



**IUSS**  
Scuola Universitaria Superiore Pavia



**Sant'Anna**  
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**Navigating the Green Transition:  
Business Ecosystem Shaping, Sustainability-Oriented  
Collaborations, and Consumer Attitudes in emerging green  
markets**

A Thesis Submitted in Partial Fulfilment of the Requirements  
for the Degree of Doctor of Philosophy in

**Sustainable Development and Climate change**

*Doctoral Programme of National Interest*



**PhD SDC**  
SUSTAINABLE DEVELOPMENT  
AND CLIMATE CHANGE

In the Curriculum

**SOCIO-ECONOMIC RISK AND IMPACTS**

**Vittorio Maria Garibbo**

March, 2025



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**SOCIO-ECONOMIC RISK AND IMPACTS**

By

**Vittorio Maria Garibbo**

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## **ABSTRACT**

The ongoing environmental crisis necessitates a profound transformation of socio-economic paradigms, often referred to as socio-technical transitions. Within this complex process, firms emerge as pivotal agents, tasked with substantial transformations to meet socio-environmental imperatives. However, this necessity is embedded in a capitalist framework that challenges firms to balance the profit maximization, achieved through heightened production in competitive arenas, with the need to develop business solutions that reduce their carbon footprint and align with systemic sustainability principles across the entire value chain.

Therefore, the central dilemma lies in understanding whether and how firms can maintain competitive equilibrium while adopting business practices that mitigate environmental impacts, thereby positioning themselves as central actors in the sustainable transition process. This dissertation investigates the strategic and operational responses developed by firms navigating the sustainability transition. Specifically, it focuses on the firm as a catalyst for transformation and the creation of sustainability-oriented markets. This approach is valuable to highlight the opportunities, challenges, and constraints inherent in the transition process, exploring how firms can adopt proactive responses to drive market evolution and embody new market paradigms.

The dissertation is structured into three essays, each examining this phenomenon from distinct yet complementary perspectives that reflect the multifaceted nature of firm operations.

**The first essay** explores how a pool of market-shaping firms position themselves within the emerging green hydrogen market, aiming to secure critical control points within this nascent ecosystem. By identifying diverse and complementary roles that firms can adopt in shaping sustainability-oriented markets, this study illustrates the specific initiatives and mechanisms that enable value creation and capture. The findings extend market-shaping literature through a case study that offers novel insights into the agentic role of firms aiming to develop new green markets.

**The second essay** builds upon the findings of the former study by analyzing a portfolio of projects dedicated to constructing the Italian green hydrogen value chain. Focusing on pioneering initiatives vital to the value chain's development, the study sheds light on the complexities faced by these projects, with a particular emphasis on the collaborative and relational dynamics that firms leverage to overcome challenges and achieve superior outcomes. Drawing from strategic management literature on partnerships and integrating the Relational View theory with Alliance Management Capabilities this essay further extend the theoretical knowledge of sustainability-oriented collaborations presenting various collaborative models that address the unique constraints of these initiatives.

**The third essay** examines the response of the retail market to green products in their early stages of adoption, which is a common scenario companies deal with when operating in emerging sustainability-oriented markets. Using the

automotive sector as a case study, it highlights the cognitive processes influencing consumer evaluations of products at varying levels of market readiness. Grounded in Behavioral Reasoning Theory, the results reveal how interactions among variables such as Familiarity, Reasons, Values, and Attitudes evolve and change as consumers assess products at different stages of development. These findings not only extend behavioral theories in the context of green technology adoption but also provide actionable insights for firms engaged in the development and further commercialization of new green products.

This dissertation, exploring how firms can enhance their role in the sustainable transition, offers insights that extend sustainability management beyond firm-level boundaries. It provides actionable recommendations to help firms shift from reacting to sustainability changes to actively shaping the sustainable transition, contributing to both theory and practice.

## **ACKNOWLEDGEMENTS**

At the end of every journey, it is important to look back and appreciate the path travelled. I believe that it is only through engaging with the people who accompany us through the various chapters of life that we can truly recognize ourselves and the value of the road we have taken.

I begin by expressing my heartfelt gratitude to Professor Eleonora Annunziata and Professor Francesco Rizzi. They have been a constant source of academic and professional inspiration, but also individuals of great humanity, always willing to listen and value my perspective and convictions during a crucial period of growth and learning. In a specialized and competitive world, professionalism is often taken for granted, a necessary and basic requirement. Human virtues, however, are an added value that make daily work fulfilling and meaningful. Thank you, Francesco and Eleonora, for the way you lead our ERE group.

I am also deeply grateful to Professor Marco Frey, without whom this academic journey would not have been possible. He sparked my fascination with the world of scientific research and sustainability, playing a pivotal role in my transition from the corporate to the academic world.

On a professional note, I would like to thank Professor René Bohnsack, with whom I collaborated during my six-month visiting period. Thanks to him, my experience in Lisbon was academically enriching, exposing me to a research model that is fresh, practical, and oriented toward real-world applications.

I take this opportunity to extend my gratitude to the academic communities that have supported my journey, the Scuola Superiore Sant'Anna and the IUSS Pavia. As the promoters of the National PhD Program in Sustainable Development and Climate Change, these institutions have created an important initiative dedicated to addressing the grand challenges of our generation.

I also want to thank my closest colleagues. Francesco G., whose constant exchange of ideas and projects has been a daily occurrence, always rekindling my passion for academia, even during moments of doubt. Alice A., whose tireless positivity smoothly introduced me to the world of Sant'Anna and Terzani office when I first arrived. Verdiana M., without whom I would not be writing these pages today - thanks to her, deadlines were met, including the submission of this thesis.

Last but not least, I thank my family: Barbara, Giulia, and Francesca.

Each of them, in their own way, has always supported my choices, even the most daring ones.

Each of them teaches me daily to seek passion and meaning in life.

The world of sustainability has its three ESG pillars; the pillars of my world are these three extraordinary women.

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## **LIST OF ABBREVIATIONS**

- AMC: Alliance Management Capabilities
- AVE: Average Variance Extracted
- BEV: Battery Electric Vehicles
- BRT: Behavioural Reasoning Theory
- BU: Business Unit
- CFA: Confirmatory Factor Analysis
- CFI: Comparative Fit Index
- CLT: Construal Level Theory
- COO: Chief Operating Officer
- CPs: Control Points
- CR: Composite Reliability
- EPC: Engineering, Procurement and Construction
- ESG: Environmental Social Governance
- EV: Electric Vehicles
- Fam: Familiarity
- FCEV: Fuel Cell Electric vehicles
- fsQCA: fuzzy set Qualitative Comparative Analysis
- GME: Gestore dei Mercati Energetici
- Green H2: Green hydrogen
- H2: hydrogen
- IEA: International Energy Agency

Int: Intention

KMO: Kaiser–Meyer–Olkin test

PHEV: Plug in Hybrid Electric Vehicles

PNIEC: Piano Nazionale Integrato Energia e Clima

QCA: Qualitative Comparative Analysis

RA: Reason Against

RaRange: Reason Against Range

RaRefil: Reason Against Refilling

RaTime: Reason Against Time

RF: Reason For

RfAid: Reason for Aid

RfEnv: Reason for Environment

RfSaving: Reason for Saving

RMSEA: Root Mean Square Error of Approximation

RV: Relational View

SEM: Structural Equation Model

SOCs: Sustainability-oriented Collaborations

SPV: Special purpose vehicle

SRMR: Standardized Root Mean Square Residual

TLI: Tucker - Lewis index

TPB: Theory of Planned Behaviour

ValueEnv: Value Environmental

## CHAPTER 1: INTRODUCTION



Author: Vittorio Maria Garibbo

As this introduction is being drafted, the 29th Conference of the Parties (COP29) has just concluded in Baku, Azerbaijan. One of the key messages emerging from the conference is the sobering projection that 2024 will once again set a new record for global greenhouse gas (GHG) emissions. Unfortunately, this is not an isolated occurrence; the upward trend in global GHG emissions has remained consistent and unchanging over the past century (EDGAR 2024). This is particularly alarming when considering that in recent decades, numerous promising technological advancements with significant potential to reduce emissions have been developed. As a society we have developed the technological know-how to efficiently harness solar and wind energy, power vehicles with renewables, capture and store CO<sub>2</sub>, and utilize low-emission fuels to achieve net-zero industrial processes. Yet, despite these advancements, our carbon footprint continues to grow.

This should be understood in the context of established socio-technical systems, which are currently pursuing incremental rather than radical changes (Dosi, 1982, Frantzeskaki and Loorbach, 2010, Markard and Truffer, 2006) due to the strong path dependencies and lock-ins that characterize existing sectors (Ahman and Nilsson, 2008, Safarzyńska and van den Bergh, 2010). Such incremental changes will not suffice to enable effective responses to the sustainability challenges that the world is currently facing. Instead, radical shifts to new systems are required, referred to as 'sustainability transitions' (Elzen et al., 2004; Grin et al., 2010).

This prompts the introduction of a preliminary concept that provides a conceptual framework for the development of this work: the challenges of

climate change, biodiversity loss, and resource depletion cannot be addressed by incremental improvements and technological fixes alone.

While eco-innovations, and new green technologies are necessary pieces of the puzzle, the process of sustainable transition involves a much deeper transformation in the paradigm of production, distribution, and consumption (Markard et al., 2012). This entails the development of *novel market models* capable of addressing the environmental dimension at all stages of the value chain. Consequently, one of the central objectives of transition research is to conceptualize and elucidate the mechanisms through which radical changes can occur in the way all the social functions are performed, and the players are involved (Geels, 2004).

In fact, the socio-technical transition toward sustainable systems is an articulated process involving a plurality of actors, each of whom plays a distinct role. At one end of the spectrum, international and national institutions and policymakers represent macro-level analysis. These have assumed a pivotal role in funding the pre-competitive phase of an innovative and more sustainable market system (Musiolik et al., 2012; Bakker et al., 2012). At the opposite end of the spectrum are final consumers, representing the micro-level. These actors, through social movements and changes in their preferences, can influence industry players, who may alter their product and positioning strategy (Farla et al., 2012). The middle category comprises firms that are subject to the two aforementioned forces and the expression of the meso-level. Enterprises are the main actors capable of developing new products, services, and business models, facilitating the creation of markets for new technologies or *driving the formation of new industries* (Musiolik et al., 2012; Berggren et al., 2015; Planko et al., 2016).

Nevertheless, the role of private enterprises as agents of sustainable transitions and how it is addressed in the literature have been subjects of extensive debate. For instance, several scholars have argued that the agency of companies is somewhat overlooked within the multi-level perspective (Smith et al., 2005; Shove and Walker, 2007; Genus and Coles, 2008), meaning that understanding of how these critical actors can drive the creation of new market systems remains underexplored and undervalued.

Management studies have, indeed, focused on sustainability issues from different perspectives providing invaluable results regarding corporate social responsibility and sustainability issues (Bansal and Song, 2017; Hahn et al., 2016), motivations for engaging in transitional pathways (Dangelico and Pujari, 2010; Rennings, 2000; Sarasini and Jacob, 2014), the development of green practices and their profitability impact (Ambec and Lanoie, 2008), and business models that enhance corporate sustainability and competitive advantage (Kramer and Porter, 2006).

Despite the rich theoretical background, much of the existing research remains confined to *the corporate domain*, providing limited insights into *how* companies can serve as catalysts for broader sustainability transitions across industries and ecosystems. This narrow focus highlights the need for a more systemic perspective that examines the role of firms within the larger context of sustainability-oriented market transformation. This gap presents a significant opportunity for further exploration, particularly in applying managerial and organizational studies to the unique challenges of sustainable transitions. Scholars have increasingly emphasized the potential of integrating concepts and frameworks from management disciplines to address the complexities of these

transitions, offering new pathways to understand and facilitate transformative change (Köhler et al., 2019).

In light of the aforementioned considerations, the objective of this work is to examine:

- (i) *How can firms serve as catalysts for complex systemic changes, driving entire industries toward sustainability-oriented markets?*
- (ii) *What processes enable firms to lead sustainability transitions, and what strategic, operational, and relational levers can they adopt to achieve this goal?*

To address these questions, we will analyze the formation of new sustainability-oriented markets, focusing on three key dynamics within the enterprise: (i) Strategic dynamics, which involve the company's positioning within emerging sustainable markets and its role in shaping market structures; (ii) Operational dynamics, which explore the development of sustainability-oriented projects through collaborative efforts that contribute significantly to the formation of new value networks; (iii) Marketing dynamics, which examine consumer responses to these emerging markets, offering insights into the levers that drive retail market engagement and facilitate the adoption of green technologies.

The structure of this thesis is outlined below, providing an overview of the content presented in the subsequent chapters.

### Chapter 2:

This chapter presents a study built upon the theoretical framework of market shaping (Helfat, 2021; Storbacka, 2019). From this theoretical perspective,

markets are dynamic systems that can be shaped by the actions of their constituent actors (Nenonen et al., 2014). Firms, therefore, can leverage their agency to influence market evolution or even facilitate the development of entirely new markets. This body of literature thus provides an excellent foundation for examining firms as catalysts for new market models.

However, most of the market shaping studies have concentrated on traditional markets rather than sustainability-oriented markets. Consequently, several scholars have called for further exploration of market shaping dynamics in the context of sustainable market building, emphasizing their potential to foster transitional models (Storbacka et al., 2022; Sheth and Parvatiyar, 2021).

This need for exploration is underscored by the unique challenges faced by sustainability-oriented markets, which are often hindered by various obstacles, including technological disruption, regulatory shifts, unpredictable customer behavior, financial constraints, and strategic inertia, such as waiting games. These complexities have prompted academic inquiries into whether and how firms can truly act as drivers of new market models while addressing these challenges without compromising their competitive position (Werbeloff et al., 2016; Köhler et al., 2019).

To address this question and bridge the gap in the literature, we analyzed the emerging green hydrogen market in Italy using the theoretical lens of the control point perspective (Pagani, 2013; Bohnsack et al., 2024) to integrate the market-shaping literature.

This perspective posits that markets are composed of value positions, and firms, by strategically occupying these positions, can contribute to the development of

new systems through value creation while simultaneously achieving significant outcomes through value capture processes. In other words, the control point perspective provides a comprehensive lens to analyze the interconnected dynamics of systemic value construction and value capture mechanisms.

This approach leads to the following research questions, which will be explored in this study:

- (i) *What control points are adopted by shaping companies to overcome sustainable market constraints and capture value?*
- (ii) *What mechanisms do shaping companies use to position such control points within emerging sustainability-oriented markets?*

This research employs a qualitative approach based on a multiple case study to demonstrate how firms can assume specific roles that identify them as market shapers, even in challenging and complex markets such as those driving sustainable transitions. Additionally, we highlight the coexistence of various **market-shaping roles**, which serve complementary functions in facilitating systemic development. Finally, each of these roles is unpacked to identify the actions and mechanisms employed by firms to develop and control key **control points**. These control points enable firms to address the challenges of sustainability-oriented markets while strengthening their competitive position.

This study provides an initial response to the questions guiding this thesis by demonstrating the significant agency exercised by firms in market transformation. These findings shed light on the strategies pursued by various actors and the actions implemented to advance market development.

Chapter 3:

This chapter complements the previous study by examining how the development of value networks in emerging markets often hinges on highly innovative and pioneering projects that set the stage for market scale-up. Focusing again on the context of the emerging green hydrogen market, we observed that the key phases of this nascent value network require the establishment of well-structured industrial projects in order to provide the foundation for sustained market formation and growth. These initiatives are typically carried out through strategic partnerships. Such collaborative approaches enable firms leading market formation (referred to in this study as focal companies) to pool assets, knowledge, and resources from other players to ensure the success of these projects.

While the role of strategic collaborations in sustainability has been well-documented - highlighting benefits such as advanced eco-innovation (Vasudeva and Anand, 2011), risk mitigation, and improved environmental outcomes (Albino et al., 2012; Dangelico, 2016) - significant gaps remain in the literature. In particular, sustainability-oriented collaborations differ markedly from traditional partnerships (Ordonez-Ponce and Clarke, 2019; Winch and Sergeeva, 2022), as they are shaped by unique factors such as *limited predictability, goal complexity, and partner heterogeneity* (Vurro et al., 2023). This raises questions about whether "mainstream" theories can sufficiently account for the distinctive characteristics of these initiatives (Vurro et al., 2023). Specifically, these collaborations have typically been analyzed using only one of two theoretical perspectives: the **Relational View** (Dyer and Singh, 1998) or **Alliance Management Capabilities** (Schilke, 2010; Schreiner et al., 2010), rather than

integrating insights from both frameworks to fully capture their unique complexities.

To better understand the managerial models capable of addressing the complexities inherent in these collaborations, we propose an analysis that integrates these two theoretical dimensions. This leads to the following research question:

- (i) *How do companies employ Alliance Management Capabilities and Relational View pillars in sustainability-oriented collaborations to better tackle the challenges embedded in these projects?*

Using a mixed-method approach that incorporates Qualitative Comparative Analysis (Ragin, 2000; 2009), we analyzed 16 different projects within the scope of green hydrogen market development. This analysis simultaneously investigated the pillars of the Relational View and Alliance Management Capabilities to identify the most effective partnership models for the construction and growth of a new market.

The results of this study reveal various combinations of factors that lead to successful outcomes and provide insights into the rationale behind why certain collaborations models outperform others.

This study, therefore, offers a second contribution to the overarching questions of this thesis. Examining an operational and relational dynamic provides a closer look at how firms exercise agency in driving systemic transitions. This contribution complements the strategic and positioning dynamic by adding a practical dimension that explains how to manage industrial projects, which serve as the foundational pillars of emerging sustainable markets.

### **Chapter 4:**

This chapter presents a study analyzing the cognitive processes consumers follow when evaluating the adoption of green products. This third perspective, particularly relevant in B2C markets, is crucial for firms seeking to position their products effectively and engage consumers as active participants in the development of new green markets.

Firms entering and developing sustainability-oriented markets typically navigate several stages: product conceptualization, prototyping and development, and eventual commercialization. Gaining insights into consumer responses at each stage - conceptualization, prototyping, and commercialization - is invaluable for developing effective marketing strategies and enabling adaptive approaches. Such insights allow firms to anticipate market dynamics, refine their communication strategies, adjust product positioning, and, where necessary, enhance prototype development to better align with consumer expectations.

The Behavioral Reasoning Theory (BRT) (Westaby, 2005; Claudy et al., 2015) is a particularly suitable framework for understanding the cognitive processes that guide purchasing behavior. Furthermore, this theory has been extensively applied in studies on green technology adoption (Dhir et al., 2021; Chen et al., 2021; Qian et al., 2023), enriching the body of behavioral research. By incorporating the rational dimension of decision-making (i.e., *reasons for and reasons against*), BRT provides a particularly effective framework for analyzing consumer behavior in the context of thoughtful, reasoned purchases, such as those involving green products (e.g., green vehicles, photovoltaic panels installation, energy-efficient home appliances, etc.).

However, no studies currently available in literature have examined the differences in consumer cognitive processes when evaluating products at different stages of development (e.g., market-ready products, prospective products, concept products). This gap raises the question: *What are the underlying determinants of the cognitive process, and how do they change when consumers evaluate products at varying stages of development?*

We used the automotive sector as the empirical setting to investigate consumer responses to various zero-emission mobility solutions. Specifically, we developed three distinct respondent samples, each tasked with evaluating their attitudes toward one single solution positioned at different stages of product readiness. The study included battery electric vehicles (BEVs), representing a mature and market-established product; fuel cell electric vehicles (FCEVs), exemplifying a prospective product that is technologically viable but not yet introduced to the Italian market; and a broader, undefined concept of zero-emission vehicles (Blind), for which no specific technological details were provided.

Through a quantitative study based on Structural Equation Modelling (SEM) our research enhances the literature on BRT by:

- (i) detailing the determinants of various cognitive processes during green product evaluations;
- (ii) enriching the model with a highly significant variable - familiarity ([Fisher and Frewer, 2009](#); [Herrera and Blanco, 2011](#)) - to better understand consumer behavior;
- (iii) integrating the concept of psychological distance ([Liberman and Trope,](#)

1998) between evaluation and behavior to refine the interpretation of results when assessing consumer responses.

These findings have significant marketing implications for firms entering new markets, offering insights into targeted interventions to engage the retail market during different stages of product development. This third and final contribution solidifies the analysis of firm strategies in emerging sustainability-oriented markets, focusing on the commercial and marketing dimensions essential for engaging one of the three key stakeholders in the sustainability transition: consumer.

#### Chapter 5:

This chapter will present the conclusions of this research, providing a comprehensive summary of the contributions derived from the previous studies. We will also outline the areas for future research needed to further develop knowledge about the firm's role as a key actor in the sustainability transition.

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## CHAPTER 2: A CONTROL POINT PERSPECTIVE ON ENVIRONMENTAL BUSINESS STRATEGIES: COMPANIES' ROLES AND MECHANISMS IN SHAPING SUSTAINABILITY-ORIENTED MARKETS



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**ABSTRACT**

The climate crisis necessitates a shift in production and consumption patterns, requiring a reconfiguration of traditional markets to align with sustainability principles. This transformation introduces unique challenges for companies operating in sustainability-oriented markets including technological disruption, regulatory shifts, unpredictable customer behaviour, financial constraints, and strategic inertia such as waiting games. While the literature on market shaping identifies firms as pivotal agents in the formation of new markets it is less clear whether firms can truly act as catalysts for sustainability-oriented markets. The additional complexities inherent in these markets raise questions about whether and how firms can effectively navigate these challenges to drive the formation of new market models without compromising their competitive positioning. To address this gap, we use a control point perspective to analyse key positions within the value network where firms can generate systemic value while ensuring future value capture. Our case study of nine key firms in the emerging green hydrogen market in Italy reveals how market-shaping roles - Market Drivers, Market Supporters, and Market Missionaries - navigate challenges of value creation and capture amidst technological disruptions, regulatory shifts, and financial constraints by exploiting different configurations of control points. Additionally, we identify recurring dynamics and specific positioning mechanisms that provide deeper insights into the agentic role of actors driving the transition to sustainable markets. By emphasizing the coexistence of sustainable transformation and competitive dynamics, this study offers several practical insights for firms seeking to navigate sustainability-oriented emerging markets. We also provide valuable guidance for policymakers to enable them to promote the effective development of new market systems.

## 1) Introduction

Strategic marketing and management studies emphasize the importance of market-shaping mechanisms in the evolution of industries (Helfat, 2021; Mollinger et al., 2021; Nenonen et al., 2020). Assuming the market as a dynamic, plastic, multi-actor system (Nenonen et al., 2014; Storbacka, 2019), this perspective acknowledges how such systems can be shaped by the actions of their constituent actors (Mele, Pels, and Storbacka, 2015; Nenonen et al., 2014). Consequently, the recognition of the pivotal role of firms in shaping new markets (Nenonen, Storbacka, and Windahl, 2019) has prompted an increasing number of scholars to question the role of business agency in sustainability transitions (Novalia et al., 2018; Werbeloff et al., 2016), emphasising the need to investigate the role of businesses as potential catalysts for the transition towards sustainability-oriented markets (Mintrom and Rogers, 2022; Schaltegger et al., 2022; Koistinen and Teerikangas, 2021).

However, while shaping new markets subject to traditional market dynamics, is already an inherently demanding endeavour for any firm, a company's role as a catalyst for a sustainability-oriented market constitutes an exceptionally complex and strategically significant challenge. Such markets need to be based on a value proposition that addresses environmental, social, and governance (ESG) dimensions across the entire value network (Syvari et al., 2025), while simultaneously aligning with conventional profit-driven dynamics. The process of value capture is even more uncertain due to the inherent instability that characterizes these emerging markets. Factors such as technological disruption, regulatory changes, unpredictable customer responses, and financial constraints

compel firms to proactively anticipate market positions where they can establish control and gradually capture value (Dattè, 2018).

