + L_j} \tag{10.8}$$

where the numerator represents the revenue in each sector and the denominator, its tax base, which in the case of net indirect taxes is the total output minus the indirect tax that falls on the products paid by the sectors (IP_j). The tax base of the taxes on production is the total output for each sector. In the case of employer-paid social contributions, the tax base is the sum of wages and salaries plus contributions. The tax rates obtained are not the nominal rates established by the existing regulations, but effective rates calculated from the SAM.

The purchase price is the result of adding trade and transport margins (39), together with the indirect taxes[8] levied on finished products (38) and to the production price. The expression used to calculate the purchase price, q_j, is as follows:

$$q_j = \left(1 + idf_j\right) \cdot \left[p_j + mg_j\right] \tag{10.9}$$

where idf_j is the net tax rate levied on finished products and applied as a percentage of the production price, mg_j represents the trade and transport margins. Taxes are calculated as the quotient between the revenue and its tax base according to the SAMESP06, through the following expression:

$$idf_j = \frac{IDF_j}{DF_j - IDF_j} \tag{10.10}$$

where DF_j is the final demand. The parameter that represents the vector for trade and transport margins, mg_j, is obtained as follows:

$$mg_j = \frac{MG_j}{DF_j} \tag{10.11}$$

The production price, the purchase price and the wage rate are endogenously obtained within the model. This is not the case with the unitary remuneration of

[8] Indirect taxes on products include the value added tax (VAT), taxes and duties on imports, excises, etc. The ideal would be to have these taxes expressed in a disaggregated form, especially in the case of VAT. However, the unavailability of disaggregated data of this tax by area of activity has made the consideration of all indirect taxes as a whole necessary.

capital and the price of imported goods, which are considered exogenous in the model. With regard to the latter, since foreign prices are the outcome of the interaction of supply and demand in foreign markets, they fall outside the pricing model considered. For the remuneration of capital services, there is no benchmark index equivalent to what the Consumer Price Index represents as a reference for salaries. This is the reason why, following Cardenete and Sancho (2002), this price is also considered exogenous in the model.

Regarding the wage rate, it adjusts itself to the evolution of consumer prices through the Consumer Price Index[9] (CPI). Thus, to calculate the wage rate, which, in turn, behaves as a final price variation index, the following expression is used[10]:

$$w = \sum_{j=1}^{26} q_j \alpha_j \tag{10.12}$$

where the wage rate, *w,* is a weighted average purchase price for the various goods produced by the productive sectors. α_j is the weight used, which represents the proportion of goods consumption *j* in relation to total private consumption.

Taking into account the aforementioned references—where the data provided by the SAMESP06 are reproduced—the model sets the initial prices for both the products and the productive factors to unity. The model and the various simulations have been solved with the help of the GAMS[11] (General Algebraic Modeling System) software developed by Brook, Kendrick, and Meeraus (1988) for the World Bank.

10.2.2 Electricity Consumption Tax and Indirect Revenue

Following a scheme similar to that of Cansino, Cardenete, and Román (2007) and Cansino et al. (2016), an electricity consumption tax (ECT) has been introduced into the above-described model. The effective tax rate of the ECT has been set, merely as a theoretical exercise, at 1%, without modifying the rest of the model. However, the results obtained will allow us to define rates to meet properly Spain's H2020 commitment in terms of energy efficiency. A 1% tax rate would be imposed on the supply of electricity ('taxable commodity') as fuels (that is lighting, heating, cooling and power) by business consumers. Electrical utilities become in a crucial

[9] The reason lies in that wage negotiations in the private sector and the establishment of the remuneration for public officials, the CPI is taken as the benchmark indicator. There are other possible assumptions, like using the total weight of salaries and wages in the sector in relation to the total wage bill, but the results obtained are very similar to those of CPI usage.

[10] In Applied General Equilibrium (AGE) modeling, this assumption is very common (Manresa et al., 1988). The explanation is based on that households take their decision on base to real wages. This assumption is too suitable to include a labor market in the full non-linear AGE, taking account the relation between the real wages and the ration between real unemployment and the unemployment after the simulation.