Therefore, shaping a sustainable market is fundamentally different from traditional market-shaping activities. As highlighted by Kullak et al. (2022), sustainable market shaping entails considering all the interdependent layers of a market system and this in turn involves reconfiguring business definitions, exchange practices, networks, representations, rules, and norms. Pinkse et al., (2023), categorise the unique constraints that companies operating in emerging markets focused on sustainability face as follows: (i) limited availability of low-carbon substitutes, (ii) the need for new infrastructures, (iii) difficulties in using existing production facilities with low-carbon inputs (Geels, 2014), and (iv) challenges in delivering the same quality or quantity of output at a comparable price when using low-carbon inputs.

Notwithstanding the extensive array of complexities intrinsic to this process, there are examples of private companies that, over the past decades, have driven new sustainable markets (e.g., electric vehicles, photovoltaic power, smart farming, etc.). Tesla<sup>1</sup>, for instance, influenced the development of electric mobility far beyond regulatory requirements. Not only did the company have a profound impact on the global advancement of electric mobility, but it also achieved a competitive advantage within the automotive sector.

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<sup>1</sup> Tesla exemplifies a market-shaping approach by intervening across multiple levels of the value network. For instance, the company made substantial investments in fast-charging infrastructure prior to achieving mass car sales, thereby resolving the chicken-and-egg dilemma traditionally faced by car manufacturers and charging station operators. The company effort to shape first the necessary market conditions and subsequently controlling the critical points of the ecosystem is considered one of the keys of Tesla competitive advantage (Anderson 2022).

Based on an established body of literature on the role of firms in shaping markets, alongside the empirical evidence of firms acting as catalysts in the development of sustainability-oriented markets, various studies have highlighted the need to investigate the roles of firms in shaping sustainable markets (Storbacka et al., 2022; Nenonen and Storbacka, 2021; Sheth and Parvatiyar, 2021). However, a review of the literature on market shaping for sustainability revealed a paucity of studies that do not provide a comprehensive description of the phenomenon. The few exceptions mainly explore how the incumbent actors prepare the market for the replacement of existing technologies with more sustainable ones (Doganova and Karnøe, 2015; Keranen et al., 2023; Werner et al., 2022) or how market systems are collectively shaped in order to promote social change in an emerging economy (Kullak et al. 2022). In light of this, recent research has underscored the need to extend the conceptual scope of market shaping beyond a traditional focus on economic improvement to encompass sustainability (Koistinen and Teerikangas, 2021; Sheth and Parvatiyar, 2021), highlighting the need for further research to balance the business and sustainability objectives of shaping strategies (Werbeloff et al., 2016; Köhler et al., 2019; Stathakopoulos et al., 2022).

We posit that the *control point perspective* provides an excellent lens through which to explore this phenomenon. This perspective enables to consider simultaneously the positions in the value network that companies need to manage to create and capture values. By integrating this perspective in the process of formation of new sustainable market, it becomes possible to understand how firms can foster harmonious value creation aligned with sustainability objectives, while strategically managing ecosystem positions that

hold the potential for long-term profitability. Control points are critical leverage points within a business ecosystem (Trossen, 2005) and represent pivotal links within the structure of the value network (Yoo et al., 2010). These links determine the operational functionality of the network and, consequently, the strategic position and dominance of the firm that controls them. Research has shed light on the role of control points in fostering the harmonious and coherent development of an ecosystem and in ensuring value creation dynamics (Pagani, 2013). Other contributions shows that firms use control points for positioning in emerging industrial ecosystems to address market constraints (van Dyck et al. 2021), and for anticipating future value capture dynamics (Datté et al., 2018). Controlling these positions of greater value increases bargaining power and enables companies to make greater profits (Bohnsack et al., 2024). The literature on control points thus provides a valuable lens to explore how firms (i) navigate new emerging markets (Datté et al., 2018), (ii) operate through the multiple layers of a value network (Yoo et al., 2010), (iii) balance initiatives of value creation and capture (Bohnsack et al., 2024), (iv) tackle peculiar constraints of these new markets (van Dyck et al. 2021).

Since the interaction between market-shaping roles in sustainable markets and how these actors navigate control points remains underexplored, studying both perspectives simultaneously will enable us to advance the understanding of the roles and the underpinning actions of the various actors during the shaping of a new sustainable market.

This paper thus addresses the following research question: *What control points are adopted by shaping companies to overcome sustainable market constraints*

*and capture value? What mechanisms do shaping companies use to position such control points within emerging sustainability-oriented markets?*

To our scope, we conducted a multiple case study involving several actors engaged in developing the emerging green hydrogen market in Italy. Using a qualitative approach, our study first identifies the roles of companies in market-shaping and how they shape a sustainability-oriented market. We found that different market-shaping roles underpin different mixes of control points that align with a company's strategy. We also show different mechanisms of control point positioning to balance value creation and capture. Finally, we demonstrate how this approach enables firms to overcome the constraints of sustainability-oriented markets while safeguarding a firm's competitive position.

Our study makes several important contributions to the existing literature. First, it extends the research on market shaping by providing empirical evidence within the context of sustainability. Secondly, it reveals distinct patterns in the development and management of control points, which offer a more comprehensive understanding of market-shaping roles, their variations and contribution to system evolution. In doing so, we emphasize the critical role of corporate agency in driving environmental change and in building new market systems that foster enhanced sustainability. Finally, our framework illustrates the unique dynamics of the actors involved in the transition to a sustainable market which help explain and potentially predict the actions of different players participating in the creation of new sustainable markets.

## 2) Theoretical Background

### *2.1) Companies' roles in shaping sustainable markets*

Long-term trends such as globalization, digitalization, and especially increasing environmental awareness make the business landscape more dynamic (Lusch et al., 2010). Consequently, firm boundaries are becoming fluid, and markets are no longer seen as fixed environments (Priem et al., 2013) but as value-creating systems where firms actively shape the context in which they work so that they can enhance value creation and capture.

The agentic effort of companies is therefore now considered as a significant driving force in strategic management, as it influences the evolution of an operating environment (Helfat, 2021) and highlights the potential role of a focal company in shaping a new market (Nenonen and Storbacka, 2021). Recognizing the firm not as a passive actor within the market system, subject to external and deterministic forces, but as a proactive entity capable of deliberately driving market change (Nenonen and Storbacka, 2021), highlights the critical role of firms in the creation of new market models oriented toward sustainability. The market-shaping literature thus offers a valid lens to study the formation of a sustainable market, and specifically focuses on the agency of different actors (Ottosson et al., 2020).

In line with recent research (Syvari et al., 2025), we define sustainable market shaping as the intentional efforts by a focal actor to create a market aimed at generating a positive impact in critically important areas for society and the planet. The agentic process begins with envisioning a desired future and actively working to guide the industry in that direction (Rindova and Courtney, 2020).

Shapers have to address the high uncertainty of a new market. To reduce perceived risks, they thus generate new information and market structures for the whole industry (Rindova and Courtney 2020). This approach is aimed at restructuring a cognitive and operative framework to create new market orders (Furr and Eisenhardt 2021). In doing so, the focal company seeks to alter the payoff structure for all firms within a specific business context (Gavetti 2017) and to simultaneously construct organisational boundaries that overlap with the nascent market to control and benefit from it (Santos and Eisenhardt 2009).

Market-shaping are purposive actions of an actor. Thus, different players participating in the shaping process use different approaches and levels of engagement in creating a new market system (Nenonen, Storbacka, and Windahl 2019). The engagement of a focal company in creating a new market and its ability to involve as many market actors as possible has been used to cluster different market shaping roles (Fehrer et al., 2020).

Roles have attracted attention in market shaping theory as they conceptualize the behavior of market actors in market shaping processes (Storbacka et al., 2022). Recent findings (Flaig and Ottosson, 2022) shown that roles are determined by the actions of a focal actor and the responses of the other actors involved (Heikkinen et al., 2007; Nystrom et al., 2014). Such actions determine what resources are accessed and utilized, which actors to collaborate with, and which networking objectives to be pursued to engage a broad number of players (Nystrom et al., 2014). In essence, by fulfilling specific roles, actors transform themselves and exert their agentic role to influence the surrounding market (Ford, 2011; Story et al., 2011). These roles thus underpin the vision-oriented actions and their intentions in relation to their immediate environment (Flaig and

Ottosson, 2022). Flaig and Ottosson (2022) identified the roles involved in market shaping domain based on the different levels of engagement exerted by the actors. Drawing on their study, our focus is on the actors who intend to build the markets and, therefore, will not take into consideration the roles of those companies hindering and opposing the evolution of new markets since they fall behind our purpose. These roles are:

- Market Drivers who outline a market vision and allocate significantly more resources than other actors to realise this vision. These actors steer market-shaping process driven by the possibility of reaching a leading position in the new emerging ecosystem. These players have a profound commitment to the creation of the new market.

- Market Supporters are companies who endorse this vision and do not interfere with the Market Drivers' shaping efforts. These companies facilitate the education of the market regarding the advantages of the nascent ecosystem, thereby enabling the positioning of their products and services within a novel market segment. Compared to the Drivers, Supporters have limited resources, and thus they leverage opportunistic partnerships to drive sales growth.

- Market Missionaries are crucial in developing market networks and promoting the market vision to a broader audience. Often funded by industry or government, they act as proxies for other actors' market-shaping efforts, extending these ambitions in line with the focal vision (cf. Mountford, 2019).

While recent studies have investigated shaping strategies for social change (Beninger and Francis, 2021; Fehrer and Bove, 2022; Tarnovskaya, Hånell, and Tolstoy, 2022), or how players pursue market changes to promote sustainable

innovations (Keränen et al., 2023; Mehtälä et al., 2023; Werner et al., 2022), a thorough understanding of how these roles operate within a sustainable market is lacking. A deeper investigation of the roles' underlying actions to achieve economic and environmental equilibrium in sustainable market-building would contribute to overcoming the current fragmented literature on shaping sustainable markets (Nenonen and Storbacka, 2021).

### 2.2) *Using control points perspective to untangle market shaping roles*

As previously illustrated, the process of building a sustainability-oriented market requires the identification of key determinants for value creation that align with the market's sustainability orientation, alongside the mechanisms of value appropriation. To understand why the control point perspective is a valuable lens for analysing these dynamics, it is essential to clarify two key dynamics that characterize market-shaping processes.

The first is the *systemic nature of the value creation process* in market formation. Multiple examples of market shapers illustrate the key role of creating value for the whole system, enabling new groups of stakeholders to engage with each other (e.g., Amazon, Airbnb, Uber) or creating the infrastructural conditions for the whole system to evolve (e.g., Tesla) (Nenonen, Storbacka and Windahl, 2019). The literature on marketing and management has progressively recognized markets as networks, systems, or ecosystems (Johanson and Vahlne 2011; Vargo and Lusch 2016; Adner 2017). This implies that value creation lies beyond the borders of the firm, and therefore value is viewed as being co-created with a multitude of stakeholders in the market (Tantalo and Priem 2016). To shape a market successfully, a firm must leverage both its own resources and those of a network of organizations to create new resource linkages and integration

patterns. This also suggests that the value of resources is not determined by their individual attributes, but rather by the connections and linkages between them within a market system (Bingham and Eisenhardt, 2008).

The second aspect regards the “temporality” of the value capture process. Whatever the reasons (e.g. improved competitiveness or social and environmental purpose), market shapers need to generate profits throughout the value capture process (Geiger and Gross, 2018). Clearly, organisations that invest considerable resources to build a new market system want a return on their investment. Therefore, unsurprisingly, the value capture concept remains fundamental in situations where the aim is to create a sustainable market (Giuliani, Tuan, and Calvimontes Cano, 2021). However, particularly when involved in the creation of a new market, market shapers are dealing with a “potential market” that has not yet fully emerged, which leads to great uncertainties (Adner, 2013; Ozcan and Santos, 2015). Companies thus have to develop control into a nascent market (Tilson et al., 2010) to strategically navigate the value capture process. In other words, this is about defining in advance the system's positions where value will be created in order to apply the value capture mechanisms once value creation has occurred (Dattè 2018).

These two aspects suggest that managerial attention should shift from the sole focus on current strategical resources to a more encompassing focus on the control of system dynamics. The intrinsic characteristics of control points are thus particularly well-suited for studying the phenomenon of market shaping.

Control points are defined as abstract positions of greatest value and control within a given business ecosystem, thereby inherently introducing a “systemic

dimension” to these positions (Pagani, 2013). Such positions are not necessarily within the firm boundaries but are placed between layers on the layered architecture of a value network (Yoo et al., 2010). According to this approach, companies first identify the assets, technologies, or industry-level value systems that could create market value. Subsequently, they develop and occupy these positions to exert dynamic control, ensuring future value capture dynamics (Baldwin and Woodard, 2007; Baldwin, 2015; Hannah and Eisenhardt, 2018).

Sometimes, the concept of control points is wrongly linked with bottlenecks. Bottlenecks arise as significant technical problems that need resolution. In contrast, control points broaden the concept to encompass "*technical or strategic features that competitors must navigate, thereby significantly decreasing their bargaining power*" (Bohnsack et al., 2024). While bottlenecks typically hinder strategy development due to technical constraints, control points represent valuable positions for leveraging critical ecosystem points for value creation and capture.

Control points can be technical, above all identifying the potential value creation in the various layers of an ecosystem, and strategic, by determining the value capture potential (van Dyck et al., 2021). Technical control points refer to technical solutions that enable access to a company’s market, while strategic control points encompass sociological and institutional aspects which help the company to benefit from the ecosystem. Finally, the influence and power of control points are also shaped by regulations (Elaluf-Calderwood et al., 2011), which may exert a crucial agentic role in creating a new market.

As with the value creation dynamic, within the context of an emerging market, control points are therefore useful for understanding how firms guide the evolution of the value network, creating value at a systemic level ([Hannah and Eisenhardt, 2018](#); [Helfat and Raubitschek, 2018](#)). With respect to the potential for value capture, establishing control points within an emerging business ecosystem involves the identification and occupation of strategic positions in advance to gain control of the ecosystem with the goal of capturing value ([Dattè, 2018](#)).

These considerations are particularly important in a sustainability-oriented market. Firstly, value creation needs to be developed at a systemic level ([Pinkse et al., 2024](#); [Albino et al., 2012](#)), given the interdependence of all stages within the value network. Secondly, the inherent uncertainty surrounding the development of such markets requires firms to act proactively to maintain competitiveness within a fluid context prone to rapid technological advancements and regulatory disruption. The control point perspective therefore offers a valuable lens to better understand how companies with specific shaping roles strike a balance between their initiatives to shape a sustainable market (value creation) and their search for enhancing their competitive advantage (value capture). Using the control point perspective is instrumental in extending the literature on market shaping roles, by identifying differences between various actors, and presenting recurring patterns that help to identify the unique characteristics of each role in shaping sustainable market.

### 3) Methodology

#### 3.1) Empirical context: the Italian emerging market of green hydrogen

The burgeoning green hydrogen market in Italy is an optimal setting for analysing the shaping of an emerging sustainability-oriented market.

In terms of sustainability, hydrogen is currently produced from fossil fuels and is used in a few industrial processes<sup>2</sup>. The prospect market will be based on green hydrogen generated through water electrolysis with an energy input derived from renewable resources. Using this energy vector across various sectors (e.g., steel, refineries, cement, heavy transport, urban heating, etc.) can significantly reduce emissions in hard-to-abate industries where no decarbonisation alternatives are available (IEA, 2022)<sup>3</sup>. Consequently, the European hydrogen strategy, the Fit-for-55 package, and the REPowerEU Communication (EU, 2020, 2022) have enhanced the prospects for green hydrogen development in Europe, setting a 2030 target of 10 million tonnes produced via electrolysis (currently near zero).

The development of the green hydrogen market is hindered by several issues (IRENA, 2022) tied to input, process, and output constraints, which are common to emerging sustainable markets (Pinkse et al., 2024). These constraints include the lack of large-scale production to ensure sufficient hydrogen supply at

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<sup>2</sup> In the European market, approximately 90% of the total hydrogen production is derived from steam reforming, a process that extracts hydrogen from methane while generating CO<sub>2</sub> as a by-product. Currently, green hydrogen (i.e., hydrogen produced via water electrolysis) accounts for only 0.2% of the total production (IRENA, 2022).

<sup>3</sup> Currently, in Europe, hydrogen is primarily used in the chemical sector and refineries. According to IEA (2022), approximately 43% of global hydrogen production is utilized for ammonia synthesis, predominantly for agricultural fertilizers, while 52% is allocated to hydrocarbon refining and desulfurization processes.

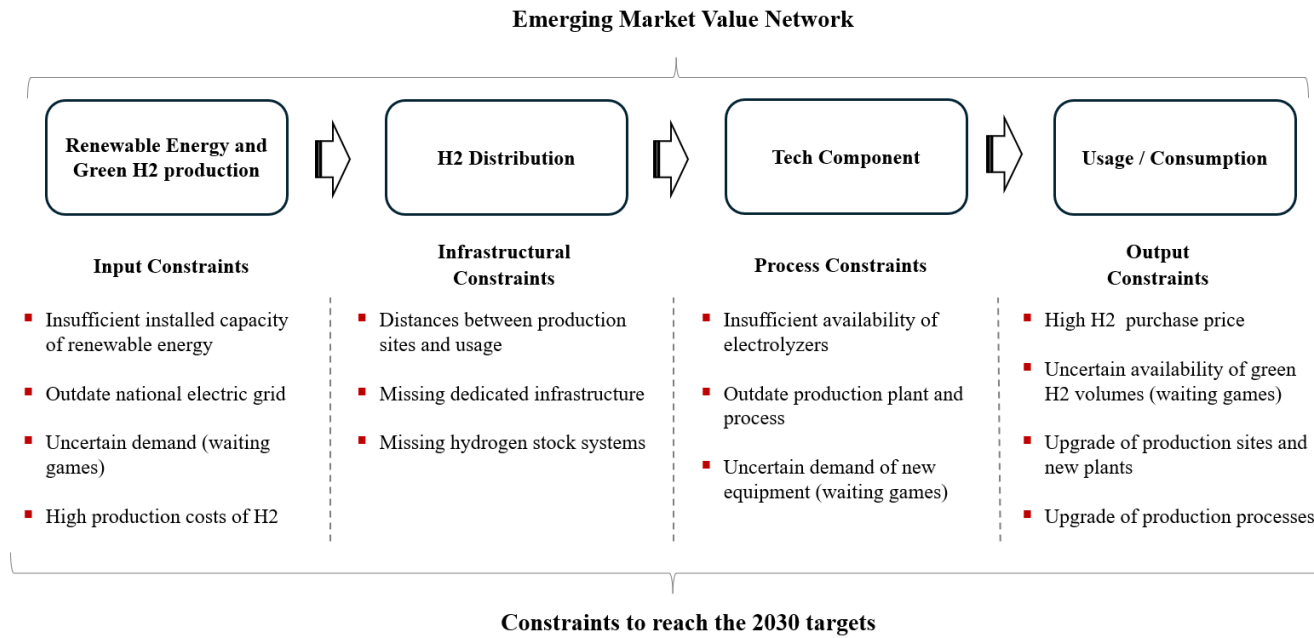
competitive prices, the absence of high-volume transport infrastructure such as pipelines, and the need for either new equipment or upgrades to existing systems to accommodate hydrogen in industrial production. Additionally, hydrogen tends to have higher purchase prices compared to fossil alternatives, and not all production processes can maintain the same quality when hydrogen is used as a substitute (IPCC, 2022, Nunez-Jimenez et al., 2022).

Consequently, this emerging market is characterized by significant uncertainties regarding its evolution (IEA, 2022), thus reflecting the complex process of systemic value creation and the temporal gap in value capture. Companies seeking to operate in this market face high levels of unpredictability and associated risks: (i) the "waiting games" (Robinson et al., 2012), which stem from the required coordination between production growth and demand; (ii) technological changes, which can lead to unexpected shifts and open up a broad range of future applications that may diverge from a company's current positioning (Gruber, MacMillan and Thompson, 2008); (iii) a fluid and unstable regulatory framework which can hinder decision-making due to unexpected mid-term changes; and (iv) misperceptions of the risks from end customers.

Despite the numerous complexities associated with this emerging market, many corporate actors are currently dedicating significant resources and efforts to building it. According to the Europe Green Hydrogen Market Report 2022 (2023), the European green hydrogen market grown at a compound annual growth rate (CAGR) of approximately 40% over the last four years. The Italian context mirrors the broader European trend, with an increasing number of companies establishing a significant foothold in the hydrogen market (Politecnico 2024; CDP 2024).

All things considered, this setting is particularly suitable for investigating the actions taken by companies entering a distinctive and promising emerging market and their efforts to shape it. *Figure 1.1* shows the value network layers used to achieve the 2030 target, highlighting the main constraints companies will have to face.

**Figure 1.1: Green hydrogen value network's layers and associated constraints**



### *3.2) Sample and data collection*

To identify market-shaping roles and companies related actions, we first gathered insights into the current state of the market through interviews with two experts from GME, Italy's energy market authority. These interviews highlighted companies' opportunities and barriers and the overall structure of the value network: (1) hydrogen production, (2) technological development, (3) hydrogen distribution, and (4) hydrogen usage, which align with European funding priorities for balanced market development.

To identify the firms that are active in this emerging market, we began with the IEA dataset, which catalogues the hydrogen projects launched since 2000 and the respective companies leading them. We supplemented this with a list of companies affiliated with associations such as the European Hydrogen Alliance and H2IT, and we also attended the Hydrogen Energy Summit & Expo in Bologna (October 2022), which is the key industry event in Italy attended by major stakeholders.

To determine the companies most committed toward the formation of this market and thus representative of the market-shaping phenomenon, we applied the following criteria: declared investments in the emerging market, ongoing projects capable of impacting the national supply chain, and public statements made by the company to shareholders. This approach enabled us to identify nine companies that are extensively involved in the emerging market. Each company within the sample is actively engaged in large-scale industrial initiatives aimed at advancing the development of green hydrogen, with financial investments amounting to several million euros. These companies are recognized as key actors in this emerging market, given their potential to revolutionize the entire

Italian hydrogen supply chain (e.g., [Osservatorio H2IT](#) and [Osservatorio H2 Agici-Fichtner 2023](#)). They consist of multinational corporations with more than 1,000 employees and annual revenues of around one billion euros. We contacted these companies, requesting interviews with representatives who were extensively involved in hydrogen projects, as well as senior executives responsible for the company's strategic direction. Between October 2022 and September 2023, we conducted interviews via Teams with a total of 22 interviewees (see **Table 1.1**). A semi-structured interview protocol was developed to conduct the interviews which lasted 45 - 90 minutes. We analysed secondary data to triangulate our findings, including press releases, annual and sustainability reports, and articles from industry outlets to assess the companies' impact on the hydrogen sector in Italy. Industry reports from consultancies, banks, and trade associations were used to validate the constraints and opportunities identified by our informants. Italian Government and Intergovernmental databases were consulted to validate investments, regulations, and funding (see **Table 1.2**).