[11] The solution software used by GAMS is MINOS.

piece of the fiscal mechanism. This tax would then be passed on to the final prices. The tax rate considered is charged at a specific rate per unit of electricity. This rate seeks to change business and household behavior in Spain to reduce electricity consumption with consequences for electrical utilities. Companies are considered taxpayers if they supply fossil fuels or electricity generated from fossil fuels, for commercial consumption. As such, they should register as suppliers. Utilities may be held liable and pay a penalty if they are required to register as taxpayers and fail to do so. This tax would be applicable to goods produced by the electricity sector ((10.7)) while other sectors in the model remain unchanged. This new tax is incorporated into the model at the same level as the net tax on products, as reflected on its calculation using the following expression:

$$p_j = \left(1 + t_j + ect_j\right) \cdot \left[\sum_{i=1}^{26} a_{ij} \cdot p_j + \left(1 + ss_j\right) \cdot w \cdot l_j + r \cdot k_j + p_m \cdot m_j + ipr_j\right] \tag{10.13}$$

10.2.3 The Private Spending Index

Changes in purchase prices as a result of a tax modification give rise to variations in household purchasing power and spending level. The gain or loss of consumers' can be measured, following Cardenete and Sancho (2002), through the so-called Private Spending Index (PSI), which calculates the variation in consumer expenditures, as required to purchase the original basket of goods and services at new prices. With this, Y can be defined as the income used to purchase the original basket of goods and services and Y' as the income used to purchase the same basket of goods and services after the tax is introduced; the difference between the two will measure the variation in household expenditure between the initial and the final situation.

$$PSI = Y - Y' = \sum_{j=1}^{26} q_j \cdot C_j - \sum_{j=1}^{26} q'_j \cdot C_j = \sum_{j=1}^{26} \left(q_j - q'_j\right) \cdot C_j \tag{10.14}$$

where q_j and q'_j are, respectively, the initial and final purchase price of the basket of goods and services, C_j is the basket of goods and services or consumption of the representative household. The PSI is the difference between Y and Y'; that is, the variation of consumer income after the tax has been introduced. A positive (negative) difference indicates that the final situation is better (worse) than the initial one, i.e. consumers will need a lower (higher) income to buy the same basket of goods and services, resulting in a higher (lower) level of household income. Although this measure includes neither the adaptation nor the modification of consumer habits in the face of the new prices, it helps to approach the improvement or worsening of private spending.

10.3 Results and Discussion

The results obtained are associated with two reference scenarios. In the first, the tax reform does not entail the tax recycling of the new tax, the ECT. In the second scenario, the reform does include tax recycling or price stability as a target, which consists of counterbalancing the introduction of the ECT with a reduction of the employer-paid Social Security contributions. In the second scenario, the tax reform is subject to two types of alternative restrictions, one that requires the total tax revenue to remain constant (revenue neutrality) and the other that requires prices to remain constant (price stability) after the tax reform.

10.3.1 Scenario 1

The effective ECT tax rate has been set, merely as a theoretical exercise, at 1%, without modifying the rest of the model. These results would allow a revised tax rate to be set to meet Spain's H2020 target. Table 10.1 shows the effects that the introduction of this tax would have on the price of the goods produced by the various areas of activity, as well as the average effect on the whole. The 2nd column reflects the increase in production prices, while the 3rd shows the increase in purchase or consumption prices.

The change in sectoral prices caused by the introduction of the ECT provoked a change in the pattern of household consumption as shown in Table 10.1. If the consumption is used as a proxy for overall output, it is possible to calculate the changes in energy consumption caused by the ECT. The sequence is as follows: The introduction of the ECT causes a change in the prices of both production and consumption of every sector. The latter modification causes a shift in the household consumption of the 26 sectors. This consumption's change implies a variation in the production sector and causes a change in the energy consumption. For the initial situation as well as for each of the scenarios considered, the consumption data are shown in Table 10.2. To calculate the change in the energy consumption data, the sectoral primary energy consumption data published by the Spanish Institute of Statistics are used. Relevant figures for Scenario I are contained in Table 10.1.To obtain the results, we used the primary energy consumption for each sector in 2014 (launch year for Spain's commitment for 2020). Compared with Cansino et al. (2016), Table 10.1 includes column 5th which shows the accumulated variation for the 2014–2020 period. It is understood that the annual variation for 2014 (column 4th) is maintained constant for all years of that period. Thus, by introducing ECT into this first scenario would allow us to reach 16.5% of the commitment for Spain for H2020. Impact on Electricity utility industry is clear and expected.

Table 10.1 Changes in prices and energy consumption

Productive sector	Changes on the prices after introduction of the ECT (%)		Variation of primary energy consumption (ktoe)	
Productive sector	Production price	Purchase price	2014	2014–2020
1. Agriculture, livestock and forestry	0.01	0.01	−0.1	−0.61
2. Fisheries	0.02	0.02	0.0	0.00
3. Coal	0.02	0.00	0.0	−0.14
4. Oil and natural gas	0.00	0.00	0.0	0.00
5. Non-energy extractive industries	0.01	0.01	0.0	−0.14
6. Oil refineries	0.00	0.00	−4.4	−30.46
7. Electricity	3.01	3.58	−367.1	−2569.73
8. Gas	0.01	0.01	0.0	−0.05
9. Water	0.05	0.05	0.0	−0.01
10. Food and stimulants	0.03	0.02	−0.3	−1.93
11. Textile and leather	0.02	0.01	−0.1	−0.75
12. Timber products	0.03	0.02	−0.6	−4.00
13. Chemical industry	0.01	0.01	−0.4	−2.76
14. Building materials	0.04	0.03	−1.0	−6.71
15. Metallurgy	0.01	0.01	−0.2	−1.75
16. Metal products	0.04	0.04	−0.1	−0.86
17. Machinery	0.01	0.01	0.0	−0.12
18. Vehicles	0.01	0.01	0.0	−0.04
19. Other transport elements	0.02	0.02	0.0	−0.01
20. Other manufactured products	0.03	0.03	−0.1	−0.74
21. Construction	0.05	0.05	−0.1	−0.41
22. Retail and catering	0.04	0.13	−0.3	−2.44
23. Transport and communications	0.03	0.03	−0.2	−1.73
24. Other services	0.04	0.05	0.0	−0.23
25. Market services	0.03	0.03	−0.4	−2.54
26. Non-market services	0.07	0.07	−1.1	−7.95
Overall variation		**0.09**	**−376.6**	**−2636.1**
2020 Target				16.5%

Source: Own elaboration based on SAMESP06

Table 10.2 Effect on consumption following the introduction of the ECT by sector (millions of Euros)

Productive sector	(1)	(Scenario 1)	(2-I)	(2-II)
1. Agriculture, livestock and forestry	16,976.3	−2.0	0.6	2.1
2. Fisheries	5603.6	−0.9	0.4	1.1
3. Coal	59.3	0.0	0.0	0.0
4. Oil and natural gas	63.1	0.0	0.0	0.0
5. Non-energy extractive industries	128.4	0.0	0.0	0.1
6. Oil refineries	21,504.0	−1.3	1.4	3.0
7. Electricity	7859.3	−70.4	−69.8	−69.4
8. Gas	1793.8	−0.3	0.3	0.7
9. Water	2420.5	−2.1	2.1	4.5
10. Food and stimulants	74,606.0	−18.3	16.3	35.8
11. Textile and leather	34,873.2	−11.0	9.2	20.6
12. Timber products	3293.4	−0.7	0.6	1.4
13. Chemical industry	13,740.4	−1.5	1.4	3.1
14. Building materials	1140.5	−0.4	0.3	0.7
15. Metallurgy	177.6	0.0	0.0	0.0
16. Metal products	2100.5	−0.7	0.6	1.4
17. Machinery	16,302.9	−1.9	1.7	3.8
18. Vehicles	22,688.4	−0.4	0.4	0.9
19. Other transport elements	2504.7	−0.1	0.1	0.2
20. Other manufactured products	23,054.8	−6.1	5.1	11.4
21. Construction	9530.1	−4.7	4.3	9.4
22. Retail and catering	127,989.9	−176.0	143.3	324.1
23. Transport and communications	34,567.0	−13.3	11.1	24.9
24. Other services	32,554.9	−16.7	14.0	31.3
25. Market services	124,616.1	−35.4	23.4	56.7
26. Non-market services	14,369.4	−11.2	9.7	21.5
Consumption/ Private Welfare Index	**594,518.0**	**−375.5**	**176.6**	**489.2**