**Table 1.1: Overview of the interviewees and their company activities**

| <b>Company Profile / Pseudonym</b> | <b>Interviewees</b>  | <b>Market shaping initiatives</b>  |
|------------------------------------|--|--|
| Energy Hubs Developer              | COO;<br>Head of strategy;<br>Head of market development            | <ul style="list-style-type: none"> <li>- Coordination of an industrial district for the use of green hydrogen</li> <li>- Development and management of renewable energy hubs dedicated to H2 production and direct interconnection with off-takers.</li> </ul>   |
| Energy Company A                   | Head of H2 BU;<br>Head of special projects;<br>Project manager     | <ul style="list-style-type: none"> <li>- Development of hydrogen valleys</li> <li>- Coordination of H2 mobility initiatives and H2 refuelling stations development</li> <li>- Collaboration to develop H2 supply and usage in hard-to-abate sectors (ceramic, steel, glass etc)</li> </ul>   |
| Energy Company B                   | Head of Strategy;<br>2 Project Managers                            | <ul style="list-style-type: none"> <li>- Development of renewable power plants dedicated to H2 production</li> <li>- Orchestration of multiple H2 pilot projects in collaboration with hard-to-abate (e.g., refinery, chemical)</li> <li>- Development of a national platform to test new H2 technologies to involve startups, and industrial off-takers and create networking</li> </ul>  |
| Gas Distributor                    | Head of H2 BU;<br>Head of decarbonization BU;<br>H2 Project Leader | <ul style="list-style-type: none"> <li>- Upgrade and replacement of gas pipelines to enable national H2 supply</li> <li>- Launch of a new company in collaboration with electrochemistry partner to develop an electrolysers gigafactory</li> <li>- Coordination of a multiparter project to develop H2 rail mobility</li> <li>- Collaboration with hard-to-abate players (steel and refinery) to test H2 integration into production cycle</li> </ul> |
| EPC Contractor A                   | CEO;<br>Business model developer                                   | <ul style="list-style-type: none"> <li>- Development of new H2-based technologies for steel making</li> <li>- R&amp;D collaboration with steel producers</li> <li>- Development of an in-house lab to test new technologies with potential clients</li> </ul>  |

|                    |                                   |  |
|--------------------|-----------------------------------|--|
| EPC Contractor B   | Coo; Head of engineering          | <ul style="list-style-type: none"> <li>- Development of new H2-based technologies for metal heating</li> <li>- Technical support for pilot projects aimed at decarbonizing ceramic and metallurgical industries.</li> </ul>  |
| EPC Contractor C   | Head of strategy; Project Manager | <ul style="list-style-type: none"> <li>- Development of new H2-based technologies</li> <li>- Partnerships with H2 valley developers to test new hydrogen storage models</li> <li>- R&amp;D collaboration with city councils to develop hydrogen mobility projects.</li> </ul>  |
| Steelworks Company | President and Coo                 | <ul style="list-style-type: none"> <li>- Multi-partners alliance to decarbonize production cycle integrating H2 (DRI technology)</li> <li>- Dissemination of ongoing results internationally to position the initiative as an industrial alternative in the steel sector.</li> <li>- Interactions with policymakers to guide regulatory development and establish a supportive framework for H2 usage initiatives.</li> </ul>        |
| Refinery Company   | Head of strategy; Project Manager | <ul style="list-style-type: none"> <li>- Multi-partner alliance to manage the production, distribution, and direct use of green H2 in crude oil processing.</li> <li>- Lobbying in Italy and the EU to unlock funding for industry decarbonization.</li> <li>- Committed to buy and use large volume of hydrogen on a long-term horizon, thereby enabling large-scale H2 production in the reference industrial district.</li> </ul> |

**Table 1.2: Secondary data sources**

| Secondary Data source  | Number of Reports / Articles / Db  | Use in our analysis to triangulate findings from primary data on: |
|--|--|---|
| Press releases, sustainability reports                               | 45 <ul style="list-style-type: none"> <li>Including two<sup>4</sup> years of sustainability reports for each of the nine companies</li> <li>and an average of three press releases per company detailing ongoing activities in the hydrogen market.</li> </ul>   | Ongoing projects mentioned in the interviews                      |
| News from h2 industry magazine                                       | 63 out of 144 <sup>5</sup><br>An average of seven articles per company, collected over approximately twenty months of data gathering from Hydronews; Hydrogen-news.it; H2it  | Sample selection and projects mentioned in the interviews         |
| National and International Industry reports on H2 market development | 7<br>KPG, PWC, Accenture, Deloitte, Rina, Intesa Sanpaolo, Confindustria   | The main constraints hindering market development                 |
| National and Intergovernmental databases                             | 3 <ul style="list-style-type: none"> <li>IEA DB covers all projects commissioned worldwide since 2000 to produce h2 for energy or climate change-mitigation purposes</li> <li>Italia Domani and OpenCoesione datasets contain data and relationships regarding the progress of interventions and activities within the National Recovery and Resilience Plan (NRRP)</li> </ul> | Project, investments and funding received                         |

<sup>4</sup> For each company, the sustainability reports for the years 2022 and 2023 were selected. Given the nascent state of the green hydrogen market, this time frame was deemed sufficient to provide pertinent and up-to-date information on these firms' entry into the hydrogen market and their ongoing initiatives.

<sup>5</sup> A total of 144 articles were identified from trade publications or industry magazine, featuring at least one of the companies in our sample in their headlines or sub headlines. Of these, 63 articles were deemed relevant for examining the positioning strategies of the firms in the Italian market, with a particular focus on ongoing activities within the reference context.

### 3.3) *Data analysis*

The data analysis employed a qualitative, abductive research methodology appropriate for examining intricate, real-world phenomena. This approach allows for the generation and refinement of theories grounded on empirical observations (Behfar and Okhuysen, 2018; Dushnitsky and Yu, 2022).

Consistent with previous research (e.g., Weber et al., 2019), our study's abductive analytical approach incorporates inductive and deductive reasoning. By consulting the literature and comparing emerging codes and themes with prior studies, we aimed to refine theory development, in line with the methodologies of Gioia et al. (2013) and Weber et al. (2019).

First, we followed Gioia et al. (2013) for inductive reasoning, deriving first-order codes that closely represented our raw data (Gioia et al., 2010). Our raw data comprised approximately 280 pages of interview transcripts, which were analysed using the qualitative data analysis software NVivo. The analysis of interview transcripts was an iterative process that led to the identification of 32 first-order themes relevant to the subsequent identification and description of control points.

In the second step, we used deductive reasoning to assign the first-order codes to pre-defined second-order themes (Weber et al., 2019); these themes represent control points previously discussed in the literature (Bohnsack et al. 2024)<sup>6</sup>.

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<sup>6</sup> Since not all first-order codes could be assigned to the predefined second-order themes, we analysed them based on their similarities and differences (Gehman et al., 2018). This analysis identified a new emerging second-order theme not previously mentioned in the relevant literature: Demand Catalyst.

The resulting 12 second-order themes were: specific infrastructure, scalability, networking, orchestration, customer access, brand, know-how, unique solutions, agility, state intervention, environmental regulation, and demand catalyst.

In a third step, the 12 second-order themes were aggregated into three overarching dimensions representing the market shaping roles: Market Drivers, Market Supporters, and Market Missionaries. This deduction was based on the characteristics of market shaping roles developed in prior studies (Flaig and Ottosson, 2022) and consistently aligned with previous role conceptualisations in the ecosystem and market strategy literature (e.g., Adner, 2017; Nenonen and Storbacka, 2020). *Figure 1.2* represents the data structure that emerged from analysing control points within market shaping roles.

Finally, based on interviews, the rich amount of secondary data, and in line with the distinctive characteristics of the market-shaping roles (Flaig and Ottosson, 2022; Adner, 2017), we associated the nine companies in our sample with three shaping roles: Market Driver, Supporter, and Missionary. To do this, we counted the number of first-order codes belonging to each individual firm that converge on each of the three shaping roles. This provided us with a comprehensive representation of the control points and the related market shaping role adopted by each company within our sample.

We then analysed the actions that each group of companies undertakes to establish and position control points within the market. Based on interpretive approach (Rynes and Gephart 2004) we identified recurring mechanisms adopted by each group of market-shaping roles<sup>7</sup>. These mechanisms reflect the

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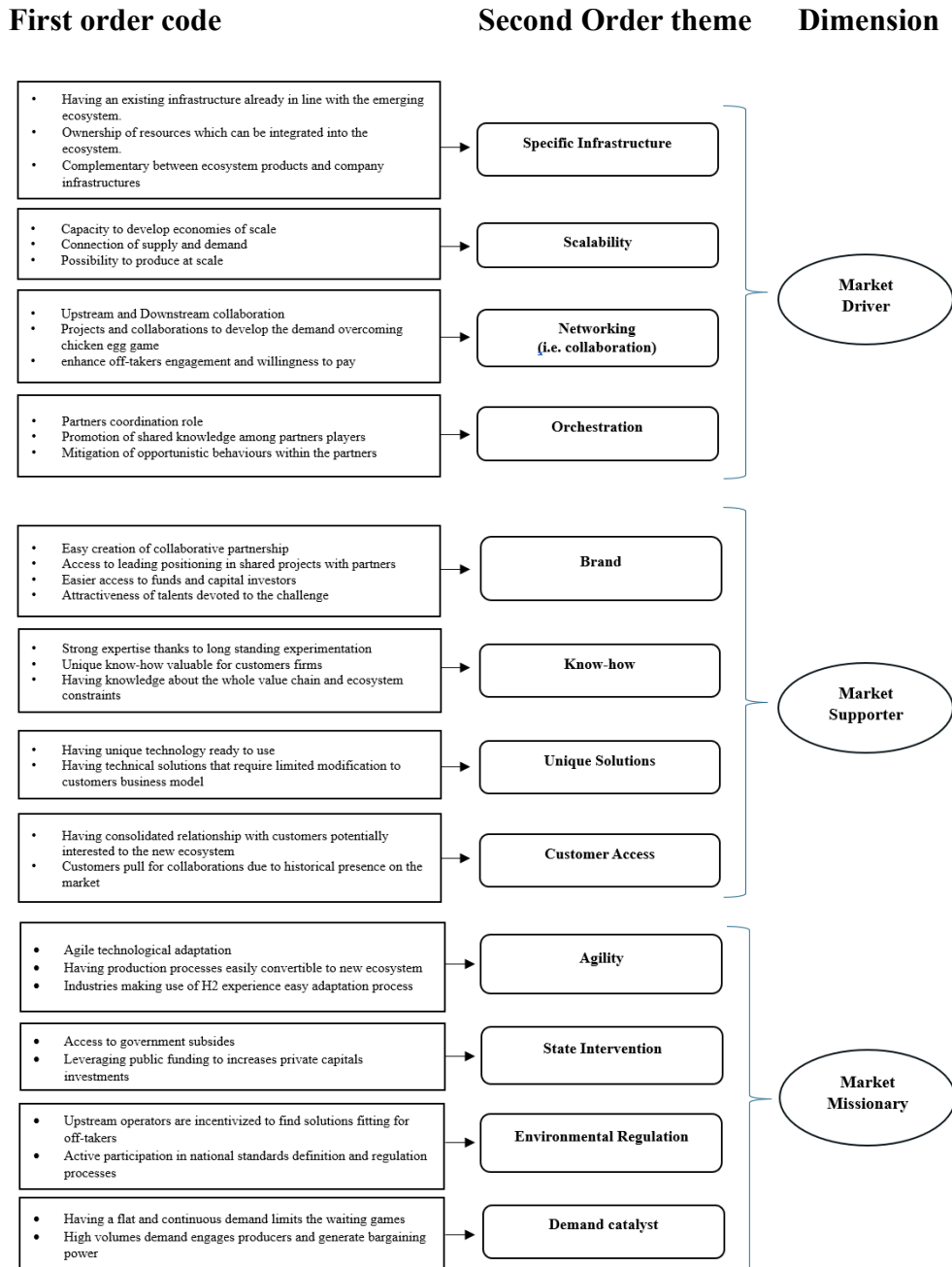
<sup>7</sup> Interpretive research aims to describe how different meanings shape and sustain a sense of truth, especially amidst competing realities, and uses these meanings as foundations for inductively

business, relational, or commercial initiatives developed by companies to take control of specific control points and exert influence over the emerging market. These mechanisms are infrastructural upgrade, branching-out, collaborative r&d programs, and sustainability-oriented symbiosis. This examination provided a deeper understanding of the systematic logic behind control point positioning across different shaping roles, highlighting the inherent differences and unique characteristics of each role.

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constructing social science concepts ([Lincoln and Guba 2000](#); [Rynes and Gephart 2004](#)). By using "thick" descriptions of verbal and nonverbal behaviors in business settings, researchers can explore the implications of differing meanings for collaboration, innovation, and market positioning.

*Figure 1.2: Analysis and data structure*



#### 4) FINDINGS

This section shows how the firms in our sample are situated within the spectrum of market-shaping roles (Flaig and Ottosson, 2022), which include Market Driver (visionary leaders with significant resource allocation), Market Supporter (endorse and partner with limited resource expenditure), and Market Missionary (network builders and promoters funded by industry or government). Section 4.1 outlines the different market-shaping roles identified in our sample and the control points supporting each market-shaping approach. Section 4.2 details the mechanisms companies use to establish and develop control points, highlighting the distinctive patterns and dynamics underlying each role.

##### *4.1) Control points underpinning market-shaping roles in a green market*

###### *Market Drivers:*

The role of the Market Driver is characterised by a targeted vision of the emerging ecosystem. As a result of this role, companies commit significant resources to develop the market, defining its boundaries, and engaging with multiple actors. Energy companies A and B are structured energy utilities that manage electricity production. The Gas Distributor is Italy's leading natural gas transporter and owner of the national distribution network. The Energy Hubs Developer is a company focused on the design, installation, and management of integrated energy systems.

*“Our company, as an infrastructure operator, has the conditions to lead the formation of this new market [...] Hydrogen represents the natural green evolution to replace fossil-origin gas, and we envision a logistics system similar to natural gas,*

*offering infrastructure, storage, and delivery for these new molecules.”* (Head of H2 BU; Gas Distributor)

These firms perceive this nascent market as a promising avenue for expanding their operational scope and believe they possess the requisite conditions to assume a leading role within it. As Energy company A’s COO observes:

*“Today, the creation of these markets is very challenging but still a great opportunity to play a leading role in this emerging market [...] This is why we have already committed such a high number of resources so that we will be recognized by the market as a reference point”* (COO; Energy company A).

These two statements are representative of the Market Driver group and highlight several important aspects of this strategic posture such as the envisioning of new market opportunities (Rindova and Courtney, 2020), the mobilization of greater resources to enhance strategic positioning (Pontikes and Rindova, 2020), and efforts to be recognized by other market participants as a driving force (Flaig and Ottosson, 2022). In line with the temporal gap between value creation and value capture, the respondents underscored the early commitment to investing resources to shape the market's evolution and secure a future leadership position.

To create the conditions to develop the market, these players “*commit a significantly larger portion of its resources in relation to others*” (Flaig and Ottosson, 2022: 78). We found they first position themselves in the market segments where they can create great value for the whole system. To this end, *Specific Infrastructure* and *Scalability* are thus key control points for these

companies, as they facilitate the scale-up of production and distribution. For example, by upgrading its pipelines, the Gas Distributor can guarantee a less expensive distribution system. The Energy Companies A and B are instead in a favourable position to create and manage new renewable based power plants to directly produce H2. These companies are therefore investing in converting or adapting existing assets and resources, aimed at establishing a foundation for the emerging market.

*“Developing large hydrogen valleys is the foundation for ensuring the system's scalability [...] our business focuses on renewable power plants [...] this makes us the best player to manage new valleys capable of producing at scale, lowering unit production costs and making the transition to H2 more appealing for potential off-takers.”* (COO; Energy Hubs Developer).

However, Market-Driver companies face great uncertainty regarding demand evolution, and it is essential for them to promote the harmonious growth of the entire system by securing the engagement of other actors and synchronizing their actions toward market creation (Fehrer et al., 2020; Kleinaltenkamp, et al., 2021; Nenonen, Storbacka, and Windahl, 2019; Storbacka, 2019). *Orchestration* and, most importantly, *Network Engagement* are control points purposively developed to build market boundaries, develop demand, and capture future value by becoming the selling reference for other actors. As prior studies have highlighted, obtaining access to resources and orchestrating other players is crucial to implementing a new value network (Amit and Han, 2017; Nenonen, Storbacka, and Windahl, 2019).

Energy Company B, for instance, is developing a physical platform where many different players (e.g., producers, users, tech providers, and researchers) can experiment with H2 technologies. The Gas Distributor is collaborating with a steel producer to test a new production process based on H2; this initiative is designed to trigger the steel industry's transition toward green hydrogen usage. The Energy Hubs Developer is coordinating the development of an industrial district where H2 production, distribution, and off-takers' demand grow harmonically. By fostering widespread engagement among multiple actors, the aim is to establish conditions that will enable them to capitalize on the new assets they are creating, thereby securing a strong bargaining position and ensuring future value capture.

*“We need to create the market, so we have developed a platform that enables us to work with startups, innovative firms, and various end-users. This creates engagement with new entities and more coordinated efforts from different supply chain actors [...]”* (Head of Strategy; Energy Company B).

Through new initiatives across the value network, Market Drivers involve the participation of actors throughout the value chain, thereby creating the bones of the new market. By orchestrating projects and other companies' efforts, they seek to build a coherent value network that strengthens their bargaining power and enhances value capture.

*Market Supporters:*

Market Supporters view market shaping as an opportunity to increase sales without significantly diverging from their core business. This role suits market

actors that are more cautious about the shaping process (Nenonen and Storbacka, 2020). They recognise that the new market can provide opportunities, but they take a more conservative approach. These firms therefore pursue activities that enable them to maintain flexibility and enable experimentation to improve their knowledge (Rindova and Courtney; 2018). Their market-shaping lies in offering solutions that engage various actors and support the initiatives of Market Drivers while staying aligned with their core business.

EPC contractors A, B, and C are technological providers responsible for the Engineering, Procurement, and Construction phases of a project and they are exploring the potential of this emerging market. They develop solutions that can be used in emerging markets, aiming to capitalise on new market demands

*“We contribute to the market formation by developing new technical solutions, striving to better understand the market evolution, leveraging and updating our technologies according to demand growth [...] This market will be a viable option to respond to the environmental needs of our customers.”* (H2 BU Director; EPC Contractor C).

This quote illustrates a more adaptive posture, where companies take a less aggressive stance in the market-shaping process. These firms support the market envisioned by the Market Drivers and align their product portfolios so that they can seize the opportunity when the market is ready.

*“We know that things are changing towards decarbonisation [...] and we are striving to support this market with solutions that will meet the new needs.”* (CEO; EPC Contractor A)

In essence, these firms view this emerging market as a means for sales growth in the coming years and thus, “*they have a strong focus on selling and educating the market about the benefits of their product*” (Flaig and Ottosson 2022: 78). They play a crucial role in developing, updating, and replacing production plants for firms transitioning to hydrogen-based models.

As for their contribution to the system value creation, they leverage control points, such as deep technological *Know-How*, to develop *Unique Solutions*. These control points address the process constraints (Pinkse 2024) that companies transitioning to green hydrogen will have to face. Updating the technological paradigm is crucial for creating a new stable market (Sandvik; Sjödin et al., 2024) and increase use value through improved offerings (Ghauri et al., 2016; Kumar et al., 2000) by removing technical constraints to support customer usage (Burr, 2014).

For instance, EPC Contractor B has developed a unique know-how and, subsequently, a unique technological solution used in heating processes within the steel industry.

*“The technological solution we developed already enables the use of green hydrogen in the heating process of steel and metals and thus supports companies approaching a green transition. However, it can also be installed in steel mills using traditional production processes which makes it very flexible for multiple potential customers ...”* (Company Director; EPC Contractor B).

This solution addresses both the current and prospective markets that might operate entirely on hydrogen. This conservative approach, resulting from collaborative R&D projects and knowledge development, is consistent with the core business while being prepared for potential market developments, by offering customers plug-and-play solutions.

As value creation and value capture in such emerging markets become timely separated, control can no longer be connected solely to fixed assets. Instead, dynamic control over the process of market shaping will draw increasingly on institutional, sociological, and relational dynamics (Thomas et al., 2014). Our findings suggest that organisations that adopt this role proactively try to leverage their established name in the industry (*Brand*) and the direct interface with end-users (i.e., *Customer Access*), by steering the process toward intangible control points. In fact, end-users embarking on transition paths are inclined to seek out well-known and experienced technology partners. Market Supporters are deeply intertwined with the industry sector. They therefore exploit these control points to position themselves as the primary point of contact for new users in the emerging market.

*“We are striving to inform the market about our commitment toward decarbonization [...] so that we can leverage our historical name as technological partners of major industrial entities [...] using our customers’ portfolio to become the first reference point for companies transitioning to the emerging ecosystem.”* (Head of strategy; EPC Contractor C).

These companies thus establish their presence in the emerging market by conducting experimental projects with customers and by leveraging their brand

as a symbol of reliability. This strategic use of control points is crucial for capturing value as the demand for new technologies grows.

Although Market Supporters operate more adaptively than Market Drivers, we argue that they play a crucial role. They support the emerging market by providing essential equipment and facilitating the industrial technologies needed for market evolution. Through market communication initiatives and experimental collaboration, they generate broader interest in the new market while exclusively securing sales channels with potential future users.

*Market Missionaries:*

The aim of Market Missionaries is to meet challenging environmental goals, with the emerging market serving as the means. They support the envisioned market as far as their resources permit (Flaig and Ottosson 2022), given the significant technical and economic challenges they face (i.e., input, process, and output constraints). However, they play a key role in the market-shaping, as their ability to realize the vision of the new market often leads Market Drivers and Market Supporters' actions to converge on them (Flaig and Ottosson, 2022; Mountford, 2019).

Despite being in hard-to-abate sectors, the Steelworks Company and the Refinery Company are committed to reaching net-zero emissions by 2040. Both companies are exploring hydrogen-based production cycles, driven by future opportunities:

*“The switch to new energy sources aligns with the new environmental requirements. This enables us to comply with new regulations, reduce carbon taxes, and attract new customers*

*looking for greener products. Nevertheless, this is still very challenging from a financial and operational point of view [...]*

(Group President; Steelworks Company).

Their participation in market shaping is motivated primarily by the pursuit of environmental benefits, the desire to achieve better business resilience and regulatory compliance and, eventually, the opening of new market relationships.

To enter this market, these actors leverage their potential to generate a stable and consistent demand for hydrogen. This reduces the uncertainty for producers regarding the presence of off-takers, thereby mitigating the risk of waiting games (Robinson et al., 2012). We refer to this control point as the *Demand Catalyst*.

*“By collaborating with us, hydrogen producers have the opportunity to supply large volumes for years [...] few companies may be willing to commit to as we are. This is an important leverage point we can exploit in negotiations [...] our volumes generate economies of scale that are beneficial for us and the entire ecosystem.”* (Head of Strategy; Refinery Company)

The uncertainty surrounding the creation of the new market typically hinders the participation of many firms, along with the associated resource commitments (e.g., Ozcan and Santos, 2015; Adner, 2013). Producers (e.g. Market Drivers) may hesitate to engage due to the risk of investing resources with uncertain returns (Datté 2018). By leveraging this *Demand Catalyst* control point, Market Missionaries create systemic value by reducing uncertainty and incentivizing other players to scale production.

In addition, Market Missionaries capitalize on their ability to quickly adapt, making them highly attractive players for collaboration and exploratory projects (*Agility*). Liljenberg (2022) focused on this aptitude within the market-shaping context to theorize '*contextual agility*,' which is defined as the preparedness to act in response to a set of interdependent market conditions. In an industrial context, this refers to a company's ability to adapt its production processes to the needs of the new market, while minimizing disruptions.

*“We can utilise existing burners with minimal infrastructural modifications. Partner companies that are developing hydrogen-based pilot projects with us find this a significant benefits, as they can test new processes without the project's P&L having to bear huge capital expenditures (Capex).”*  
(Group President; Steelworks Company)

Finally, it is important to stress that business objectives are deeply intertwined with environmental goals in shaping sustainable markets. The economic return that drives ecosystem participation has to be in line with systemic benefits regarding emission reductions. Market Missionaries, experience the most significant benefits in emission reductions and can leverage this advantage. The generic control points determined at the institutional level, such as *State Intervention* and *Environmental Regulation*, are exploited mainly by Market Missionaries. These companies are the first players entitled to apply for government grants and participate in regulatory discussions to address key constraints and systemic challenges in evolving regulations.

*“The decarbonisation of our industry is a national interest [...] for these reasons, we communicate directly with policymakers*

*to discuss market constraints and the regulation evolution. Nobody can explain what works better than us and what is missing from a normative perspective. [...] in these discussions, we take on board our big project partners to strengthen the evidence coming from the market [...]"* (Head of Strategy; Refinery Company)

Lobbying with institutions is a well-recognized action in market shaping (Nenonen, Storbacka, Sklyar, et al. 2020) and it is needed to redesign the normative framework in line with business needs. This involves creating new standards and influencing formal rules and laws via regulatory work (Alvarez et al., 2015; Ghauri et al., 2016; Humphreys, 2010). The privileged position of Market Missionaries makes them an appealing partner for all the other players (particularly Market Drivers) who are seeking deeper connections with policymakers to influence new developing regulations. This control point is leveraged by Market Missionaries to hook companies that seek to establish a voice at the institutional level and to forge new collaborative relationships that are instrumental in supporting their transition projects.

In conclusion, although they face significant constraints, Market Missionaries can effectively leverage multiple control points. The demand catalyst, agility, state intervention, and connections with policymakers make this market-shaping role crucial for market shaping and capable of securing value capture in the long run.

#### *4.2) Mechanisms of control point positioning in sustainability-oriented market*

While the previous section presented control points' mixes associated with the market shaping role, this section describes the recurring mechanisms used by

different market shapers to position such control points, thus highlighting both the practical actions and the specific differences among players.

*Figure 1.3* illustrates a matrix to help understand the dynamics of control point positioning. The rows list the different market-shaping roles we have analysed. The columns represent the four key steps we identified in the emerging market: production, distribution, technological development, and final use. This matrix enables us to identify the entry segment of each player within the value network (going-in position) and the process of control points positioning, through which each market shaper pursues its strategy to capture value (target position).

The analysis reveals that different strategic roles correspond to distinct approaches in the market-shaping process. Market Drivers tend to develop control points across the entire value chain, operating both upstream and downstream, and are driven by the need to promote the harmonious growth of the whole market and avoid bottlenecks. Market Supporters cautiously tap into different business domains primarily for practical purposes. They maintain alignment with their core business by operating within the layers of the value network which facilitate the development of new expertise, with the aim of opening new sales channels. Finally, Market Missionaries tend to remain anchored to a single layer of the value network, typically the one most aligned with their core business, and seek to attract the attention of various stakeholders to collaboratively address the multiple constraints that characterize their decarbonization journey.

Structural Upgrades:

Through structural upgrades, companies invest in creating essential assets and infrastructure that will be essential for the development of the market. Companies thus define the market boundaries that overlap with their organizational structure (Santos and Eisenhardt 2009) and build the skeleton of the new value network. This approach is common among Market Drivers since they have a stronger commitment to market shaping than other players.

*"We start from a unique positioning. In fact, our business focuses on the development of renewable power plants, which are the fundamental assets for driving the hydrogen economy forward [...]"* (Project Manager; Energy Company A)

Market Drivers have resources that can be integrated into the ecosystem through upgrades to meet the specific demands of the emerging market. In this market, for example, energy companies can develop renewable energy plants dedicated to hydrogen production, while gas distributors can expand the hydrogen distribution network.

In essence, through this mechanism, Market Drivers adapt parts of their assets to the needs of the emerging market in order to establish the necessary support infrastructure. By doing so, they enter the emerging market and develop essential resource for systemic value creation (i.e., specific infrastructures and scalability).

*"We are developing new infrastructure to integrate the direct production of green H2 to our offshore wind energy hub. This will enable us to bring H2 to the system at scale level"* (Head of Market Development, Energy Hubs Developer)

*Branching Out:*

Unlike structural upgrades, by branching out firms do not integrate resources from their core business into the emerging market. Instead, companies establish separate business divisions positioned in different segments of the value network from their original domain. These initiatives are common to Market Drivers as they aim to ensure the harmonious development of the entire value network, preventing bottlenecks in the supply chain and securing future value capture.

*“How do we bring other actors on board? We invest directly in their business areas where engagement is necessary [...] In this way, it is as if we coordinate market development operations across the entire value chain.”* (Head of H2 BU; Energy Company A).

Through this mechanism, firms operate in underdeveloped segments of the value network to engage other actors in the market formation and to coordinate resources and efforts toward a common goal—which are key aspects in market-shaping (Nenonen, Storbacka, and Windahl, 2019).

For instance, the Gas Distributor is working on developing a gigafactory for electrolyzers in collaboration with high-tech firms, while Energy Company A is developing refuelling stations with transport companies to promote hydrogen mobility.

*“We cannot afford to play the chicken-and-egg game. We cannot build a hydrogen valley that we then cannot fully utilize. For this reason, we are actively operating downstream to ensure the*

*development of the supply chain, which will guarantee full use of our position” (Head of H2 BU; Energy Company A).*

As illustrated in **Figure 1.3**, branching-out serves the dual purpose of value creation and capture. This mechanism involves direct investments to scale up resources and critical infrastructure in segments where engagement from other players is limited (e.g., specific infrastructures, scalability). Additionally, it promotes the engagement of other firms within that specific business segment (e.g., networking). In this way, Market Drivers position themselves within the layers of the value network where demand is expected to grow through its orchestration, thus ensuring the readiness to capture value as the market matures.

*Collaborative R&D programs:*

Collaborative R&D programs are common to Market Supporters and involve research and development projects in collaboration with various industrial partners. This mechanism allows the company to understand the specific needs of the emerging market and develop new solutions that respond to the market demand while positioning the company as the reference supplier for new potential customers.

*“We support players who are experimenting with pilots to test industrial transformation, offering free consultancy in the initial stages. These jointly developed R&D programmes give us the opportunity to strengthen our skills and further develop new solutions [...]” (CEO; EPC Contractor A).*

These initiatives do not provide immediate economic returns and are offered free of charge. For example, the EPC Contractor C is offering its consultancy to a

municipality in southern Italy and a local transport company to test hydrogen mobility and jointly identify obstacles to be solved. Similarly, EPC Contractor A is overseeing an experimental project aimed at testing steel production using hydrogen (DRI process) with steelmakers.

*“[...] by offering our consultancy to these experimental initiatives, we become the new key reference for further projects aimed at an extensive transition.”* (CEO; EPC Contractor A).

In doing so, companies operating in areas related to technological development can thus approach the emerging market while limiting their exposure to risk, developing new competencies, and establishing themselves as key partners for new clients.

This dynamic explains the double harrow of these mechanisms (see **Figure 1.3**) indicating the dual purpose of such endeavours. By engaging in collaborations and consultancy with firms that are exploring pilot projects, companies involved in technological development aim to develop new know-how and, consequently, unique solutions needed for the new market. This approach enables companies to establish direct contact with future potential clients (i.e., customer access) and associate their brand with the nascent market.

*Sustainability symbiosis:*

Sustainability Symbiosis are common to Market Missionaries and involve building new collaborations where companies develop strong interdependencies. Such Symbiosis are sought by firms aiming to transform their production processes to reduce emissions, with the emerging market serving to achieve this

goal. Through this mechanism the focal company triggering the collaboration, benefit from the contributions of multiple partners in order to overcome the financial and operational constraints characteristic of these transition pathways.

*“The decarbonization project we are developing involves several partners with whom we have a symbiotic relationship. For instance, the energy company we collaborate with has developed a solar park exclusively for hydrogen production, for which we are the sole buyers. This example illustrates the extent of our interdependence and mutual commitment”* (Head of Strategy; Refinery Company)

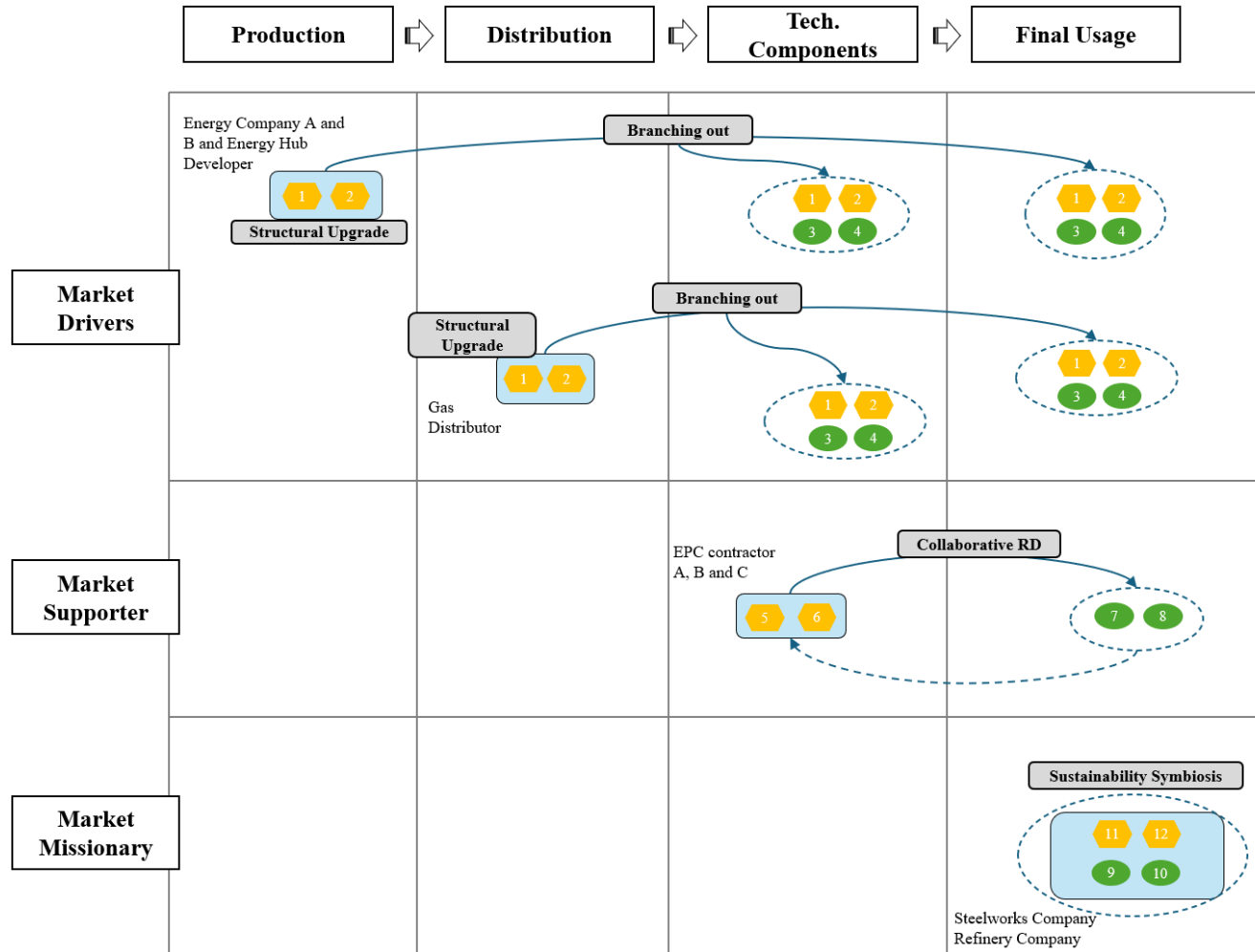
Similarly, the Steelworks Company has launched a decarbonization initiative for its factory, inviting new partnerships with technology providers and gas distributors who are interested in co-investing in this project.

To foster these valuable collaborations, Market Missionaries seek to elevate the visibility of their projects, presenting them as unique initiatives at both national and international levels (e.g., the first fully green steel plant or the first net-zero refinery). Additionally, by leveraging their capacity to provide a stable demand and adapt quickly (i.e., demand catalyst, agility), they create substantial value for the emerging ecosystem by reducing uncertainty. In doing so, they become appealing partners for Market Drivers and Supporters seeking to expand their scope of action and shaping influence.

*"After announcing our intention to create multi-partner collaboration to use of H2 in our production cycle and decarbonize steel production, we received an unimaginable*

*number of requests from various operators. Honestly, we never expected so much attention and so many contacts... to give you a size of this, we've also been contacted by a foreign bank, which is willing to fund our project under very competitive conditions..." (Group President; Steelworks Company)*

As illustrated in the figure, Sustainability Symbiosis operates within a single layer of the value network where the Market Missionary can harness the power of collaboration among multiple actors to secure public and third-party funding and establish itself as a key partner for institutions.



**Figure 1.3: Market shaping mechanisms and the positioning of control points within the value network**

| Control Points                  | N  |
|---------------------------------|----|
| Specific Infrastructures        | 1  |
| Scalability                     | 2  |
| Networking (i.e. collaboration) | 3  |
| Orchestration                   | 4  |
| Know-how                        | 5  |
| Unique Solutions                | 6  |
| Brand                           | 7  |
| Customer Access                 | 8  |
| State intervention              | 9  |
| Environmental Regulation        | 10 |
| Agility                         | 11 |
| Demand catalyst                 | 12 |

- Value Creation
- Value Capture
- Going-in Position
- Shaping Mechanism
- Target Position

## 5) DISCUSSION AND CONCLUSIONS

### *5.1) Control points as a lens to shape the sustainable market*

The aim of this study was to explore the ways in which private companies can exert their agentic effort to shape sustainability-oriented markets and tackle the challenges embedded into these paths. Based on prior research on market shaping roles (Flaig and Ottosson, 2022) and control points (Bohnsack et al., 2024; Dattè et al., 2018; Pagani, 2013), we clustered different market shapers to clearly outline their process of value creation and capture within sustainable emerging markets.

Our findings show how different market-shaping roles contribute to the formation of a new sustainable market. Each player exerts its agentic role and develops specific mechanisms to position control points useful to either create systemic value or capture it at a later stage. We found these bundles of mechanisms and underlying control points to be common to different categories of actors, therefore enabling a deeper understanding of market-shaping roles in sustainability-oriented contexts. *Table 1.3* shows the clear association between roles, mechanisms, control points, and, ultimately, the market constraints that hinder the development of new sustainable markets.

In line with the urgency to transform our society and economic models into new systems capable of addressing environmental challenges, prior research opened the question of how companies can lead the formation of new markets capable of tackling environmental challenges while simultaneously maintaining economic equilibrium (Storbacka et al., 2022; Nenonen and Storbacka, 2021; Sheth and Parvatiyar, 2021; Köhler et al., 2019; Stathakopoulos et al., 2022). By

taking a control point lens to address this fundamental question, this study adds a more fine-grained perspective to enrich the ongoing discussion. These results highlight both the distinct *contributions of various actors to market development* and the specific positioning dynamics that foster *value capture mechanisms and competitive equilibrium*.

We found that Market Drivers leverage technical control points (e.g., specific infrastructure) to establish foundational pillars across the entire value network. By initially integrating their assets into the emerging market, these players subsequently progress through various layers of the value network to ensure cohesive development. Through strategic control points (e.g., networking), they secure broad and coordinated commitments. This approach mitigates some of the entry barriers (Pinkse et al., 2024) hindering market development, such as the limited availability of low-carbon substitutes, lack of infrastructure, and high production costs.

Market Supporters leverage their technological expertise to initiate trial collaborations with new potential customers, thus expanding their technical knowledge and developing essential new technologies (e.g., unique solutions) that facilitate market entry for new entrants. They contribute to the market's development by addressing operational efficiency issues, such as the need for new facilities and technological applications, thereby opening potential new sales channels. In this case, value creation occurs in-house, however the impact extends across the value network, influencing new industrial sectors that could emerge as future players in the nascent market by adopting these newly developed technologies.

As end-users, Market Missionaries play a key role in stabilizing the market and reducing uncertainty, thereby avoiding waiting games (Robinson et al., 2012). Their pioneering and challenging projects, developed through close multi-partner collaboration, bring visibility to the new market and attract private capital and government funding. In doing so, they gain national visibility, and open dialogue channels with policymakers to influence regulatory directions. The mechanisms employed by these players are designed to overcome operational challenges within their business domain, such as high production and process conversion costs.

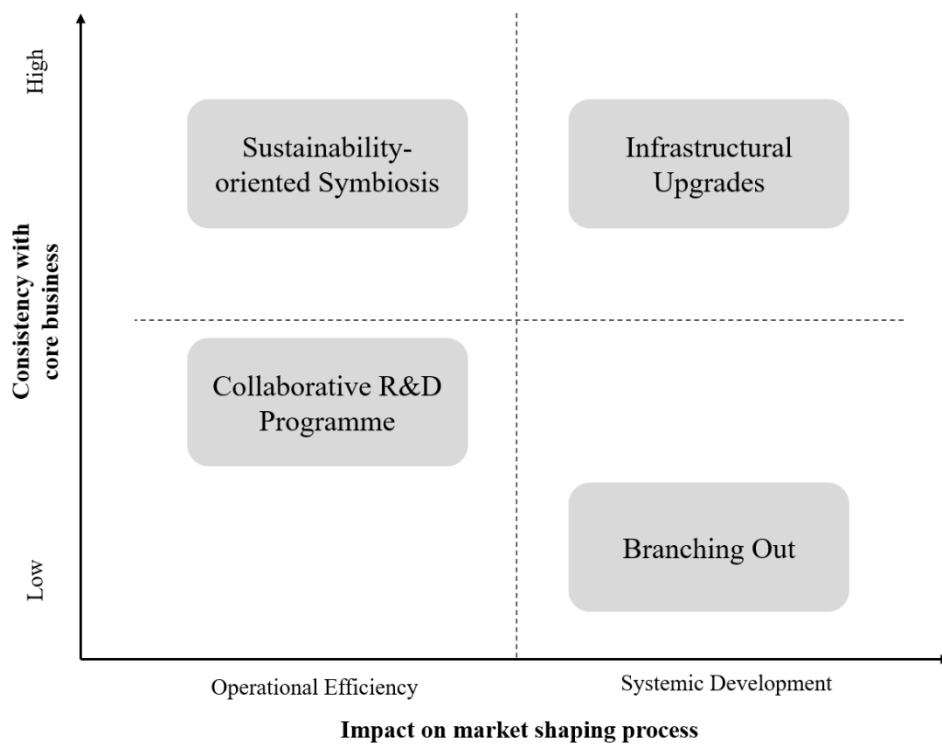
As a systemic process, market shaping reveals that certain roles, such as the *Market Driver*, operate across the entire value network, initiating business ventures that diverge significantly from their core business. Conversely, other roles (e.g. *Market Missionaries*) engage in market-building processes by developing initiatives that remain more closely aligned with their existing business domain. This dual dynamic not only describes and categorizes *market shaping roles*, highlighting the unique mechanisms underlying market creation, but also sheds light on the differing impacts generated by these approaches. The matrix depicted in **Figure 1.4** shows the impacts that arise from the identified shaping mechanisms. The horizontal axis illustrates the type of impact that the identified mechanisms generate, which can contribute either to operational efficiency or to the development of the entire value network's backbone. The vertical axis delineates the alignment level between the adopted shaping mechanism and the company's core business, providing an integrative understanding of the dynamics shown in **Figure 1.3**.

These findings help bridge the gaps in market-shaping research applied to sustainability-oriented markets (Nenonen and Storbacka, 2021; Sheth and Parvatiyar, 2021) by identifying a systematic and structured approach by which companies - based on their long-term vision - act to address peculiar barriers of sustainable markets.

**Table 1.3: Systematization of the intersection between the impact of control points on firm value dynamics and their role in overcoming market constraints**

| Market Shaping Role      | Shaping Mechanisms       | Control Points   | Dynamic        | Market constraints tackled  |
|--------------------------|--------------------------|--|----------------|---|
| <b>Market Driver</b>     | Infrastructural Upgrade  | <ul style="list-style-type: none"> <li>• Specific Infrastructure</li> <li>• Scalability</li> </ul>         | Value Creation | Limited availability of low-carbon substitute<br>High production costs      |
|                          | Branching out            | <ul style="list-style-type: none"> <li>• Networking</li> <li>• Orchestration</li> </ul>                    | Value Capture  | Lack of distribution system<br>Harmonious growth of the whole value network |
| <b>Market Supporter</b>  | Collaborative R&D        | <ul style="list-style-type: none"> <li>• Unique solution</li> <li>• Know-how</li> </ul>                    | Value Creation | Need for new technological components                                       |
|                          |                          | <ul style="list-style-type: none"> <li>• Brand</li> <li>• Customer Access</li> </ul>                       | Value Capture  | Need for replacement of facilities  |
| <b>Market Missionary</b> | Sustainability Symbiosis | <ul style="list-style-type: none"> <li>• Agility</li> <li>• Demand Catalyst</li> </ul>                     | Value Creation | Uncertain demand and waiting games  |
|                          |                          | <ul style="list-style-type: none"> <li>• Environmental Regulation</li> <li>• State intervention</li> </ul> | Value Capture  | Higher output price point<br>Lack of a clear regulation                     |

**Figure 1.4: Matrix of shaping mechanisms in sustainable-oriented markets and their related impact**



*5.2) Contribution to theory*

Our findings firstly contribute to the literature on the agency role that firms can exercise to shape new markets to promote sustainable transition.

The literature on sustainable transitions highlights the role of firms as key actors driving systemic changes. Firms, developing new products, services, and business models, contribute to market creation for emerging technologies, and

facilitate the establishment of new industries (Rosenbloom et al., 2016; Berggren et al., 2015; Turnheim and Geels, 2013; Geels and Verhees 2011). However, the question of “*how*” firms act as initiators of systemic transitions—in particular the mechanisms through which they exert systemic influence to shape new markets—remains underexplored (Smith et al., 2005; Genus and Coles, 2008).

Existing contributions from management literature, primarily examine corporate social responsibility and sustainability issues (Bansal and Song, 2017; Hahn et al., 2016), motivations for engaging in transitional pathways (Dangelico and Pujari, 2010; Rennings, 2000; Sarasini and Jacob, 2014), the development of green practices and their profitability impact (Ambec and Lanoie, 2008), and business models that enhance corporate sustainability and competitive advantage (Kramer and Porter, 2006; Blanco et al., 2013).

Despite the recognition of firms as one of the central agents in transition processes, the intersection of sustainable transition research—viewed as a systemic process—and organizational and managerial studies remains relatively underdeveloped (Köhler et al., 2019). Scholars therefore emphasize the untapped potential of intensifying research at the intersection of sustainable transition studies and managerial research (Farla et al., 2012; Musiolik et al., 2018).

Drawing on market-shaping literature, this study positions the firm as an active driver of systemic changes. Our findings identify strategic and operational levers that go beyond corporate sustainability or adaptive strategies. From a corporate perspective, the research explores the manner in which firms can act as catalysts for green market formation addressing the foundational processes of creating new markets. Furthermore, leveraging the control point perspective, this study highlights critical ecosystem points that are essential for the evolution of new

value networks and the mechanisms of value capture—key conditions for firms to drive transition processes while maintaining competitive equilibrium. By integrating a managerial lens (e.g., market-shaping roles and control point perspectives) with a systemic dimension derived from transition studies, this research sheds light on how companies trigger systemic transitions and identifies levers firms can use to effectively steer these processes.

Secondly, our study offers a more detailed understanding of the functioning and unique characteristics of various market-shaping roles. Recent studies have emphasized the need to explore the diversity of actions and approaches employed by market shapers (Kohli and Jaworski, 2023), highlighting that the literature remains quite broad and vague regarding market-shaping actions companies undertake in sustainability contexts (Nenonen and Storbacka, 2021). By presenting a case study that illustrates the initiatives undertaken by market shapers in developing a sustainable market, we help bridge this gap by providing detailed evidence of the mix of actions needed to balance systemic value creation and profitability (Sheth and Parvatiyar, 2021; Köhler et al., 2019; Stathakopoulos et al., 2022). By doing so, our study contributes primarily by characterizing the distinctive dynamics of each market-shaping role with greater precision. We identified the propensity of Market Drivers to operate across the entire value network, the cautious approach of Market Supporters focused on limited initiatives in value networks' layers further from their core business and the Market Missionaries' strategy, which entails a strong anchoring to the value network segments closest to their business domain. These findings build on the categories provided by Flaig and Ottosson (2022) to broaden the different market-shaping roles in forming new sustainable markets. In so doing our results

contribute to the literature providing the disentanglement of the composite process of market shaping and thus fill the gap highlighted by recent research (Storbacka et al., 2022; Nenonen and Storbacka, 2021) on the limited applicability of the market-shaping literature within the sustainability context.

Finally, our study contributes to the control point perspective by applying it outside a digital, profit-oriented market to a physical, sustainability-oriented context. This not only responds to recent calls (Bohnsack et al., 2024) to further enhance the explanatory power of this theoretical perspective, but also helps address the sustainable transition challenge with a more critical and concrete approach: firms that can lead the transition need to understand how it can be pursued in alignment with a profit-oriented economic model. Understanding how a sustainability-oriented market can also reinforce competitive positioning is fundamental to maximizing the engagement of multiple economic actors.

### *5.3) Implications for companies, policymakers, and further research*

Our research contributes to the critical discussion on transforming production and consumption paradigms to address the climate crisis. Sustainability-driven markets are emerging across sectors, such as electric mobility, renewable energy, and sustainable construction. Our study focuses on one of these emerging markets and offers insights that could apply to other contexts.