Source: Own elaboration based on SAMESP06
(1) Initial consumption
(2-I) Changes in consumption following the introduction of the ECT and its offset with a decrease of social contributions. Objective: to maintain the revenue
(2-II) Changes in consumption following the introduction of the ECT and its offset with a decrease of social contributions. Objective: to maintain price stability

10.3.2 Scenario 2

This second scenario draws inspiration from Cardenete and Sancho (2002) and the British CCL,[12] where the introduction of the rate is compensated by a 0.3% reduc-

[12] The British CCL is intended to contribute to the reduction of greenhouse gas emissions. It is a tax on the consumption of products for lighting, heating and electricity of industry, commerce, agriculture and public administration sectors and for other services. The taxed products are electricity,

tion of the employer-paid social contributions. In the present model, the offset of employer-paid social contributions required to ensure that the tax reform is financially neutral, in terms of both revenue (scenario 2-I) and prices (scenario 2-II), has been calculated.

In this second scenario, the tax reform involves, in addition to the introduction of the ECT, a reduction of the employer-paid Social Security benefits. The reform is also subject to a first restriction of revenue neutrality and to a second restriction of price stability.

Table 10.3 shows the variation in energy consumption for each sector in scenarios 2-I and 2-II. Attaining the objective for H2020 is, in this case, 15.5% and 15.0%, respectively (see columns 3th and 5th). Once again, Electrical Utility industry receives directly the impact of the tax reform showing a decrease of 2546.6 ktoes for scenario 2-I and for the cumulated period 2014–2020 and of 2533.5 for scenario 2-II.

From previous results and from Table 10.2, it is possible, by means of an iterative process, to calculate the effective tax rates that would allow each scenario to reach the exact target for Spain in 2020 in terms of energy efficiency. In scenario 1—that is with the introduction of ECT—it would be necessary to have a tax rate of 5.52% to reach the objective. In scenario 2-I, the ECT tax rate would be established at 5.83% and a decrease in social security payments of 2.96%. If the objective is price stability (2-II), the ECT rate should be 6.24%, with a reduction in social security payments of 4.82%. Table 10.4 gives details. The results show that the 1% rate was a little far from being a tax reform that reaches 100% of Spain commitment for H2020. Table 10.4 shows the results regarding the tax rates that affect each of the 26 sectors. The 2nd column presents the effective rate of the initial employer-paid social contributions, that is, before the introduction of the ECT and the offset through their reduction. The 3rd and 4th columns reflect the decrease in the effective rates of the contributions in order to satisfy the required restrictions: in the first case, maintaining revenue neutrality.

Table 10.5 presents the effects on final prices and changes in energy consumption under full H2020 by sectors, which would be attained upon introducing ECT into the scenarios contemplated. Together with this, an in-depth review of the available literature regarding price elasticity for electricity is provided in Fig. 10.2 showing that assumptions made are in line with literature. As could be expected Electricity Utility industry shows the higher values varying in a range from −15,576.7 ktoes to −16,914.2 ktoes. For the same Industry impact on prices with H2020-rates is also higher than in the theoretical case; 21.73% (min) and 23.60% (max).

Impacts on different tax revenues of every scenario are shown in Table 10.6.

Table 10.7 shows PSI changes. In Scenario 1, the increment of the final prices reduces the households' purchasing power that could be quantified in 3359.7 million Euros. In the simulation for Scenario 2-I, the price reduction following the decrease of the average effective rates for the employer-paid social contributions

gas, liquid hydrocarbons and coal. This rate is applied per nominal unit of power and, in the case of electricity, is 0.0043 £ per kilowatt-hour.

Table 10.3 Variation of primary energy consumption (ktoe)