The critical importance of our setting is highlighted by EU policies that aim to foster green hydrogen development as part of a broader energy transition and decarbonization strategy, with substantial funding allocated at both EU and national levels. However, EU institutions themselves recognise that while government action is essential, sustainable transitions require the engagement of multiple stakeholders.

Our results could thus be exploited in designing and enhancing regulations and business funding policies. The approach presented in this paper proposes mapping the nascent value chain of a new ecosystem, identifying its challenges and bottlenecks, and then overcoming these constraints and establishing control points that can determine value creation and capture. This systematic approach could be employed by policymakers to maximize the engagement of the private sector, which could act as a multiplier of the forces and resources involved in developing these new markets.

The implications of this study at the individual firm level are more direct. Firms seeking to engage in market-shaping initiatives can leverage our framework to strategically evaluate resources, identify value-generating opportunities, and navigate control points to secure sustainable competitive advantage. By integrating the control points lens within sustainable market shaping, the framework offers a new perspective that encourages firms to explore market positions beyond their traditional core activities, and to thus reveal opportunities for substantial long-term value creation and capture.

Like any study, ours has its limitations. These include the qualitative nature of our findings, which are based on nine case studies. Future research should investigate the control points and positioning mechanisms in other sustainable emerging markets. Furthermore, our analysis did not address the roles of firms that resist or actively hinder change to preserve the status quo. Further studies could explore how such firms operate, the control points they leverage, and how their positioning strategies either interact with or oppose the market-shaping roles examined in this study.

#### *5.4) Conclusions*

The aim of this study was to contribute to the literature on market shaping in the context of sustainability, addressing calls from various scholars to bridge this gap (Storbacka et al., 2022; Nenonen and Storbacka, 2021; Sheth and Parvatiyar, 2021). We have demonstrated that firms are key to creating new green markets by developing initiatives and business models that break through the barriers inherent to these markets. By adopting the control point perspective, we provide a more granular understanding of how firms navigate the tension between sustainable value creation and value capture to secure and sustain competitive advantage. In today's fluid and rapidly evolving context - marked by transformative shifts and the emergence of new markets in response to the climate crisis - this study emphasizes the intrinsic power of firms and focuses on those dimensions that enable firms to achieve their aims. We believe that our study reframes the discussion around the feasibility of a green transition aligned with the dynamics of profitability and competitiveness.

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## CHAPTER 3: SUSTAINABILITY-ORIENTED COLLABORATIONS IN EMERGING GREEN ENERGY MARKETS: A CONFIGURATIONAL ANALYSIS OF ALLIANCE MANAGEMENT CAPABILITIES AND RELATIONAL VIEW



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**ABSTRACT:**

Sustainability-oriented collaborations are inter-organisational arrangements where the competencies of diverse companies are pooled together to tackle environmental challenges. These collaborations differ from traditional strategic alliances as they tackle complex goals amidst greater uncertainties and often involve a more diverse array of partners. Consequently, scholars have questioned whether the mainstream strategic alliance literature can adequately explain the varying outcomes of sustainability-oriented collaborations. Drawing on the Alliance Management Capabilities (AMC) and Relational View (RV) literature, we investigated 16 sustainability-oriented collaborations to understand how the focal companies guide these partnerships to success. The results of a fuzzy-set Qualitative Comparative Analysis unravel four different combinations of constructs derived from AMC and RV, namely coordination, inter-organizational learning, governance models and transaction-specific assets, which effectively address the unique challenges of sustainability-oriented collaborations and ensure their successful functioning. As its main contribution, this study offers a configurational perspective that provides actionable insights for effectively managing and leveraging alliance management capabilities and relational resources in emerging green energy markets.

## 1) Introduction

The sustainable transition towards new models of production and consumption represents one of the primary and most complex challenges that businesses will need to address in the coming years, and no company can tackle it alone (Albino et al., 2012). Initiatives addressing the net zero challenge often face high uncertainties and entail partnerships that reflect the articulated nature of this transition (Winch and Sergeeva, 2022). Being a trial-and-error logic central to transitions, the research community in sustainability transitions is called to understand how companies can collaborate to effectively and efficiently achieve sustainable production and consumption goals (Winch and Sergeeva, 2022; Daniel, 2022) and what factors in strategic initiatives and alliances lead to success (Slavinski et al., 2023).

Compared to traditional alliances, sustainability-oriented partnerships often necessitate a diverse membership to address the systemic nature of sustainability challenges (Ordonez-Ponce and Clarke, 2019) and require novel competencies in both technological and non-technological areas that are not core to their business (Rizzi et al., 2013). Consequently, differences from traditional strategic alliances are manifest in (i) goal complexity, where the attainment of environmental objectives may supersede the conventional logic of business competitiveness (ii) heterogeneity of the partners engaged in the collaboration, where there are strategic interdependencies among actors throughout supply chain and networks and (iii) limited predictability, where the complexity of the sustainability challenges makes the approaches to solve the problems not straightforward, with consequences that are difficult to predict (Vurro et al., 2023).

Given these peculiarities, despite partnerships and alliance management capabilities being vital in eco-innovation (Dangelico, 2016), mainstream literature on strategic alliance still does not provide clear directions on how to achieve effective management of the capabilities required to operate sustainability-oriented collaborations (SOCs) (Menghwar and Daood, 2021; Vurro et al., 2023). Indeed, recent studies (Valbuena-Hernandez et al., 2022; Dentoni et al., 2020) claim we still know too little about how the organization of collaborative endeavours can support environmental resilience and sustainability outcomes.

To fill this gap, it is crucial to delve into SOC to understand how companies operationalise the theoretical constructs from the strategic alliance literature (Gölgeci et al., 2019; Melander, 2022).

These constructs can be divided into (i) those constituting the structural dimension of the partnership (or alliance level) according to the Relational View (RV) (Dyer and Singh, 1998) and (ii) those shaping the individual dimension (or firm level) belonging to the Alliance Management Capabilities (AMC) framework, which pertains to the attitudes, skills, and capabilities of each firm engaged in the alliance (Schilke, 2014; Schreiner et al., 2009).

Both the AMC and RV theories encompass a complex array of organizational routines and structures. Recent literature has emphasized that contextual contingencies and partner-specific characteristics can influence the varying roles of these routines (Al-Tabbaa and Zahoor, 2024). Consequently, comprehending the function of these theoretical frameworks in peculiar collaborations aimed at achieving sustainability outcomes is essential for advancing the current body of knowledge, offering valuable insights to the fields of alliance management and sustainability (Ardito et al., 2019).

Despite many studies examining structural or individual dimensions of collaborations independently (Menghwar and Daood, 2021; Niesten and Jolink, 2020), focusing on their complementarities is crucial for deepening knowledge in SOCs (Helfat and Raubitschek, 2018; Kohtamäki, 2018).

Early studies (Dhaundiyal and Coughlan, 2022; Donbesuur et al., 2021) attempting to understand how the AMCs of a company allow this firm to capitalise on the constructs of the RV to generate positive environmental outcome are almost exclusively focused on eco-innovation results and leave ample room for further exploration of how the structural components of alliances and the individual skills of a focal company relate to sustainability outcomes. Hence, our paper aims to build on the literature on RV and AMC to explore how structural and individual dimensions within collaborations influence the effectiveness of SOCs in achieving sustainable outcomes, leading to the following research question:

*RQ1: How do companies employ AMCs and RV pillars in SOCs to better tackle the challenges embedded into these projects?*

To this end, we investigated a set of projects undertaken through inter-firm collaborations with an explicit environmental intent in addition to the conventional economic and competitive purpose. All these projects shared an interest in collaboratively addressing environmental issues by developing new disruptive processes and business models capable of reducing their emissions or by facilitating the scale-up of new green technology.

In the next Section, we reviewed the theoretical connections between AMC and RV constructs. In Section 3, we explain the rationale behind our exploratory research strategy and justify the adoption of a qualitative comparative analysis

approach, with results detailed in Section 4. The final section discusses how configurations of AMC and RV constructs contribute to the effectiveness of SOCs, providing managerial and theoretical implications, highlighting the study's limitations, and proposing directions for future research.

## **2) Theoretical Background**

### *2.1) The theoretical foundations of inter-firm collaborations*

In recent years, numerous inter-organizational collaborations have formed, driven by a shared commitment to addressing environmental challenges (Wassmer et al., 2014). In general, these SOCs are collaborations aimed at upgrading a company's products, processes, or practices to realise environmental value besides economic returns (Adams et al., 2016). Frequently, SOCs refer to the interaction between different companies with similar commitments to plan and develop innovations to reduce their businesses' environmental footprint (Vachon and Klassen, 2008), but they can also cover similar concepts reported in the extant literature under the name "green alliances" or "cross-sector social partnerships", among others.

The mainstream literature examines these collaborations from different angles. When studies target the partnership as a whole, the RV emerges as the most suitable theoretical lens for understanding the relationships established between the parties (Dyer and Singh, 1998). When, instead, the study targets a single company, the AMCs theoretical framework is the most appropriate theoretical framework for understanding the characteristics that allow a company to maximise the partnership's outcome (Schilke, 2014; Schreiner et al., 2009).

From a structural perspective, the RV framework proposed by Dyer and Singh (1998; 2018) posits the effectiveness of partnerships in generating competitive

advantage because of supernormal profits, called relational rents, deriving from the extraction of value from mutually integrated resources (Lavie, 2006). According to the original formulation of the RV and further empirical evidence, effective governance, complementary resources, investment in relationship-specific assets, and knowledge-sharing routines are necessary to generate relational rents (Dyer and Hatch, 2006; Kale et al., 2001; Lavie, 2006).

The AMCs framework, instead, integrates the RV in that it adopts an individual firm's perspective on multiple relations (Wang and Rajagopalan, 2015) to distinguish the resources that are necessary to handle individual alliances (Schreiner et al., 2009) from those that are necessary to manage a portfolio of alliances (Schilke et al., 2010). In particular, AMCs spotlight the skills and competencies that help focal firms orchestrate strategic alliances (Kale and Singh, 2007), which is crucial in explaining performance differences across alliances (Wang and Rajagopalan, 2015).

In recent years, the literature has begun to apply these theoretical frameworks beyond the traditional search for profitability to address eco-innovation and environmental outcomes (Vasudeva and Anand, 2011), providing evidence that intense collaborative endeavours among multiple actors help tackle environmental challenges (Albino et al., 2012) and achieve higher sustainability performance (Dangelico, 2016). For example, Inigo et al. (2020) have shown how, among AMCs, the alliance portfolio coordination capability helps establish new sustainability-oriented collaborations. Other scholars (Dhaundiyal and Coughlan, 2022; Donbesuur et al., 2021) investigating the alliance post-formation phase instead demonstrated that coordination and communication capabilities help achieve better environmental results. Overall, these studies

align with existing evidence suggesting that well-structured inter-firm collaborations can enhance green performance (Melander, 2017), highlighting the need for further investigation at the intersection of AMC and RV to effectively understand the distinctive challenges of SOCs (Menghwar and Daood, 2021; Niesten and Jolink, 2020; Vurro et al., 2023).

*2.2) An integrative analytical framework to investigate organisational lever for SOCs*

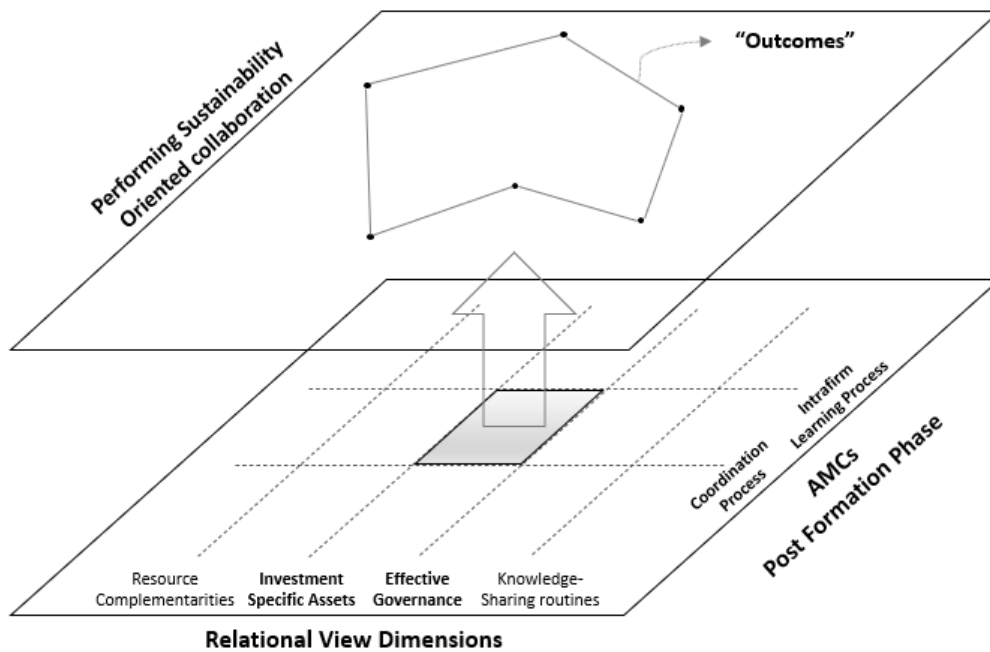
Based on the framework proposed by Wang and Rajagopalan (2015), the post-formation phase of inter-company collaborations, which encompasses the stage where partners have already been selected and the alliance's design has been established, is key to determining their actual outcomes. Focusing on this phase is important to complement the analysis of the RV and AMC constructs relevant in the pre-formation alliance stage, which includes resource complementarity, a proven precondition to forming effective alliances (Dyer and Singh, 2018).

In the post-formation phase, assuming the partnership is properly established, coordination and inter-organizational learning are crucial for creating value (Kale and Singh, 2007; Schilke and Goerzen, 2010; Schreiner et al., 2009).

In this phase, focal companies have significant autonomy in managing their coordination capabilities and learning processes to better meet the specific demands of sustainability-oriented collaborations. Moreover, focal companies are free to leverage investment-specific assets and effective governance mechanisms to fostering collaborations outcomes (Wang and Rajagopalan, 2015).

*Figure 2.1* presents the analytical framework that outlines the strategic variables available to focal firms for influencing effective SOCs during the post-formation phase based on the integration of RV and AMC dimensions.

**Figure 2.1: Analytical Framework**



According to this framework, the variables that the focal firm can strategically influence include:

- (i) Intrafirm learning processes regarding the routines associated with articulating, codifying, sharing, and internalising alliance knowledge (Kale and Singh, 2007). This construct looks at the implementation by the focal firm of new internal mechanisms to accumulate new information (Zollo and Winter, 2002) and, thus, to develop

environmental learning (Donbesuur et al., 2021). The intra-firm learning processes determine the ability to absorb new skills from partners, which is crucial to attaining sustainable goals (Ardito et al., 2018).

- (ii) **Coordination:** it refers to the capability of the focal firm to coordinate activities and resources with the alliance partners (Gulati et al., 2005), to efficiently manage tasks, responsibilities, and interdependences and to flexibly adapt partners' agreements (Schilke, 2014; Schreiner et al., 2009). Huang and Li (2017) have demonstrated that the coordination capability enhances an effective co-engagement between separate functions and positively impacts green product developments. Moreover, as empirically demonstrated by Donbesuur et al. (2021), inter-organizational coordination is positively associated with eco-innovation, with environmental intra-firm learning serving as a key mediating factor.
- (iii) **Investment-Specific Assets:** when a firm develops specialised assets in collaboration with partners, it generates a configuration of resources that is not easily replicable by competitors (Dyer and Singh, 1998). The specialisation of assets generates deeper trust in partners, activates new interactions and stimulates informal communication (Dyer et al., 2018). Co-investing with partners on key assets is also associated with achieving better innovation outcomes. Scholars have found a positive relationship between the level of relationship-specific investments and the generation of innovative ideas (Potter and Wilhelm, 2020). Higher transaction volumes between firms facilitate communication and operational efficiency, improving the capacity for product development and differentiation (Dyer and Hatch 2006).

- (iv) **Governance Mechanism:** the governance model applied to the partnership describes how companies have formalised their agreements, authorities, roles, and responsibilities within the partnership. Effective governance is necessary to boost value creation, reduce transaction costs, and reduce partners' opportunistic behaviours. Various alliance governance models exist, ranging from highly formalised to less formalised and from high to low-directional power relations. In eco-innovation partnerships, resource interdependence and shared investments are typical but can create appropriation concerns (Dyer et al., 2018). Thus, the governance models are necessary to avoid litigations and contrasts among partners and enhance alliances' orientation toward innovation (Gulati and Singh, 1998).

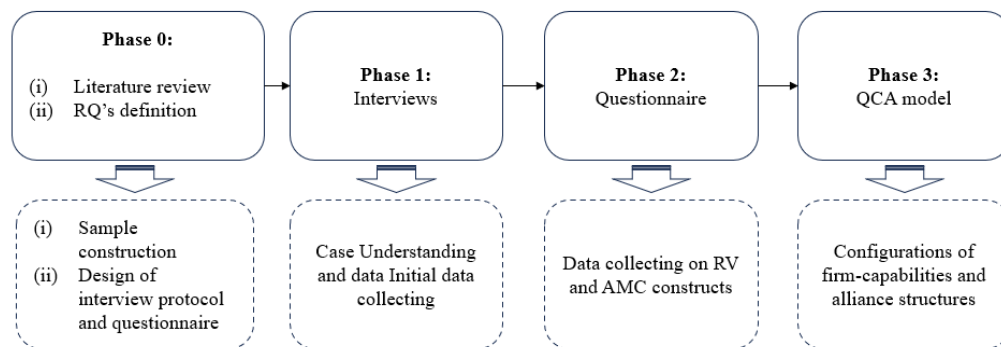
While existing literature strongly supports the importance of these dimensions for effectively managing collaborative projects, it lacks specific guidance on their configuration and practical application in SOCs. Our study aims to bridge this gap by exploring the underlying rationale for how RV and AMC constructs are configured in successful SOCs.

### 3) Research Context and Method

This study analysed 16 projects undertaken through SOCs, adopting the perspective of the focal company (i.e. the company that triggered the project and the one mainly involved in it) to analyse how this actor combines the constructs of AMC and RV to leverage the characteristics of each partnership. *Figure 2.2* indicates the methodological flow employed in this study, delineating the

activities carried out in each step (boxes with continuous lines) and the related purposes and outcomes (boxes with dashed lines).

**Figure 2.2: Methodological Flow**



### 3.1) Research context: green hydrogen and the Italian market

We chose the emerging green hydrogen (i.e. hydrogen produced by water electrolysis using renewable power) market as an optimal context for our research. Being a pillar of the energy transition, this market presents (i) relevant institutional pressures towards greenhouse gasses reduction (IPCC 2022), (ii) significant demand for innovations to advance technologies, processes and business models capable of boosting a market that currently is at an early-stage (IEA 2022), (iii) a variety of stakeholders throughout the green hydrogen value chain, and (iv) a multitude of projects facilitated through collaborative partnerships.

Green hydrogen attracts investors' interest because it enables the decarbonisation of hard-to-abate industries where direct electrification is not feasible, and it serves as an enabler for the utilisation of renewable sources (IEA, 2022). These

features justifies its inclusion in the political agendas of numerous governments as a mean to address climate change even though it is still far from being a dominant technology with well-established investment paths (IPCC, 2022). In fact, despite studies reporting H2 demand and consumption increase in the coming years (Nunez-Jimenez et al., 2022), several challenges still hamper the H2 diffusion, resulting in high variations in H2 implementation forecasts (IRENA, 2022).

This context is optimal for our research as it involves a diverse range of incumbents and new entrants who are actively investing in SOCs to develop new business models and collaborative solutions aimed at overcoming market barriers that would be insurmountable if tackled individually.

We confined the analysis to Italy to ensure environmental homogeneity regarding institutional settings, infrastructures, regulatory constraints, renewable energy availability, and energy price and to focus on a context that presents (i) goal complexity due to high hydrogen interest and wide commitment (MISE, 2020), (ii) large investments stimulated by the 2020 EU's hydrogen strategy (EU, 2020) and the 2030 target in REPowerEU plan (EU, 2022), (iii) high uncertainties because of an ongoing regulation and infrastructural development and (iv) relevant potential synergies among different industries and operators into the supply chain (MISE, 2020).

The exploratory nature of our study justified the collection of primary data from exemplar focal companies and the use of qualitative research methods.

### 3.2) *Sample and data source*

The selection of cases matched the relevance criteria and the availability of abundant secondary data sources, which are essential to triangulating our observation of the phenomena and ensuring that no single point of view dominated our understanding (Gibbert et al., 2008).

Initially, we used the IEA Hydrogen Projects Database, a repository of projects launched since 2000 for H2 production, distribution, and utilisation. Then, we added projects developed by companies affiliated with associations that promote H2-related technologies, such as H2IT and the European Clean Hydrogen Alliance. Finally, we interviewed 2 experts from GME (the Italian organisation overseeing the electricity market) to complete the list of projects relevant to the study. This approach yielded an in-depth market understanding and a list of 64 Italian projects related to green hydrogen.

To refine our case selection, we carefully evaluated the ongoing activities of each project, ensuring they encapsulate the essential features of SOCs: (i) a strategic intent to generate impacts that extend beyond the immediate collaboration (Pedersen et al. 2021); (ii) a diverse partnership composition, involving firms from distinctly different sectors; and (iii) inherent unpredictability, driven by the innovative nature of these projects and the multiple objectives they aim to achieve, such as mobilizing institutional support and establishing new standards. Combining these constraints with the focal companies' willingness to participate in the study, we arrived at a final sample of 16 projects. **Table 2.1** illustrates the selected projects and their positioning along the value chain.

Our sample benefited from the substantial heterogeneity among the selected projects, effectively minimizing the risk of overemphasizing context-specific dynamics.

For confidentiality reasons, the names of the projects and partners are not disclosed. Nevertheless, it is noteworthy that all projects are large-scale industrial initiatives, recognized nationally for their strategic importance due to their potential to revolutionize supply chains and transition traditional production methods toward sustainable models. The leading companies driving these projects are multinational corporations with over 1,000 employees and turnovers approaching or exceeding one billion euros.

### *3.3) Interviews Process and qualitative data collection*

To investigate how focal companies combine AMCs with the structural components of the RV in high performance in SOC, we employed an articulated qualitative research methodology. This approach included extensive data collection through interviews, questionnaires and analysis of public reports of the companies involved in the selected projects, culminating in a qualitative comparative analysis (Ragin, 2000, 2009).

Collecting primary data was essential for gaining in-depth insights into each case. We conducted two or more interviews for each project in our sample between September 2022 and March 2023. The informants were key figures of the focal company involved in strategic decision-making and committed to project advancement, guaranteeing a broad view of the project's corporate strategy and managerial dynamics. The interviewees held positions such as CEO, innovation director, or project manager, depending on the company size and the respondent's knowledge of the hydrogen projects.

Each interview was conducted online via videoconferencing, lasting between 1 and 2 hours, resulting in approximately 60 hours of recorded material. We

developed a research protocol to conduct semi-structured interviews aimed at developing an understanding of: (i) the project's objectives, development and results; (ii) the governance of the collaboration and the focal company's organizational set-up developed to manage the relationships with partners.

In line with best practices for conducting a QCA, we used interviews to develop a thorough understanding of our case studies (Greckhamer et al., 2018). This data informed our QCA model and enhanced our understanding of reasons why certain configurations of capabilities and alliance structures are conducive to generating higher performance in SOC. We collected also secondary data available on the websites of the interviewed companies, in sustainability reports, and in sector-specific journals focused on developments in the Italian hydrogen economy to triangulate the evidence emerging from the interviews. For instance, we verified project start dates, the involved partners, the objectives declared to investors, and, most importantly, communications on ongoing results, such as: hydrogen production volumes, emissions reductions, specific investments, key strategies and decisions to manage the partnership, the creation of new companies and the value generation and distribution among partners.