	2-I		2-II	
Productive sector	(1)	(2)	(1)	(2)
1. Agriculture, livestock and forestry	0.0	0.2	0.1	0.6
2. Fisheries	0.0	0.0	0.0	0.0
3. Coal	0.0	0.2	0.0	0.3
4. Oil and natural gas	0.0	0.0	0.0	0.0
5. Non-energy extractive industries	0.0	0.1	0.0	0.3
6. Oil refineries	5.0	34.7	10.2	71.5
7. Electricity	−363.8	−2546.6	−361.9	−2533.5
8. Gas	0.0	0.1	0.0	0.1
9. Water	0.0	0.0	0.0	0.0
10. Food and stimulants	0.2	1.7	0.5	3.8
11. Textile and leather	0.1	0.6	0.2	1.4
12. Timber products	0.5	3.4	1.1	7.6
13. Chemical industry	0.4	2.5	0.8	5.5
14. Building materials	0.9	6.2	1.9	13.4
15. Metallurgy	0.2	1.7	0.5	3.7
16. Metal products	0.1	0.7	0.2	1.6
17. Machinery	0.0	0.1	0.0	0.2
18. Vehicles	0.0	0.0	0.0	0.1
19. Other transport elements	0.0	0.0	0.0	0.0
20. Other manufactured products	0.1	0.6	0.2	1.4
21. Construction	0.1	0.4	0.1	0.8
22. Retail and catering	0.3	2.0	0.6	4.5
23. Transport and communications	0.2	1.5	0.5	3.3
24. Other services	0.0	0.2	0.1	0.4
25. Market services	0.2	1.7	0.6	4.1
26. Non-market services	1.0	6.9	2.2	15.3
Overall variation	−354.4	−2481.1	−341.9	−2393.4
2020 Target		15.5%		15.0%

Source: Own elaboration based on SAMESP06
Scenarios 2-I and 2-II

softens the decline of the PSI until 382.2 million Euros. PSI raises up to 1479.4 million in Scenario 2-II.

Finally, from changes in primary energy requirements, Table 10.8 contained total CO_2 emissions avoided due to ECT. Original data came from Spanish National Statistics Institute (INE, 2015). However, data source used required to group some of 26 sectors considered in our analysis up to 20.

Table 10.4 Employer-paid social contributions simulated to reach the set targets (100% H2020 commitment)

Productive sector	Initial social contributions	(2-I)	(2-II)
1. Agriculture, livestock and forestry	0.1254	0.1217	0.1194
2. Fisheries	0.1434	0.1391	0.1365
3. Coal	0.2825	0.2741	0.2689
4. Oil and natural gas	0.2041	0.1980	0.1942
5. Non-energy extractive industries	0.2388	0.2317	0.2273
6. Oil refineries	0.2801	0.2718	0.2666
7. Electricity	0.2595	0.2518	0.2470
8. Gas	0.2718	0.2638	0.2587
9. Water	0.2574	0.2498	0.2450
10. Food and stimulants	0.2337	0.2268	0.2224
11. Textile and leather	0.2229	0.2163	0.2122
12. Timber products	0.2262	0.2195	0.2153
13. Chemical industry	0.2387	0.2316	0.2272
14. Building materials	0.2390	0.2319	0.2274
15. Metallurgy	0.2522	0.2447	0.2400
16. Metal products	0.2263	0.2196	0.2154
17. Machinery	0.2333	0.2264	0.2220
18. Vehicles	0.2601	0.2524	0.2476
19. Other transport elements	0.2409	0.2337	0.2293
20. Other manufactured products	0.2245	0.2178	0.2137
21. Construction	0.2406	0.2334	0.2290
22. Retail and catering	0.2196	0.2131	0.2090
23. Transport and communications	0.2237	0.2171	0.2130
24. Other services	0.2238	0.2172	0.2131
25. Market services	0.1908	0.1852	0.1816
26. Non-market services	0.2290	0.2223	0.2180
Weighted average	**0.2238**	**0.2172**	**0.2130**

Source: Own elaboration based on SAMESP06
(2-I) Effective rates of employer-paid social contributions required to keep the revenue constant
(2-II) Effective rates of employer-paid social contributions required to keep the prices constant

10.4 Conclusions and Policy Implications

As an alternative of the Emissions Trade Schemes, carbon taxes might have an important opportunity in Paris Agreement deployment. Looking at the Spanish commitments in H2020 right rates of a carbon tax designed on electricity consumption would range between 6.24% and 5.52% to reach the total target. Figures would vary depending of the tax reform chosen (with or without tax recycling) as is detailed below.