*Table 2.1: Projects Details*

| <b>Project n°</b> | <b>Focal Company</b>                     | <b>Project</b>                    | <b>Project Partners</b>   | <b>Project Description</b>  |
|-------------------|--|-----------------------------------|---|---|
| 1                 | Utility – Energy Company                 | Testing Platform                  | (i) Energy Company<br>(ii) Users  | Development of an experimental platform to test H2 supply chain, electrolysers, H2 delivery and stocking.   |
| 2                 | Steelworks                               | Steel Making Blending             | (i) EPC contractor<br>(ii) Utility<br>(iii) Consulting<br>(iv) Steelworks | Use of hydrogen in burners used in the steel heating process replacing a % of methane.  |
| 3                 | Utility – gas transportation and storage | Steel Making flexible Blending    | (i) Utility – gas<br>(ii) Energy Company<br>(iii) Steelworks              | Development of an electrolyser in a steel mill connected to a dedicated photovoltaic park (off-grid) to supply H2 to an electric furnace.   |
| 4                 | EPC Contractor                           | Optimisation of Value chain steps | (i) EPC contractor<br>(ii) Utility – gas<br>(iii) Electrochemistry        | Development of an in-house laboratory to test burners on a real scale. The project has developed photovoltaic roofs to produce renewable energy and thus connected to an electrolyser installed on-site |

|   |  |  |  |   |
|---|--|--|--|---|
| 5 | Utility – Energy Company                 | Hydrogen valley                                | (i) Energy Company<br>(ii) Engineering developer company<br>(iii) EPC Contractor | Construction of three hydrogen production centres powered by photovoltaics with integration from the grid.  |
| 6 | Energy Hubs Developer                    | Energy hub and H2 Stock                        | i) Energy Hubs Developer<br>ii) EPC contractor<br>iii) Private equity fund       | Development of an energy hub powered by offshore wind and floating photovoltaics. H2 is used as storage to mitigate the intermittency of renewables and sold as feedstock to neighbouring businesses. |
| 7 | Utility – gas transportation and storage | Definition of blending % in national pipelines | (i) Utility – gas (3)<br>(ii) Technical Consultant<br>(iii) Category association | Assessment of the entire supply chain and all parties connected to the gas network to test the possible increase in the percentage of blending within national gas pipelines.                         |
| 8 | Refinery                                 | Refinery                                       | (i) Energy Company<br>(ii) Refinery  | Installation of an electrolyser in a refinery powered by energy from the grid certified through a Power Purchased Agreement (PPA) to replace some of the grey hydrogen used with green H2.            |
| 9 | Utility – Energy Company                 | Refinery                                       | (i) Energy Company<br>(ii) Refinery  | Supply of green H2 to a Refinery company through installation within the plant of an electrolyser powered by the electric grid (Virtual PPA). Origin certificates qualify it as green H2.             |

|    |  |                       |  |  |
|----|--|-----------------------|--|--|
| 10 | Utility – Energy Company                 | Refinery              | (i) Energy Company<br>(ii) Refinery  | Supply of green H2 to a Refinery company through the construction of an electrolyser adjacent to a photovoltaic park and transportation by road (40 km). |
| 11 | EPC Contractor                           | Steel Making          | i) Partnership between 2 EPC contractors<br>ii) Steelworks                 | Development and installation of a direct reduction plant in a steel mill.  |
| 12 | EPC Contractor                           | Steel Making          | i) Partnership between 2 EPC contractors<br>ii) Steelworks                 | Development and installation of a direct reduction plant in a steel mill.  |
| 13 | Utility – Energy Company                 | Transportation Trucks | (i) Energy Company<br>(iii) Trucking companies<br>(iii) Networkist company | Production of certified green H2 and delivery to refilling stations where partner trucks will be supplied.   |
| 14 | Utility – gas transportation and storage | Transportation Train  | (i) Utility – gas<br>(ii) Energy Company<br>(ii) Rail transport company    | Construction of a first hydrogen production plant adjacent to a train station and replacement of the current fleet with H2-powered electric trains.      |

|    |  |                            |  |   |
|----|--|----------------------------|--|---|
| 15 | EPC Contractor                           | Transportation Busses      | (i) EPC contractor<br>(ii) Energy company<br>(iii) Bus transport company | Construction of an H2 production and storage site and a refilling station for bus charging. |
| 16 | Utility – gas transportation and storage | Electrolysers Giga Factory | (i) Utility – gas<br>(ii) Electrochemistry                               | Creation of a giga factory for electrolyser components based on alkaline technology.        |

#### 3.4) *Questionnaire for the QCA*

We developed and sent a questionnaire to the key informants in the focal companies to homogeneously collect information about the alliance characteristics, firm capabilities and the performance achieved for each project. In particular, we measured via psychometric scales the variables Coordination, Interorganizational Learning, and Transaction-Specific Assets (Schilke and Goerzen's 2010; Schreiner et al. 2009; Wu et al 2017).

Each construct's value was calculated as the average of its respective items. The items were based on prior literature and were measured using a 7-point Likert scale from 1 = strongly disagree to 7 = strongly agree (Table 2.2).

The binary variable Governance was the result of our direct observation of the phenomenon through the interview. Grounding on Dyer and Singh (1998), we assigned 0 to partnerships where the nature of the partnership relationship is based on rigid contractual agreements defining the parties' obligations, and 1 when the project has a shared governance through either the creation of special-purpose entities (SPV) or the creation of a new company with a shared board, dedicated to the project.

Finally, we employed a psychometric scale to measure Project Outcomes (Kale and Singh, 2007; Krishnan et al., 2006), a variable capturing whether the objectives for which the partnership was established have been achieved, the satisfaction with overall performance and whether the partnership has improved the company competitive position. Considering that all our projects are SOCs, the variable alliance performance proxied the achievement of environmental outcomes.

Aligning with previous studies that demonstrate best practices for measuring perceptual subjective indicators strongly correlated with actual performance, we collected and triangulated evidence to support subjective performance assessments, thereby minimizing biases (Richard, et al., 2009).

### *3.5) QCA Data Sets and Calibration*

We found the qualitative comparative analysis (QCA) fitting our purpose since, differently from other statistical methods that are unable to accommodate multiple alternative paths (Woodside, 2013), assuming equifinality (i.e., different combinations of attributes can produce the same outcome) (Ragin, 2000;2009), it allows to unravel patterns of attributes from a small sample of projects (Greckhamer et al., 2018) adding more nuances to the interplay of different attributes (Schneider and Wagemann 2010).

Moreover, this methodology, by identifying multiple combinations of attributes capable of explaining the occurrence of an outcome of interest, is proving increasingly valuable for understanding complex phenomena such as governance and managerial mechanisms and their influence on sustainable outcomes (López-Cabarcos et al., 2023; Torres, 2024).

We employed a fuzzy set variant of QCA (fsQCA) that, differently from the traditional Crisp QCA (Ragin, 1998), allows for the use of continuous variables ranging between 0 and 1. This higher granularity in data observation (Ragin, 2000) is particularly useful in social and management studies, where variables frequently exhibit vagueness that seldom result in extreme values (Campbell et al., 2016), requiring instead to express nonbinary degrees of membership in a specific set.

Calibration is a critical step in QCA as it translates observed variables into a range between 0 (complete non-membership) and 1 (complete membership) (Ragin, 2014). To accurately reflect variations across cases, we established thresholds at three cut-off points representing full membership, complete non-membership, and an intermediate set point. These thresholds enabled us to differentiate membership levels based on the conditions and outcome sets (Greckhamer et al., 2018).

We carried out the transformation by using sample-dependent anchors defined by the 0.95, 0.50, and 0.05 percentiles as the three thresholds (or breakpoints), transforming the data into the log-odds metric with all values being between 0 and 1. In the absence of a solid theoretical foundation to define ex-ante high or low levels of membership to a specific set, consistent with prior studies (Fiss, 2011; Greckhamer et al., 2008; Gupta et al., 2020; Torres, 2024), we adopted sample-dependent anchors corresponding to predetermined percentiles of the distribution. **Table 2.2** shows the calibration rules adopted for each attribute and outcome.

**Table 2.2: Questionnaire' Items**

| <b>Constructs</b>                           | <b>Description and previous literature usage</b>  | <b>Calibration</b>  |
|---|---|---|
| Coordination Dimension                      | Categorical variable based on a 4 items construct (Schreiner et al. 2009) to capture the extent to which the focal company has established process and routines to coordinate external partners activities  | Sample Based Calibration  |
| Interorganizational learning                | Categorical variable based on a 4 items construct (Schilke and Goerzen's 2010) to capture the extent of routines designed to facilitate knowledge transfer and absorption from alliance partners  | 0.95 percentile → Fully membership<br>0.50 percentile → Cross Over point<br>0.05 percentile → Full non-membership                                 |
| Transaction-Specific Assets                 | Categorical variable based on a 4 items construct (Wu et al 2017). It measures the relation-specific investments in terms of the extent to which the company invested in an alliance relationship   |   |
| Governance Mechanisms                       | Dichotomous variable resulting from direct observation of the phenomenon through the interview process. In line with (Dyer and Singh 1998) it discriminates between (i) partnerships governed by client-supplier contracts and (ii) partnership with shared governance through the creation of special-purpose entities (SPV) | Not shared governance → 0<br>Shared Governance → 1  |
| Alliance Performances (Outcome of interest) | Categorical variable based on a 4 items construct. This construct used by Dhaundiyal and Coughlan (2022) and adapted from Krishnan et al. (2006) with one extra item from Kale and Singh (2007) relating to competitive position. This construct reflects the subjective perception of alliance performance.                  | Sample Based Calibration<br><br>0.95 percentile → Fully membership<br>0.50 percentile → Cross Over point<br>0.05 percentile → Full non-membership |

#### 4) Results

After the calibration of our dataset, we implemented a three steps fsQCA.

First, we constructed the so-called truth table, which identifies all possible combinations of the selected attributes, and we sorted the empirical observations into the rows of this table based on their attribute values (Fiss, 2011).

Second, we reduced the number of rows based on two conditions (Ragin, 2009): (i) a frequency threshold equal to 1, which determined the minimum number of cases required for a solution to be considered, and (ii) a consistency threshold equal to 0,8, which reflected the minimum degree to which cases conform to the set-theoretic relationships expressed in a solution (Fiss, 2011). **Table 2.3** shows the truth table providing, after the described simplification, nine different combinations of attributes displayed by our 16 projects.

Third, we employed an algorithm based on Boolean algebra to logically reduce the rows of the truth table to simplified combinations (Fiss, 2011). We utilised the Quine-McCluskey algorithm (implemented in the fsQCA 3.0 software package) to minimise sufficiency statements, simplify complexity, and obtain a more parsimonious outcome (Schneider and Wagemann, 2012).

**Table 2.3: Truth Table**

| <b>RO<br/>WS</b> | <b>CONDITIONS</b> |                                  |  |                          | <b>OUTCOME</b>         |                             |
|------------------|-------------------|----------------------------------|--|--------------------------|------------------------|-----------------------------|
|                  | Coordina<br>tion  | Interorganizat<br>ional learning | Transacti<br>on-<br>Specific<br>Assets | Governa<br>nce<br>Models | Num<br>ber of<br>cases | Alliance<br>Performa<br>nce |
| <b>1</b>         | 0                 | 0                                | 1                                      | 1                        | 2                      | 1                           |
| <b>2</b>         | 0                 | 0                                | 0                                      | 1                        | 1                      | 1                           |
| <b>3</b>         | 1                 | 0                                | 1                                      | 1                        | 1                      | 1                           |
| <b>4</b>         | 1                 | 1                                | 1                                      | 0                        | 1                      | 1                           |
| <b>5</b>         | 1                 | 1                                | 1                                      | 1                        | 3                      | 1                           |
| <b>6</b>         | 0                 | 1                                | 0                                      | 0                        | 2                      | 0                           |
| <b>7</b>         | 1                 | 1                                | 0                                      | 0                        | 3                      | 0                           |
| <b>8</b>         | 0                 | 0                                | 1                                      | 0                        | 1                      | 0                           |
| <b>9</b>         | 0                 | 0                                | 0                                      | 0                        | 2                      | 0                           |

*4.1) FsQCA: Necessary and Sufficiency Analysis*

The analysis of necessity enables us to determine whether certain conditions are necessary for the outcome to occur, i.e. whether RV or AMC attributes are consistently present when the partnership achieves superior performance. It is recommended to use a consistency benchmark of at least >0.90 (Ragin, 2009;

Schneider and Wagemann, 2012) as a threshold to conclude that empirically observed configurations are associated with the outcome (Greckhamer et al., 2018).

**Table 2.4** shows the results considering whether the presence or absence (labelled ~) of a condition is necessary for the presence or absence (~) of the outcome (Alliance performance).

Given that no conditions have a consistency above 0.9, we conclude that no conditions were necessary to reach a high level of alliance performance.

The sufficiency analysis is performed by applying the Quine-McCluskey algorithm to the dataset. This reduces the causal complexity to a minimal equation of attributes sufficient for the outcome to occur (Greckhamer et al., 2008), and it computes complex, parsimonious, and intermediate solutions. In line with Ragin (2009), we opted for the intermediate solution, which uses only the remainders that survive counterfactual analysis (Ragin, 2009; Schneider and Wagemann, 2012) and is more appropriate in situations of limited diversity due to its simple assumptions based on easy counterfactuals (Fiss 2011).

**Table 2.5** shows the results of the analysis by providing both the raw coverage, which indicates the share of the outcome explained by the configuration, and the unique coverage, which reflects each configuration's relative empirical weight, for each combination (Campbell et al., 2016; Ragin, 2009).

**Table 2.4: Necessary conditions analysis**

| <b>CONDITIONS</b>                | <b>ALLIANCE<br/>PERFORMANCE</b> |                 | <b>~ ALLIANCE<br/>PERFORMANCE</b> |                 |
|----------------------------------|---------------------------------|-----------------|-----------------------------------|-----------------|
|                                  | <b>Consistency</b>              | <b>Coverage</b> | <b>Consistency</b>                | <b>Coverage</b> |
| COORDINATION                     | 0.724                           | 0.755           | 0.627                             | 0.537           |
| ~COORDINATION                    | 0.556                           | 0.645           | 0.714                             | 0.679           |
| INTERORGANIZATIONAL<br>LEARNING  | 0.692                           | 0.723           | 0.631                             | 0.541           |
| ~INTERORGANIZATIONAL<br>LEARNING | 0.561                           | 0.649           | 0.677                             | 0.643           |
| TRANSACTION-SPECIFIC<br>ASSETS   | 0.729                           | 0.812           | 0.476                             | 0.435           |
| ~TRANSACTION-SPECIFIC<br>ASSETS  | 0.492                           | 0.534           | 0.795                             | 0.706           |
| GOVERNANCE SHARED                | 0.602                           | 0.755           | 0.237                             | 0.244           |
| ~GOVERNANCE SHARED               | 0.398                           | 0.389           | 0.763                             | 0.611           |

*Table 2.5: Sufficiency conditions and QCA results*

| Conditions / Configurations  | Configuration 1<br>"Technology Uplift" | Configuration 2<br>"New Business Exploration" | Configuration 3<br>"Synergic Decarbonization" | Configuration 4<br>"Industry Catalyst" |
|------------------------------|--|---|---|--|
| Coordination                 | ⊗                                      | ●   |   | ●                                      |
| Interorganizational learning | ⊗                                      | ●   | ⊗   |  |
| Transaction-Specific Assets  |  | ●   | ●   | ●                                      |
| Governance Shared            | ●                                      |   | ●   | ●                                      |
| Consistency                  | 1                                      | 0.905   | 0.974   | 0.861                                  |
| Raw coverage                 | 0.251                                  | 0.469   | 0.298   | 0.387                                  |
| Unique Coverage              | 0.044                                  | 0.157   | 0.029   | 0.011                                  |
| Solution Coverage            | <b>0.720</b>                           |   |   |  |
| Solution Consistency         | <b>0.901</b>                           |   |   |  |

*4.2) Results of the configurational analysis related to performance outcomes in SOCs*

The results reveal that focal firms rely on four main combinations of AMC and RV constructs, with their underlying rationale becoming clear through the detailed case study analysis. The resulting configurations and interpretations are:

- Configuration 1:

In this configuration, the outcome is determined by the presence of shared governance among partners and the lack of coordination and inter-organizational learning. It can be referred to as “**Technology Uplift**” since it occurs when the leading company initiates a project to exploit the need for a green transition in existing markets by offering technical solutions that are not yet widely adopted as reference standards.

This configuration is particularly relevant in projects 11 and 12, where two Engineering, Procurement and Construction (EPC) contractors (or technological developers) with a well-established collaboration involved a third company from a different sector to develop a technological upgrade.

The longstanding relationship between two complementary players and the highly technical nature of the project is key to understanding this configuration. In fact, the absence of project-specific coordination and inter-organizational learning suggests that the focal company views existing coordination and knowledge integration processes as sufficient. This reflects the partners' deep familiarity and extensive collaboration experience, resulting in well-established and efficient communication and coordination.

Furthermore, the high technological intensity of the projects necessitates that each partner independently manages its specific project segment while ensuring their specialized contributions complement one another. The project manager of the focal company engaged in Project 12 stated:

*“We know each other... we have daily and constant interaction that doesn't require the establishment of new procedures or ad hoc structures... everyone offers its deep expertise to develop the activities more in line with its background”.*

Therefore, players with a mature relationship tend to exhibit a propensity for achieving high performance in environmental projects just leveraging project-specific shared and equitably distributed governance.

- Configuration 2:

In this configuration, developing new inter-organizational learning processes, coordination efforts, and developing specialised assets are the pillars of the SOC. It can be referred to as "**New Business Exploration**", as it occurs when the leading company explores, in collaboration with new partners, innovative business models to improve environmental conditions of a whole sector (e.g., hydrogen mobility).

In Project 13, for instance, the focal company is an energy utility that orchestrates a new network of partners from other industries to start new markets and go beyond their usual businesses. In this situation, new processes and workgroups are crucial to coordinate activities and enhance cross-fertilisation, mutual learning and knowledge absorption, which is necessary to develop a project that deviates from the companies' business as usual. In this regard, the project manager of the energy company stated:

*“During the project design phase, we made face-to-face meetings almost on a day-by-day basis [...] We learned a lot about the truck technologies, prices, refilling methods, and customer needs [...] All this precious knowledge came from our partners”.*

Therefore, in projects designed to explore new value-generating market opportunities (e.g., introducing new transportation modes to exploit synergies between energy and mobility markets), the focal company benefits from acquiring new knowledge to better understand the counterpart's businesses,

accurately assess the intentions of the partners and mitigating the risk of falling victim to opportunistic behaviours.

Coordination and inter-organisational learning are thus functional to enhance mutual trust and understanding, which is necessary to invest in new assets in collaboration with new and specialised partners.

- Configuration 3:

This configuration aligns with projects aimed at improving the environmental performance of traditional businesses, like those aimed at significantly reducing emissions in hard-to-abate industries. This combination of shared governance and highly specific investments can be referred to as “**Synergic Decarbonization**”.

The interplay between shared governance and dedicated assets helped create deep trust between partners and shared risk exposure, enhancing the intensity of transactions and producing specialisation and efficiency.

In the case of Project 9, the partnership was established to develop a decarbonisation project requiring a *dedicated asset* consisting of the integration of a photovoltaic power plant with a hydrogen electrolyser. In this project, none of the involved companies, an energy utility and an oil and gas player, could independently undertake the venture due to the significant financial exposure and mutual reliance on each other’s unique technical expertise. The importance of collectively addressing the substantial investments required and jointly overseeing the evolution of activities led to the creation of a special purpose vehicle (SPV) designed to manage shared governance, pool resources, and limit financial risk by isolating the project assets under this joint entity.

This configuration is particularly effective for complex projects in traditional industries requiring significant human, technical, and financial resource

investments to enhance the environmental performance of their core business.

The project manager of the energy company involved in Project 9 stated:

*“In a technically complex project like this one, the work we are undertaking is synergistic and complementary [...] We have made shared investments because we believe in the project [...] To manage these unique characteristics and the associated risks, we have established a joint venture where we are equal partners.”*

These projects, characterised by a high degree of technical specialisation, do not primarily emphasise knowledge absorption. Instead, they highlight the importance of a synergistic approach, where each partner applies its unique expertise to contribute to the shared objective effectively.

- Configuration 4:

This configuration highlights the importance of coordination, transaction-specific assets, and shared governance as a means to establish a new commercial entity that serves as a catalyst for an emerging business (e.g., the production of electrolysers to facilitate the national development of the hydrogen economy) vertically integrated into core activities. Project 16 well represents this configuration, which can be referred to as the “**Industry Catalyst**” configuration.

Here, coordination is crucial in fostering synergies between entirely different businesses, enabling the partners to break free from technological lock-ins. Interorganisational learning, instead, is not a priority because the competencies mobilised for the project are not usefully integrable into the focal company's core business (e.g., the gas utility may not be interested in learning how to

manufacture electrolysers but can provide the newly formed company with commercially significant contacts).

According to the interviewed executive from the Gas utility of Project 16, given the commercial nature of the challenge, the creation of a new company primarily served to coordinate the resources committed by the partners rather than to mitigate technological uncertainties.

The new project coordination mechanism thus served not to expand mutual knowledge but to support the commercial activity of the new company, as stated by the project manager of the energy utility:

*"In this project, the products and the technical development skills belong to our partner. We bring a deep knowledge of the industrial world and a huge portfolio of potential customers...."*

This configuration thus helps initiate high-risk tasks aiming to build new market supply chains, mobilising shared investments to collect the significant resources required, and fostering the development of co-specialized assets between partners to access a new market segment by leveraging the diverse resources of each partner.

Establishing the new company ensured a unified governance structure, which was essential for the equitable and fair distribution of returns, and favoured new coordination processes, which were necessary to facilitate the management of activities among players with no prior experience in the new business.

## 5) Discussion

### 5.1) Determinants of RV and AMC in SOC

This study aimed to investigate whether and how focal firms combine the components of RV and AMC when they structure SOCs. A QCA complemented by insights from vertical interviews revealed the configurations that allow successful integration of these constructs. Our findings extend the existing literature by showing that the components of RV and AMC considered critical in SOCs are not universally necessary or effective in achieving superior outcomes. The rationale for SOCs varies depending on the specific context and nature of the collaboration, driving the selective combination of certain constructs rather than the blanket application of all components.

*Table 2.6* presents a summary of the context-dependent drivers and configurations of constructs. A (-) symbol indicates that a stronger presence of the driver reduces the importance of developing the corresponding RV or AMC condition, while a (+) symbol shows the opposite relationship, where the driver enhances the need for the associated condition. Analysing the varying roles of RV and AMC across different contexts provides intriguing insights.

Firstly, it becomes clear that the necessity for developing **new coordination processes** decreases as the partners' pre-existing relational base increases. In line with prior studies, the deepened understanding of partnership dynamics that partners gain along previous collaborations diminishes the leading company's inclination to adopt a coordinating approach thanks to increased trust and well-established collaborative processes (Dyer et al., 2018). Overemphasizing coordination in these situations can be counterproductive, potentially

undermining trust. On the other hand, establishing new coordination processes becomes essential when substantial financial exposure and significant asset-specific investments exist. In such cases, the leading company legitimately needs to monitor project progress and safeguard against opportunistic behaviours closely (Brookes et al., 2017). Therefore, coordination and specific investment tend always to be combined. These findings contribute new insights to the existing literature (Schilke, 2014; Schreiner et al., 2009; Galvin et al., 2021), revealing a nuanced trade-off between the potential for enhancing trust and empowerment through loose coordination and the necessity of implementing strong coordination to safeguard against appropriation concerns in contexts of substantial investment.

Furthermore, our findings indicate that the development of **new inter-organizational learning processes** is closely tied to the degree of divergence between the project and the partners' core business activities, a dynamic recently highlighted as a fundamental determinant of sustainability outcomes (Valbuena-Hernandez et al., 2022). Our insight advances the existing literature on inter-organizational learning (Kale and Singh, 2007) by refining the understanding of knowledge absorption's role within sustainability initiatives (Ardito, 2018), offering a nuanced perspective on how learning processes are shaped by strategic alignment with sustainability goals.