In scenario 1, with the introduction of ECT and to reach the objective, the tax rate would be 5.52%. In scenario 2-I, and to attain revenue neutrality, an ECT tax rate would have to be established at 5.83% and a 2.96% decrease in social security pay-

Table 10.5 Effects on final prices and changes in energy consumption under full H2020

	Effects on the final prices of the introduction of the ECT and changes in the effective rates of employer-paid social contributions (%) (100% H2020 commitment)			Variation of primary energy consumption (ktoe)		
Productive sector	(1)	(2-I)	(2-II)	(1)	(2-I)	(2-II)
1. Agriculture, livestock and forestry	0.064	−0.021	−0.074	−3.7	1.2	4.3
2. Fisheries	0.092	−0.039	−0.121	0.0	0.0	0.0
3. Coal	0.022	−0.027	−0.057	−0.9	1.1	2.3
4. Oil and natural gas	0.001	−0.001	−0.002	0.0	0.0	0.0
5. Non-energy extractive industries	0.073	−0.071	−0.161	−0.8	0.8	1.8
6. Oil refineries	0.020	−0.025	−0.053	−184.6	222.9	477.7
7. Electricity	21.730	22.878	23.596	−15,576.7	−16,399.7	−16,914.2
8. Gas	0.058	−0.068	−0.146	−0.3	0.4	0.8
9. Water	0.298	−0.321	−0.708	0.0	0.0	0.1
10. Food and stimulants	0.135	−0.127	−0.291	−11.7	11.0	25.2
11. Textile and leather	0.079	−0.070	−0.163	−4.5	4.0	9.3
12. Timber products	0.134	−0.121	−0.281	−24.2	21.8	50.6
13. Chemical industry	0.067	−0.065	−0.148	−16.7	16.3	36.9
14. Building materials	0.195	−0.190	−0.431	−40.7	39.6	89.8
15. Metallurgy	0.066	−0.069	−0.154	−10.6	11.1	24.7
16. Metal products	0.213	−0.192	−0.445	−5.2	4.7	10.9
17. Machinery	0.072	−0.068	−0.155	−0.7	0.7	1.6
18. Vehicles	0.062	−0.068	−0.148	−0.2	0.2	0.5
19. Other transport elements	0.110	−0.108	−0.244	0.0	0.0	0.1
20. Other manufactured products	0.159	−0.142	−0.330	−4.5	4.0	9.3
21. Construction	0.297	−0.292	−0.660	−2.5	2.5	5.6
22. Retail and catering	0.758	−0.654	−1.537	−14.8	12.7	29.9
23. Transport and communications	0.180	−0.159	−0.371	−10.5	9.3	21.7
24. Other services	0.283	−0.251	−0.584	−1.4	1.3	2.9
25. Market services	0.157	−0.110	−0.276	−15.4	10.8	27.2

(continued)

Table 10.5 (continued)

	Effects on the final prices of the introduction of the ECT and changes in the effective rates of employer-paid social contributions (%) (100% H2020 commitment)			Variation of primary energy consumption (ktoe)		
Productive sector	(1)	(2-I)	(2-II)	(1)	(2-I)	(2-II)
26. Non-market services	0.429	−0.393	−0.907	−48.2	44.2	102.0
Overall variation	**0.522**	**0.201**	**0.000**	**−15,979.0**	**−15,979.0**	**−15,979.0**
2020 Target				**100%**	**100%**	**100%**

Source: Own elaboration based on SAMESP06
Introduction of the ECT
(2-I) Where the objective is to maintain the revenue
(2-II) Where the objective is to maintain price stability

	Electricity demand price's elasticity			
	Short run	Long run	Short run	Long run
Romero et al (2014)	-0.26	-0.37	no estimations (ne)	ne
Blázquez et al. (2013 a)	-0.07	-0.19	ne	ne
Blázquez et al. (2013 b)	-0.04	ne	ne	ne
Labandeira et al (2012)	-0.25	ne	-0.03	
Adeyemi (2007)	-0.78	-0.78	ne	-0.3

Fig. 10.2 Price's elasticities review

ments. If the objective is stability of prices (2-II) the ECT rate should be 6.24%, with a reduction in social security payments of 4.82%. Regarding how feasible these tax reforms are, we might bear in mind that fact that this Electrical Utility industry is a regulated one its sales and every details of invoices to clients make easier the tax reform develop. Thinking of high Spanish unemployment level, 2-II scenario might be considered the best choice for policy makers.

When the H2020 energy efficiency objective is reached in full, the results obtained in this study allow us to conclude the following:

First, the introduction of an electricity consumption tax (ECT) without tax recycling has an inflationary impact, an important welfare loss (greater than the increase in revenue generated by the new tax) and an increase in the total tax revenue of 1.72%. Despite it inflationary impact, if energy prices success to reflect the real cost of energy, consumers and companies would rightly invest in energy efficient-equipment.