In particular, our results show that focal firms tend to exert efforts to establish new inter-organisational learning processes just in case of SOCs that do not significantly overlap with its core. When SOCs diverge from their business as usual and require knowledge in previously unexplored fields, focal firms give specialised partners a pivotal role in providing information and knowledge related to these new activities (Vaez-Alaei et al., 2024). Since firms' prior

collaborative experiences determine mutual knowledge and understanding (Dyer and Singh, 1998; 2018; Zollo and Winter, 2002), the inclination of focal companies to develop new intercompany teams dedicated to learning about the partner's activities decreases when partners have long-standing relationships.

Our in-depth analysis across various SOCs reveals that inter-organizational learning is not a one-size-fits-all solution. It demands significant organizational resources, prompting firms to carefully assess whether establishing such a process is truly beneficial or merely a potential drain on resources. Indeed, we also found an inverse relationship between the technical complexity of a project, measured in terms of complexity of transformation procedures and the level of interactions between elements involved in the system (Baccarini, 1996), and the absorption of new knowledge. In highly complex technological scenarios, the process of new knowledge absorption places an excessive strain on the focal company's resources, making the implementation of new inter-organizational learning processes overly burdensome. Notably, this evidence integrates recent research linking project complexity to the level of innovation achieved (Vaez-Alaei et al., 2024), offering insights into the conditions under which partners should independently execute their roles to maintain the efficiency and effectiveness of their collaboration.

SOC-specific conditions referring to the distance between the focal company's core business and the project's scope also impact the focal firm's **investments in transaction-specific assets** (i.e., specialised assets developed in collaboration with partners). For instance, as observed in configurations 2 and 4, companies benefit from developing new assets in conjunction with partners when they aim to enter a new market segment.

We extend the existing literature, which highlights the strategic importance of these investments in creating differentiation and making replication difficult (Dyer and Singh, 1998; Li et al., 2017), by demonstrating that necessary prerequisites, such as the ambition to enter new or emerging markets, exist and are crucial for effectively leveraging partner expertise and resources.

Furthermore, we show that the financial scale of a project and its associated risks serve as key catalysts for the decision to develop transaction-specific assets and establish **shared governance among partners**. In fact, companies undertaking projects requiring substantial resource investments are more likely to seek partners to support these shared financial commitments. Financial exposure induces appropriation concerns among partners (Gulati, 1998) that justify the creation of Special Purpose Vehicles (SPVs) or new companies with shared governance structures. Pooling financial and material resources within these structures is functional to separate the financial exposure of individual companies from that of the project and manage potential disputes through a shared board of directors.

What is more, we integrate prior research by explaining why, taken in isolation, shared governance is not sufficient to explain the overcoming of opportunism and, therefore, higher project performance (Galvin et al., 2021). While prior studies suggest that forming a distinct entity within an alliance shifts focus from individual profit/cost concerns to a collaborative problem-solving approach, fostering trust and cooperation, our findings reveal that this relationship is not universally applicable. In particular, we found that substantial financial exposure is crucial to determine to what extent focal firms consider the integration of shared governance and transaction-specific assets as crucial for overcoming opportunism and ensuring higher performance in SOCs.

**Table 2.6: Factors driving AMCs and RV pillars implementation**

| Drivers / AMCs and RV pillars   | Coordination | Interorg. learning | Transaction-Specific Assets | Governance Shared |
|---|--------------|--------------------|-----------------------------|-------------------|
| Pre-existing knowledge among partner companies                              | (-)          | (-)                |                             |                   |
| Magnitude of project financial commitment / Project risk                    | (+)          |                    | (+)                         | (+)               |
| The technical complexity of projects / non-transferable technical expertise |              | (-)                |                             |                   |
| Project in line with focal company business as usual                        |              | (-)                | (-)                         |                   |

*5.2) The interplay of RV and AMC to address SOC's challenges*

SOCs differ from traditional strategic alliances as they deviate from conventional business objectives, leading focal firms to adapt and combine RV and AMC constructs in unique ways to address distinct challenges stemming from goal complexity, limited predictability and heterogeneity of partners.

The **goal complexity** of SOC's is usually high, as exemplified by projects that incur diseconomies due to green transition (Grewatsch et al., 2021) when pursuing broader societal and environmental impacts besides traditional

economic outcomes (Pedersen et al., 2021). Goal complexity emerges also in the green hydrogen market, where SOCs have a significant potential for emission reduction but incur additional costs compared to business as usual.

The peculiarities of these SOCs show that the interplay of RV and AMC is context-dependent. In SOCs characterised by high financial exposure and risk of diseconomies, establishing an SPV, which is a new and separate business entity from the constituent companies, significantly mitigates these limitations and favours fair investments and asset allocation. The rationale for the priority that focal firms give to some RV and AMC constructs, namely transaction-specific assets and governance structures, is thus the need to reduce transaction costs and tensions among investors, ensuring a balanced exposure to risks.

SOCs in configurations 3 and 4 are prevalently marked by **limited predictability** stemming from their intrinsic complexity and uncertainty surrounding the outcomes. Here, the combination of a shared governance model with the concurrent presence of dedicated and project-specific investments is instrumental in addressing the profound uncertainty inherent in such endeavours and allows a stable and distinctive identity that is valuable in mitigating risks and uncertainties (DiVito et al., 2021).

The possibility to embrace higher levels of risk through the establishment of shared governance and transaction-specific assets increases resilience to profound uncertainty, preserving a deep engagement of partners in the SOC, a facet deemed crucial in fostering the implementation of eco-innovation (Donbesuur et al., 2021). This rationale for the integration of RV and AMC constructs complements the recent findings of Patrucco et al. (2022) by elucidating under what conditions investment-specific assets and effective governance are useful in pursuing challenging sustainability outcomes.

The third peculiarity distinguishing SOC is the profound **heterogeneity** of the involved actors. This heterogeneity is often the consequence of the inherent nature of sustainability challenges, with focal firms explicitly searching for it when forming collaborations (Pinkse and Kolk, 2012). Our findings indicate that when this peculiarity characterises a SOC because of low overlap between the partners' businesses and little mutual knowledge, focal companies tend to develop new inter-company learning processes and coordination mechanisms. This evidence enriches previous studies (Dangelico et al., 2016; De Marchi and Grandinetti, 2013) and supports Gulati's findings (2005) by enlightening the role of partner-specific experience as a determinant of context-dependent relational structures and competence mobilisation.

In this regard, only high technical complexity discourages inter-company learning, favouring shared governance mechanisms, which are perceived as more effective for managing and understanding the profound differences among the players. As reported by some interviewees, in projects characterised by profound technological complexity, the leading company does not find it necessary to absorb the skills of other operators:

*"We and our partner are deeply different, but for this project, it is necessary that all partners row in the same direction; no one has time to learn how the others row, but everyone must trust each other's ability to do it". (Project 11 Project manager)*

By fostering a context of mutual trust, which can be enhanced through the establishment of shared directional boards, the focal company mitigates information asymmetries and facilitates the delegation of responsibilities. This configuration demonstrates how focal firms can adapt investments in RV and

AMC components to maintain the coexistence of partners within the same SOC, even when they have differing objectives (Baranova, 2022).

## **6) Conclusions, limitations and further research**

Our study identifies specific configurations of RV and AMC constructs that are associated with superior performance across different SOC.

Firstly, our findings validate the applicability of these theories within the sustainability domain while also emphasizing the need to carefully consider the context-dependent characteristics unique to SOC. This consideration enriches the debate regarding the essence of AMC and RV constructs into alliances (Al-Tabbaa et al., 2019; Leischnig et al., 2014) by showing that these capabilities should be perceived theoretically and practically as being adaptive rather than universalistic. Among the critical determinants of effective SOC functioning are pre-existing knowledge among partner companies, the technical complexity of targeted activities (reflected in the non-transferability of knowledge), the level of financial exposure (indicating project risk), and the alignment between the focal companies' core business and the SOC objectives.

Secondly, our configurations, along with their underlying rationales, directly address Vurro's (2023) call for a deeper understanding of how SOC align with mainstream management theories, particularly those related to AMC and RV. The combinations of constructs and the underlying driving factors explain the conditions necessary for the collaboration to operate successfully, making it possible to address the criticalities associated with the goal complexity, high heterogeneity and limited predictability of SOC.

Furthermore, our study also addresses the gap identified in recent literature regarding the limited investigation of sustainability themes in project

management practices (Slavinski et al., 2023; Daniel, 2022). By focusing on SOCs, the above-presented synoptic framework based on our results offers insights into the critical characteristics of inter-firm collaborations that focal firms should treat as indicators during alliance design. These characteristics help guide investments towards the RV and AMC constructs that most effectively contribute to achieving superior sustainability performance.

Methodologically, our study underscores the value of integrating QCA with extensive follow-up interviews, demonstrating how this combined approach, on the one hand, helps identify the configurations of RV and AMC constructs in SOCs and, on the other hand, also deepens their rationale and the understanding of how the related constructs interact across various settings. This methodological synergy enhances the interpretive power of QCA results, offering richer, context-specific insights into the dynamics of SOCs.

The managerial implications of this study are straightforward. Once SOC goals and partners are selected, managers of focal companies can use our interpretative framework to identify the RV and AMC constructs that deserve more investments, thus implementing new coordination and learning processes and introducing new governance structures and transaction-specific investments only when they are necessary. In fact, the configurations of RV and AMC outlined in our study offer managers guidance in establishing context-specific partnerships, highlighting the importance of tailoring these constructs to the unique demands of each collaboration. This approach mitigates the risk of misinterpreting these theoretical constructs as deserving a universal application, ensuring that managers align their strategies with the specific dynamics and challenges of their particular SOC. By aligning with our findings, focal

companies engaged in energy transition pathways or committed to opening new sustainable markets can structure partnerships and invest in mobilising the capabilities that yield optimal results.

As with any research, our study has its limitations, which naturally present opportunities for future exploration. Addressing these limitations in subsequent studies could further refine and expand upon our findings, offering a deeper understanding and potentially new insights into the dynamics of SOCs. First, the understanding of the interplay of RV and AMC constructs is based on a sample of 16 projects. Even if the sample size is appropriate for studying 4 attribute interactions, a larger one might offer a more comprehensive and exhaustive analysis, and eventually could include more attributes into the research.

Second, the geographical perimeter of the study is limited to Italy. Even though this limitation was intentionally established to ensure sample homogeneity, future research could explore different cultural or environmental contexts to determine whether other successful SOCs exist and identify their unique rationale and configurations of RV and AMC constructs.

The third limitation regards the measurement of the results achieved in SOCs, which in our study, given the difficulties in using more concrete and comparable indicators to test the outputs, consists of respondents' self-perceptions of SOC performance during their implementation. Future studies can usefully conduct longitudinal studies to observe SOCs' results after their completion.

Finally, the fourth limit of this study is linked to our focus on the relevant construct of AMC and RV in the SOC post-formation phase. We acknowledge that the pre-formation stage can also impact alliance outcomes (Wang and Rajagopalan, 2015). Thus, we highlight as an avenue for further research the

analysis of whether and how a SOC can leverage potential partners' AMCs and which is the related impact on its structure.

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## CHAPTER 4: BEHAVIOURAL REASONING THEORY AND GREEN TECHNOLOGY ADOPTION: EXPLORING CONSUMER RESPONSES TO ZERO- EMISSION VEHICLES DURING EARLY-STAGE OF TECHNOLOGY DIFFUSION



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**ABSTRACT**

With the growing urgency to address the environmental crisis, the development and further diffusion of green products have become a central challenge. Companies are expected to contribute by embracing eco-innovators' role and addressing consumer preferences with environmentally friendly solutions. Despite the critical need to understand and predict consumers' response to emerging products, limited attention has been paid to understanding the cognitive processes consumers engage in when evaluating solutions that are not yet market-ready, which is crucial to designing marketing strategies for emerging products. Drawing on Behavioral Reasoning Theory (BRT), this paper integrates insights from the Construal Level Theory to explain how the cognitive mechanisms that shape consumers' attitudes towards green vehicles change when consumers evaluate existing or prospective products or, more broadly, the related product category. In particular, this study introduces these manipulations to test a BRT model extended with the introduction of familiarity as an attitudinal antecedent through a between-group experimental design in which 1,071 Italian consumers were randomly assigned to a specific evaluative condition. The findings reveal that familiarity is negatively related to the reasons against, and values are positively related to the reasons for and attitude regardless of the product specificity, thus showing the universality of these relationships. Instead, familiarity is positively related to the reasons for, and values are negatively related to the reasons against depending on the specific manipulations consumers evaluate, which differ across stages of product diffusion and levels of abstraction. This study contributes to the literature on green technology adoption by enriching the BRT, highlighting the role of familiarity in predicting reasons and demonstrating the influence of psychological distance in shaping consumers'

cognitive processes. Managerial implications for companies seeking to effectively promote their products and tailor marketing strategies to the distinctive characteristics of the product or its category are discussed in the paper.

## 1. Introduction

The imperative to reduce the environmental impact of production and consumption processes drives businesses to rethink their processes and products to align with the demands of the so-called “ecological transition” (Guyader et al., 2022). As a result, companies are increasingly expected to embrace the role of eco-innovators, addressing consumer preferences and needs, a dual challenge that is particularly complex in industries with relevant path dependencies, such as automotive (McMeekin and Southerton, 2012; Rizzi et al., 2014). The industrial dynamics at the regional level in the EU are reducing the resources available for investment (Zsolt, 2023), exacerbating dilemmas concerning how to invert the decline in sales and help consumers navigate alternative offerings (Ziegler and Abdelkafi, 2023) in fluctuating market conditions (Calabrese et al., 2023; Du et al., 2024). It is thus crucial for firms to understand how consumers process promotional cues in such a complex environment (Saeed et al., 2020).

Among the theories addressing consumer behaviour, Behavioural Reasoning Theory (BRT) (Westaby, 2005) has recently gained attention for its ability to disentangle how individuals use reasons to justify and defend their actions, thereby shaping their overarching motives and intentions (Westaby, 2005). By deconstructing the reasons for and against individuals’ target behaviour, BRT has the potential to capture the multifaceted dimensions shaping consumer cognition when processing stimuli related to both dominant and emerging products (Huang and Qian, 2021). However, in the latter case, despite initial evidence of BRT’s application also in the automotive sector (Sahu et al., 2020), autonomous vehicles (Qian et al., 2023), EV adoption and sharing (Claudy et al., 2015; Chen et al., 2021; Eccarius et al., 2023), its potential to inform marketing strategies for

emerging products with different stages of diffusion remains largely unexplored. In particular, it is necessary to investigate the differences that may arise when consumers evaluate a *concept product*, which is generic and lacks technological specificity, a *prospective product*, which is a technological reality that has yet to establish itself in the market, or finally, an existing *product*, which is currently available and undergoing market diffusion. This objective relates to understanding the cognitive processes explaining how reasons influence consumers' intentions to learn more about new, high-involvement and psychologically distant products in significant real-life settings, which is the case of the promotion of green vehicles as an entire concept product category or as specific prospective products characterised by technologies at a specific stage of diffusion (e.g. electric or fuel cell vehicles). In this regard, the intersection between BRT and construal level theory (CLT) can provide valuable empirical evidence (Saeed et al., 2024). In fact, from this perspective, CLT can usefully complement BRT when interpreting differences in how consumers value the “reasons for” and “against” concerning products that, being at early adoption stages, are not yet fully tangible. Furthermore, CLT also provides the rationale for assuming that the mental representations and the related cognition of “reasons for” and “against” vary with the perceived familiarity with the object of the evaluation (Förster, 2009). Given the potential for conceptual integration, exploring the intersection of BRT and CLT can reasonably enhance our understanding of how firms can cultivate consumers' interest in learning about their innovative products, which is, from a logical standpoint, an important precursor to their eventual adoption.

To start filling this gap, the following section reviews BRT, drawing elements from the CLT to frame how familiarity can complement the BRT conceptual model to explain how values, familiarity, reasons for and against shape the intention to learn about battery electric vehicles (BEV), fuel cell vehicles (FCEV), two types of innovative green vehicles that differ significantly in terms of market diffusion, or green vehicles as a whole (i.e., the product category), which is typical for companies competing for the market and not only in the market. In the method section, we describe the experimental design employed to collect empirical evidence on how consumers elaborate typical and comparable stimuli concerning BEV, FCEV, and the category of green vehicles. The results and discussion section examines the hypothesised relationships and provides critical insights that inform the discussion. At the same time, theoretical predictions are enriched with empirical evidence, providing insights into the differences among the evaluated products. In the concluding section, this integration leads to the development of actionable recommendations for marketers aiming to effectively promote their products and, most of all, understand how to tailor marketing strategies to specific target audiences based on the product's unique characteristics or its category.

## **2. Review of literature and hypotheses development**

### *2.1 The Behavioural Reasoning Theory and the proposed model*

The BRT (Westaby, 2005; Claudy et al., 2015) framework underpins the theoretical foundation of this study. BRT is a recent approach that has rapidly gained traction in the literature on behaviours that explain technology adoption.

The primary advantage of this theory is its ability to propose a model that considers both enabling and inhibiting factors for adopting new technology (Jan et al., 2023). Integrating both of these aspects is particularly relevant considering that the “reasons against” (RA) are not merely the “reasons for” (RF) that act in the inverse directions and, thus, in many cases, constitute different constructs (Claudy et al., 2015).

Despite its recent theorisation, the BRT has proven versatile and applicable to high-involvement products (Claudy et al. 2013; 2015) in various fields, including the adoption of pro-environmental behaviours (Dhir et al., 2021) in the mobility sector (Chen et al., 2021; Qian et al., 2023). BRT is particularly suitable for highly complex decision-making situations (Peterson and Simkins, 2019) as it focuses on how consumers elaborate reasons to reduce cognitive dissonance (Westaby et al., 2010).

Claudy et al. (2015) theorise a model in which values are precursors of RF/RA, which influences the attitude towards adoption. Attitude, in turn, shapes the intention to adopt, which is directly connected to the adoption behaviour. These final relationships of the model (between attitude and intention and between intention and behaviour) stem from more widespread theories, such as the well-established Theory of Planned Behaviour (TPB; Ajzen, 1991), and thus do not require additional empirical support.

The following section provides a concise overview of the variables under investigation. This includes the structural variables of the model (i.e. Values, RF, RA, Attitude), as implemented in Claudy et al. (2013; 2015), as well as additional variables introduced in this study to enhance the framework (i.e. Familiarity). This extension was developed based on insights derived from

Construal Level Theory (Lieberman and Trope, 1998). Hence, the present paper intends to provide some first insights into the ability of CLT to enrich the decision-making process shown in the BRT approach supporting the idea that an individual's perceived psychological distance (Lieberman and Trope, 1998) influences the formation of the key variables in this theory (particularly the reasons).

*Values.* A value is “a belief pertaining to desirable end states or modes of conduct that transcends specific situations, guides selection or evaluation of behaviour, people, and events, and is ordered by importance relative to other values to form a system of value priorities” (Schwartz and Bilsky, 1987). In line with theoretical models that adopt psychographic variables to predict consumer behaviour, such as the Value-Belief-Norm Theory (VBN, Stern et al., 1999), values are direct or indirect antecedents of attitude, intention, and behaviour in green settings (Groening et al., 2018). Although BRT studies operationalise values in many different ways, in green settings, values are typically framed as “environmental values” (see, for example, Zhu et al., 2023; Sreen et al., 2023), which are individual or collective beliefs on the importance and the role of the natural environment and how human being can interact with it (Reser and Bentrupperbäumer, 2005).

*Reasons for and reasons against.* These are the original and crucial variables of the BRT model. Westaby (2005) introduces the concept of “reasons” in a behavioural intention model, arguing that it serves as a “bridge” between the most intimate characteristics of an individual (beliefs and values) and the global motives (attitude, subjective norms, and perceived control). Also Claudy et al. (2015) give “reasons” the core role of strong motivational forces that can act

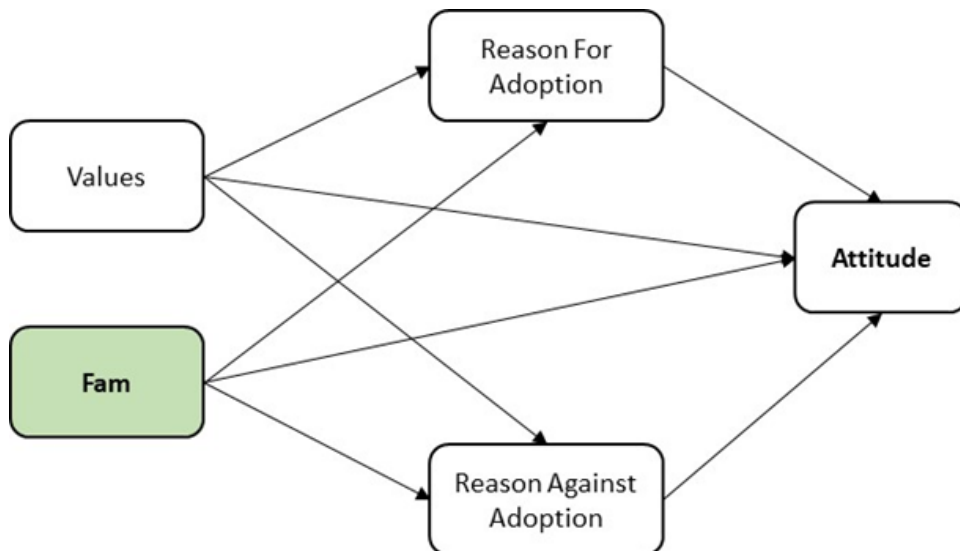
positively or negatively in favour or against a specific behavioural intention, further underlying the difference between beliefs and reasons. Beliefs are broadly construed and refer to general thoughts, while reasons are narrow visions of the behaviour considered (Westaby, 2005). Relating to innovation adoption, “*beliefs would thus reflect people’s opinion about the innovation characteristics in general, whereas reasons for/against adoption would constitute specific factors that influence the purchase decision*” (Claudy et al., 2015).

*Attitude.* Westaby (2005) classified attitude as one of the global motives, highlighting its ability to predict intention in different behavioural settings and contexts. It is considered a generally positive or negative evaluation of certain behaviour (Ajzen, 2001). Attitude is one of the most frequently adopted variables in behavioural models. Bagozzi and Kimmel (1995), comparing the leading theories for predicting behaviours (such as the Theory of Reasoned Action, the TPB, and the Theory of Self-regulation), found that attitude significantly explains the intention in all the considered models.

*Familiarity.* In our research setting, the CLT provides insights into dimensions that could enhance BRT to improve further its ability to explain intentions. In fact, CLT points to familiarity, which is the opposite of the lack of experience. Familiarity is a common trait of the various types of psychological distance (Lieberman and Förster, 2008) representing an important factor that influences the construal level of an event or product (Förster, 2009). Familiarity can be considered a stratification of past experience and information (Alba and Hutchinson, 1987; Rao and Sieben, 1992). Growing consumer confidence in a product or product category modifies their decision-making process primarily by altering the relationships with behavioural antecedents, such as trust,

satisfaction, and loyalty (Fandos Herrera and Flavián Blanco, 2011). Similarly, Rizzi et al. (2020) found that exposure to information positively influences the behavioural antecedents in TPB. The mechanism by which familiarity influences decision-making suggests that it affects the learning process through the quantity and type of new information gathered and processed (Johnson and Russo, 1984). Fischer and Frewer (2009) demonstrated that even the relationship between risk and benefit perception varies according to the level of familiarity due to the effect of risk perception and heuristics activation. These results suggest that familiarity can usefully extend the BRT model, given its influence on RF/RA, as shown in Figure 3.1.

**Figure 3. 1: The proposed model adapted from Westaby (2005) and Claudy et al. (2015)**



## *2.2 The hypotheses development*

Most of the literature operationalising BRT primarily focuses on verifying the positive/negative influence RF and RA have on attitude. While these linkages are well-established in the extant literature, investigations comparing the effects and magnitude of RF and RA on attitude remain absent.