Second, the introduction of the new tax (ECT) with tax recycling and tax neutrality requires a small reduction in employer-paid Social Security contributions and generates only a slight increase in consumer prices and a loss of household welfare less than the revenue generated by the new tax.

Table 10.6 Effects on the tax revenues and the prices of a decrease in social contributions (millions of Euros) (100% H2020 commitment)

Type of tax	(1)	(2-I)	(2-II)
Net taxes on products (industries)	22,203.8	22,095.6	22,027.9
Net taxes on production	1915.0	1915.0	1915.0
Employer-paid social contributions	104,691.2	101,269.4	99,130.0
Net taxes on finished products	86,042.0	85,764.2	85,590.5
ECT	2332.2	2476.9	2567.3
Total revenue	**217,184.3**	**213,521.0**	**211,230.7**
Price index	1.0052	1.0020	1.0000
Scale factor of social contributions		0.970	0.952

Source: Own elaboration based on SAMESP06
(1) Changes in consumption following the introduction of the ECT
(2-I) Changes in consumption following the introduction of the ECT and its offset with a decrease of social contributions. Objective: to maintain the revenue
(2-II) Changes in consumption following the introduction of the ECT and its offset with a decrease of social contributions. Objective: to price stability

Table 10.7 Private Spending Index (PSI) following the introduction of the ECT and its offset by a reduction of social contributions (millions of Euros) (100% H2020 commitment)

	PSI
Initial situation	0.0
Introduction of the ECT	−3359.7
Introduction of the ECT and offset by a reduction of the contributions. Objective: to maintain the revenue	−382.2
Introduction of the ECT and offset by a reduction of the contributions. Objective: to maintain the prices	1479.4

Source: Own elaboration based on SAMESP06

Thirdly, the introduction of the new tax (ECT) with price stability leads to a decline in employer-paid Social Security contributions. This is higher than in the previous case, resulting in a 1.07% reduction in revenues and a significant increase of household welfare.

Last but not least, Electrical Utility sector act as a key driver to achieve the Spanish commitment by reducing largely its energy primary consumption. CO_2 emissions avoided by this sector are remarkable.

Although this paper considers an only tax rate for all of the utilities concerned, further analysis could enhances the tax design to a new one in which different tax rates would considered how clean/green electricity is.

It should be noted that the model used is a linear general equilibrium model. Although this kind of model is perfectly valid when analyzing the effect on prices and revenues, it is more limited than an applied general equilibrium model, which allows the establishment of a comprehensive and complex network of relationships between the different economic agents, as well as the consideration of a greater number of macroeconomic variables. We might be cautious with results obtained

Table 10.8 CO_2 emissions avoided up to 2020 (ktoe)

Productive sector	(1)	(2-I)	(2-II)
Agriculture, livestock, forestry and fisheries	−53	18	62
Energy extractive industries	−2	3	6
Non-energy extractive industries	−4	4	9
Oil refineries	−49	59	126
Electricity, gas and water	−38,344	−40,368	−41,634
Food and stimulants	−62	58	134
Textile and leather	−30	26	62
Timber products	−7	6	14
Chemical industry	−43	42	95
Building materials	−708	690	1563
Metallurgy and metal products	−88	88	199
Machinery	−5	5	11
Transport elements	−2	2	4
Other manufactured products	−49	44	101
Construction	−115	113	255
Retail and catering	−400	345	812
Transport and communications	−593	526	1227
Other services	−15	14	32
Market services	−46	32	81
Non-market services	−19	17	40
Total variation	**−40,636**	**−38,276**	**−36,800**

Source: Own elaboration based on SAMESP06

because of limits of the analysis in middle/long-terms. However, as an approximation to this network of interactions, the linear general equilibrium model provides enough insight into the effects that may result from a tax reform, and can be later expanded with the application of an applied general equilibrium model. These results are of interest to energy policy makers and designers fighting against climate change.

Finally, a pricing policy such as the ECT might be complemented with others instruments that include information for consumers and financial support for the purchase of energy-efficient appliances. Energy efficiency standards such as building energy codes and electric appliance would be also considered. Energy consumers may be informed about the negative impact of their energy demand on the global warming problem.

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