Claudy et al. (2015), in theoretically discussing the differences between RF and RA, pointed out how the “loss aversion” effect can lead consumers to overestimate barriers compared to advantages (Kahneman and Tversky 1979). This means consumers could perceive the losses resulting from adopting innovations more heavily in absolute terms than the benefits (Claudy et al., 2015). Nevertheless, empirical data do not always support this reasoning, as recent studies suggest that RF may have a higher absolute effect on attitude than RA (Yadav et al., 2022; Jan et al., 2023; Qian et al., 2023). This can be explained by considering that, in these studies, consumers are asked to evaluate a hypothetical future purchase, attitude, or intention to buy or adopt a specific product or innovation, leading respondents to perceive a high psychological distance, which, according to the CLT (Liberman and Trope, 1998), can be determined by spatial, social, and hypothetical distance. The temporal distance from a hypothetical purchase is a factor that can change an individual’s perception and influence mental construal (Liberman et al., 2002). An object or event is mentally represented as concrete or low-level construal when it is temporally close, whereas it is considered abstract or high-level construal when it is temporally distant (Liberman et al., 2002). In such circumstances, the pros are overestimated and outweigh the cons (Trope et al., 2007) as individuals get more confident when thinking about something temporally distant than

something temporally close, making it easier to cognitively generate pros versus cons when referring to future events (Herzog et al., 2007). This overestimation may be particularly relevant within decision-making processes concerning high-involvement products, regardless of being a product category, a prospective product or specific product, which require significant consideration and effort. Then, our first hypothesis is the following.

*H1: RA have a universally lower impact on attitude compared to RF in the decision-making processes related to high-involvement purchases*

The effect of loss aversion (Kahneman and Tversky 1979) is crucial to analysing how RA takes shape in individuals' minds and influences decision-making. Beyond the fact that loss aversion also depends on consumer characteristics, it is stronger in the case of durable (Neumann and Böckenholt, 2014) and expensive products (Mukherjee et al., 2017), as in the case of high-involvement products.

Studies examining the strategies consumers use to address loss aversion often find information seeking as key to reducing the uncertainty deriving from loss aversion and risk perception (Sheth and Venkatesan, 1968). The same can be argued for brand loyalty (Roselius, 1971), which assumes that the product has been purchased in the past and can, therefore, benefit from the specific experience gained. Considering that Yeung et al. (2010) confirm that brand and information have a relevant role in facing perceived risk, and that familiarity stems from information and experience (Alba and Hutchinson, 1987; Rao and Sieben, 1992), familiarity can reduce risks and loss aversion, as confirmed by recent literature (Xu and Zeng, 2022). This cognitive mechanism can be

considered overarching, and its validity is universal among concept, prospective or existing products. Then, we hypothesise the following.

*H2a: Familiarity is negatively and universally related to RA in the decision-making processes related to high-involvement purchases*

RF assist individuals in making sense of their world by offering causal explanations for their behaviour (Westaby, 2005). This is because individuals feel better about their choices when they have justifiable and well-structured reasons to support their behaviour (Pieters and Zeelenberg, 2005), especially in the case of green products, which are linked to value-driven attributes (Khan and Mohsin, 2017). In fact, previous research has highlighted that the formation of RF is closely tied to individuals' beliefs (Claudy et al., 2013) and their deep compatibility with personal values (e.g. Garcia et al., 2007; Karahanna, 2006; Kleijnen et al., 2009). Therefore, RF takes shape in individuals' minds both by searching for practical confirmation to justify and defend their behaviour (Pieters and Zeelenberg, 2005) and by seeking alignment with personal values and reinforcement of self-esteem (Kunda, 1990; Steele et al., 1993). This reinforcement can occur through the knowledge and experience accumulated by individuals at a superordinate level, that is, familiarity, emphasising the benefits of a particular choice. Westaby (2005) states that "*individuals first collect information about decision alternatives and then evaluate the credibility and value of the information when generating their reasons.*"

However, this backwards-looking process aimed at constructing and validating RF may not hold when the evaluation shifts from the product category

to a specific product (Laroche et al., 2010). In fact, the product category is more difficult to evaluate than the specific product (Laroche et al., 2010) due to its greater vagueness and generality of characteristics. In the case of specific products, the information gathered becomes pragmatically tied to more technical and reality-based characteristics, which may conflict with the purely value-driven dimension that guides the formation of RF. Therefore, familiarity does not necessarily result in an optimistic perception of the product's positive attributes, especially in the green setting, where green product categories are often desired regardless of the confidence in their specific products, leading to differences in how familiarity elicits a more sceptical attitude. We thus hypothesise the following.

*H2b: Familiarity is positively related to RF for the product category, and not for the specific product, in the decision-making processes related to high-involvement purchases*

Values are among the most recurrent and effective antecedents in the main theoretical models explaining consumer behaviour. Westaby (2005) and Claudy et al. (2015) postulated that values are precursors of RF and RA. In particular, Claudy et al. (2015) find that values positively influence RF and do not influence RA. In the most recent applications of the BRT, the role of values in the conceptual models is heterogeneous and the results are discordant. Sometimes, they are used just to classify respondents (Kumar et al., 2023).

Considering only the cases in which environmental values are at focus, Dhir et al. (2021) found that values do not influence RF but have a negative relation with RA, while Sreen et al. (2023) and Chatterjee et al. (2022) found a positive link

with both RF and RA. Among the explanations of these dissimilarities, the CLT (Liberman and Trope, 1998) complements product-specific considerations by suggesting that individuals questioned about future events cognitively tend to represent them abstractly due to the perceived temporal distance (Liberman et al., 2002). In the case of temporal distance, “*pragmatic concerns are subordinate to people’s inner, idealistic values*” (Trope et al., 2007). Then, in evaluating a temporally distant event, individuals tend to favour an idealistic vision, which might be particularly influential in the case of a value-related product, leading to more optimistic evaluations (Trope et al., 2007). In the case of high-involvement green products, values are thus expected to emphasise RF. Then, our hypothesis is stated as follows.

*H3a: Values are positively and universally related to RF in the decision-making processes related to high-involvement purchases*

If values emphasise the pros when an idealistic self-representation is activated (Kivetz and Tyler, 2007), we can conversely hypothesise that they could also mitigate, at least to some extent, the effect of the cons. In this second case, it is important to distinguish how the tendency of consumers to idealise a product category varies compared to a specific product because of the differences in the related shortcomings they recall. Since the formation of RA involves factors such as uncertainty and loss aversion, which intensify perceived risk and, consequently, can amplify the evaluation of cons (Kahneman and Tversky, 1979; Sheth and Venkatesan, 1968), it is essential to understand the type of risk that comes into play during the evaluation to unravel its effect on RA formation.

Aligning with Bettman's (1973) classification of risks, we differentiate between "inherent risk", associated with the product class, and "handled risk," which pertains to the specific product. From this perspective, when referring to green products, since the category is harder to delineate precisely and the related information seeking is harder to pursue compared to specific products (Laroche et al., 2010), an idealistic vision may prevail, which allows values to reduce the RA (Trope et al., 2007). On the contrary, product-specific evaluation can benefit from the availability of recalling prior experiences and specific knowledge directly related to the product. This may lead to a more pragmatic view and a focus on concretely delineated risks that may decrease the significance of the idealistic perspective. Consequently, the values may not be able to mitigate the specific and well-defined concerns related to a particular technology. This reasoning justifies our following hypothesis.

*H3b: Values are negatively related to RA for the product category, and not for the specific product, in the decision-making processes related to high-involvement purchases*

Several studies have demonstrated attitude to be a key predictor of pro-environmental behaviour, such as electric vehicle adoption (Jansson et al., 2011), renewable energy installation (Bruner and Kumar, 2007; Claudy et al., 2015; Dabholkar and Bagozzi, 2002) and recycling practice (Chung and Leung 2007). BRT posits that attitude mediates the effect of reasons and values in predicting the final behavioural intention. In this regard, familiarity - stemming from knowledge, information, and past experiences - plays a significant role in the cognitive processes that shape behaviour through attitudes. Indeed, scholars

have found that exposure to general information and increased familiarity with a product can reshape consumers' informational foundations, thereby serving as a background variable influencing attitude (Witzling et al., 2015; Trumbo and O'Keefe, 2001).

Although behavioural studies provide a solid theoretical foundation on the role of familiarity in predicting attitude, to date, empirical evidence is still needed to demonstrate familiarity's ability to enhance BRT and improve the explanatory power of its behavioural model. To this end, we hypothesise that familiarity directly affects attitudes towards green concept, prospective or specific products, independent of complete mediation through reasons. Our hypothesis is stated as follows:

*H4: Familiarity is positively and universally related to attitude in the decision-making processes related to high-involvement purchases*

Values are expected to directly affect attitudes towards green concept, prospective or specific products, without full mediation through reasons (Westaby 2005). In fact, in line with our previous hypothesis, the cognitive justifications individuals use are influenced not only by situational deliberate reasoning but also by automatic value-driven elaborations that can circumvent deeper levels of rational thought activation (Bargh et al., 1996; Fazio et al., 1995; Mitchell and Beach, 1990).

When dealing with green products, environmental values reflect the collective beliefs on the importance and the role of the natural environment (Reser and Bentrupperbäumer, 2005; Zhu et al., 2023; Sreen et al., 2023). Several findings

support the assumption that environmental values predict environmental attitudes likely to engage in green consumer behaviour (Schultz and Zelezny, 1999; Schwartz, 1992; Schwartz and Bilsky, 1990).

However, previous studies (Groening et al., 2018), have shown that environmental values do not always translate into green consumer behavior, highlighting the importance of exploring scenarios where environmental values do not seamlessly translate into green action. Building on this potential disconnect between idealistic intentions and pragmatic actions we recognize the need to deepen the understanding of the relationship between environmental values and attitude. Specifically, we seek to investigate whether values consistently act as predictors of attitudes, regardless of product specificity or the higher-level category to which the product belongs.

For this reason, we test the effect of values on attitude with the following hypothesis.

*H5: Values are positively and universally related to attitude in the decision-making processes related to high-involvement products*

### **3. Methods**

#### *3.1 Research Setting*

Testing the hypotheses outlined above requires a research setting focused on high-involvement green products, aligning well with the characteristics of the automotive sector in countries adopting vehicles for ecological transition. In this regard, the European electric vehicle (EV) market has experienced steady growth over the past five years, with a significant rise in the number of registered Battery

Electric Vehicles (BEV) and Plug-in Hybrid Electric Vehicles (PHEV), in line with global trends (IEA 2024; EEA 2024). Despite the overall growth across Europe, there are marked disparities in electric vehicle registrations among the major regional economies.

Among the countries with a lower adoption rate of green vehicles, in 2022, Italy registered approximately 115,000 EVs, accounting for less than 9% of total registrations, significantly below the European average (OECD 2024). Italy has a deeply ingrained traditional automotive industry, primarily represented by the holding Stellantis (which includes the Italian brands Fiat, Alfa Romeo, Lancia, and Maserati), which covers 17% share of the European market and making it the second-largest vehicle seller after the German Volkswagen Group in terms of total vehicles sold (Stellantis 2023).

From a regulatory and policy perspective, Italy has demonstrated a clear commitment to promoting industrial policies aimed at facilitating the energy transition. As outlined in the National Energy and Climate Plan (PNIEC), Italy's strategic document for energy and climate policy, there is a commitment to reach 20% zero-emission vehicles by 2030, equating to approximately 6.6 million fully electric cars (MASE 2023).

These targets are highly ambitious, considering the current rate of EV registrations (BEV + PHEV). Without a substantial acceleration toward green mobility, the current penetration of zero-emission vehicles will not even approach half of the projected 3.8 million electric vehicles outlined in the PNIEC.

This context, characterized by the absence of significant structural barriers, provides a particularly promising opportunity to explore the behavioral factors

that influence consumer preferences for green vehicles during the early adoption phase.

### *3.2 Survey response and data collection*

The questionnaire we developed comprises three distinct samples, differentiated solely based on the initial stimulus provided to respondents before commencing the survey. Respondents in the first sample were asked to assess a BEV-related stimulus and, in the second, an FCEV-related stimulus. Finally, the third sample, called the “Blind” sample, was asked to evaluate a stimulus concerning zero-emission vehicles without specifying the technology but just referring to the product category. The questions following the initial stimulus remained consistent across all three samples.

All stimuli had the same structure and formulation, placing respondents in a scenario requiring them to evaluate a potential future purchase (i.e., high psychological distance) and differing solely in the proposed technology (i.e., BEV, FCEV, or a blind option representative of the category).

Randomising respondents among the stimuli allowed us to evaluate changes in consumer inclinations between a well-established technology (BEVs), an early, pioneering stage technology (FCEV), serving as a prospective product, and the general concept of zero-emission vehicles or green mobility, thereby abstracting the broader category.

As for the questionnaire structure, it was developed using the Qualtrics platform and distributed through a commercial surveying service provider during the period of April-May 2024. As for inclusion criteria, participants must hold a driver’s license and own a vehicle or express the intention to purchase one within

one year. These criteria ensured that the responses were from potential vehicle buyers.

To ensure respondents paid attention to the initial stimulus, a concluding verification question was included to test and include in the sample only respondents who were aware of the type of vehicles they evaluated. Additionally, we excluded respondents who completed the questionnaire in less than five minutes, deemed the minimum reasonable time given the number of questions and the need for careful reflection on the concepts presented. After applying these exclusion criteria, we obtained 1,071 valid respondents: 354 in the BEV group, 351 in the FCEV group, and 366 in the Blind group. **Table 3.1** presents the demographic characteristics of the respondents.

The three samples are balanced in gender distribution, with each group comprising approximately 50% male and 50% female participants. The samples show a higher concentration in the over-35 age and higher education groups, aligning with the general car-owner demographics in Italy ([ISTAT 2023](#)).

Random sampling ensured homogeneity across the samples regarding gender, age, and education and enabled robust cross-sample comparisons (**Table 3.1**).

**Table 3. 1: Respondents Profile**

| <i>Respondent Profile</i> |                      | <b>BEV</b> |               | <b>FCEV</b> |               | <b>BLIND</b> |               |
|---------------------------|----------------------|------------|---------------|-------------|---------------|--------------|---------------|
| <b>Variable</b>           | <b>Sub-variable</b>  | <b>Abs</b> | <b>%</b>      | <b>Abs</b>  | <b>%</b>      | <b>Abs</b>   | <b>%</b>      |
| Gender                    | Male                 | 178        | 50,3%         | 171         | 48,7%         | 181          | 49,5%         |
|                           | Female               | 176        | 49,7%         | 180         | 51,3%         | 185          | 50,5%         |
| Age (in years)            | 18-35                | 19         | 5,4%          | 33          | 9,4%          | 15           | 4,1%          |
|                           | 35-54                | 185        | 52,3%         | 170         | 48,4%         | 186          | 50,8%         |
|                           | Over 54              | 150        | 42,4%         | 148         | 42,2%         | 165          | 45,1%         |
| Education Level           | Middle school        | 16         | 4,5%          | 17          | 4,8%          | 23           | 6,3%          |
|                           | Professional college | 173        | 48,9%         | 184         | 52,4%         | 188          | 51,4%         |
|                           | Postgraduate degree  | 165        | 46,6%         | 150         | 42,7%         | 155          | 42,3%         |
| <b>Total respondent</b>   |                      | <b>354</b> | <b>100,0%</b> | <b>351</b>  | <b>100,0%</b> | <b>366</b>   | <b>100,0%</b> |

### 3.3 Measures

Each questionnaire began by introducing the focus of the survey and the objective to capture respondents' opinions on BEVs in sample 1, FCEVs in sample 2, and the zero-emission vehicles category in sample 3. After the opt-out (driving license and car ownership) and demographic questions, the survey included 31 items designed to measure the constructs included in the conceptual framework (see **Figure 3.1**). Environmental Values, Attitude, RF and RA, and Familiarity were measured using a seven-point Likert scale (1 = strongly

disagree, to 7 = strongly agree), with respondents rating their level of agreement with each statement.

In detail, the *Environmental Values* construct assesses personal values influencing behaviour towards zero-emission vehicles using six items developed by Haws et al. (2014) in line with recent studies (Sreen et al., 2023) in the field of green purchasing behaviours.

*Attitude*, a predictor of intention in BRT (Westaby, 2005) that refers to a “psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour” (Eagly and Chaiken, 1998, p. 1), was measured using a three-item scale adapted from Westaby et al., (2010) in line with previous studies on consumer behaviour in such green markets as wind turbines (Claudy et al., 2015) and solar panels (Claudy et al., 2013).

The “*reasons*” are context-specific factors that vary from one product to another, and this makes the identification of the constructs that can accurately measure the RF and the RA particularly challenging, considering how intricate and diversified these motivations can be. Previous studies have often referred to extant literature to identify the “reasons” and have measured them through countless modalities, such as observed or latent variables, first or second-order variables, etc. (Sahu et al., 2020). The type of variables considered depends mainly on the type of behaviour to be analysed and the setting considered each time.

As for the *Reasons For* we identified three key variables that, according to the literature, are the most influential determinants of consumer tendencies toward green vehicles: (i) **environmental advantages** (RfEnv), assessing the

importance of having a low-emission vehicle, measured using four items adapted from Degirmenci and Breitner (2017); (ii) **economic advantages** (RfSaving), evaluating respondents' perceptions of green vehicles being more cost-effective compared to traditional combustion vehicles, particularly in terms of fuel savings, measured with three items adapted from recent studies (Krupa et al., 2014); and (iii) **governmental subsidies** (RfAids), assessing with three items the importance of benefiting from national subsidies to lower the purchase price of green vehicles (de Oliveira et al., 2022; Degirmenci and Breitner, 2017; Krupa et al., 2014).

Similarly, the inhibitors of consumer behaviour toward green vehicles classified as *Reasons Against* were: (i) long charging or **refuelling times** (RaTime), operationalised using three items adapted from Carley et al., (2013) and Krupa (2014), (ii) limited **driving range** and associated range anxiety (RaRange), measured using a three-item scales from Wiedmann et al. (2011), and (iii) insufficient availability of charging or **refuelling stations** (RaRefil), measured using a three-item scales from Eccarius et al. (2023).

Lastly, the **Familiarity** construct, aimed at identifying the respondent's level of knowledge regarding the subject of each questionnaire, was operationalised using three items derived from the studies of Sabbe et al. (2008) and Shirazi et al. (2022).

To ensure consistency in the translation process, as recommended in previous studies employing similar survey methodologies (Qian et al., 2023), we utilised the back-translation method (English-Italian-English). Specifically, one linguistic expert translated the items into Italian, while another independently translated them back into English. Any discrepancies between the original and

back-translated versions were carefully reviewed and resolved to ensure conceptual equivalence across the two languages.

#### 3.4. Data Analysis

The data analysis was conducted using Stata version 18 (statistical software for data science).

Initially, *convergent validity* was tested by calculating the factor loadings of the items and the Kaiser-Meyer-Olkin (KMO) index. Factor loadings represent the correlation between an observed variable (item) and a latent factor, indicating how well a particular item is explained by the factor in the factor model. The KMO index, on the other hand, assesses sampling adequacy and confirms whether the data are suitable for factor analysis. All item loadings exceeded 0.7, and the KMO values were higher than 0.6, reflecting a desirable measurement model (Hair et al., 2014).

Next, Cronbach's  $\alpha$ , Composite Reliability (CR), and Average Variance Extracted (AVE) were derived for each construct. All Cronbach's  $\alpha$  values were above 0.8, while the CR and AVE values exceeded the recommended thresholds of 0.60 and 0.50, respectively, as suggested by Sekaran and Bougie (2016). These results surpass the indicated thresholds, supporting the validity of the constructs and demonstrating good internal consistency (Bagozzi and Yi, 1988). The results of the Convergent Validity are presented in **Table 3.2**.

As a second step, *discriminant validity* was calculated for each sample using the method proposed by Fornell and Larcker (1981), which involves comparing the square root of the AVE for each factor with its correlation to other constructs. According to this method, discriminant validity is established when the

empirical scores confirm that two variables predicted to be uncorrelated are indeed uncorrelated. **Table 3.3** presents the results of this analysis, where the square root of the AVE for each construct was significantly higher than the correlations with other constructs, confirming that the measurements are distinct and unrelated, thus supporting the validity and independence of the variables in the study.

Finally, the measurement model for each sample demonstrated a *good fit with the data*, as indicated by the *fitting indices* consistently exceeding the recommended thresholds (Hair et al., 2014). The fit indices reported in **Table 3.4** include RMSEA between 0 and 0.05, CFI >0.95, TLI >0.92, and SRMR between 0 and 0.05. These analyses confirmed the model's fit and convergent and discriminant validity, establishing the reliability and appropriateness of the measurement instruments used.

Table 3. 2: Convergent validity results

| Construct | Variable Notation | BEV            |            |       |       |       |       | FCEV           |            |       |       |       |       | Blind          |            |       |       |       |       |
|-----------|-------------------|----------------|------------|-------|-------|-------|-------|----------------|------------|-------|-------|-------|-------|----------------|------------|-------|-------|-------|-------|
|           |                   | Factor Loading | Uniqueness | KMO   | Alpha | AVE   | CR    | Factor Loading | Uniqueness | KMO   | Alpha | AVE   | CR    | Factor Loading | Uniqueness | KMO   | Alpha | AVE   | CR    |
| Fam       | fam1              | 0,922          | 0,150      | 0,810 |       |       |       | 0,913          | 0,167      | 0,852 |       |       |       | 0,938          | 0,120      | 0,791 |       |       |       |
|           | fam2              | 0,935          | 0,126      | 0,757 | 0,931 | 0,822 | 0,933 | 0,946          | 0,105      | 0,715 | 0,934 | 0,831 | 0,935 | 0,940          | 0,117      | 0,782 | 0,943 | 0,850 | 0,944 |
|           | fam3              | 0,957          | 0,085      | 0,687 |       |       |       | 0,962          | 0,074      | 0,668 |       |       |       | 0,965          | 0,069      | 0,685 |       |       |       |
| Int       | int1              | 0,979          | 0,042      | 0,783 |       |       |       | 0,959          | 0,080      | 0,743 |       |       |       | 0,965          | 0,068      | 0,736 |       |       |       |
|           | int2              | 0,982          | 0,036      | 0,749 | 0,978 | 0,937 | 0,978 | 0,965          | 0,069      | 0,717 | 0,951 | 0,870 | 0,952 | 0,967          | 0,065      | 0,726 | 0,957 | 0,883 | 0,959 |
|           | int3              | 0,975          | 0,049      | 0,827 |       |       |       | 0,940          | 0,116      | 0,847 |       |       |       | 0,946          | 0,105      | 0,855 |       |       |       |
| Rarang    | rarang1           | 0,908          | 0,175      | 0,728 |       |       |       | 0,926          | 0,143      | 0,783 |       |       |       | 0,949          | 0,100      | 0,768 |       |       |       |
|           | rarang2           | 0,918          | 0,157      | 0,707 | 0,887 | 0,727 | 0,889 | 0,926          | 0,142      | 0,781 | 0,927 | 0,811 | 0,928 | 0,956          | 0,086      | 0,736 | 0,944 | 0,850 | 0,944 |
|           | rarang3           | 0,884          | 0,219      | 0,795 |       |       |       | 0,950          | 0,097      | 0,701 |       |       |       | 0,941          | 0,115      | 0,808 |       |       |       |
| Ratime    | ratime1           | 0,943          | 0,111      | 0,774 |       |       |       | 0,931          | 0,133      | 0,834 |       |       |       | 0,928          | 0,140      | 0,758 |       |       |       |
|           | ratime2           | 0,939          | 0,118      | 0,792 | 0,939 | 0,838 | 0,939 | 0,954          | 0,091      | 0,730 | 0,940 | 0,843 | 0,941 | 0,919          | 0,155      | 0,787 | 0,918 | 0,788 | 0,918 |
|           | ratime3           | 0,951          | 0,097      | 0,743 |       |       |       | 0,952          | 0,094      | 0,737 |       |       |       | 0,935          | 0,127      | 0,735 |       |       |       |
| Rarefil   | rarefil1          | 0,807          | 0,348      | 0,806 |       |       |       | 0,839          | 0,296      | 0,794 |       |       |       | 0,840          | 0,295      | 0,759 |       |       |       |
|           | rarefil2          | 0,886          | 0,216      | 0,663 | 0,823 | 0,614 | 0,821 | 0,906          | 0,179      | 0,665 | 0,850 | 0,658 | 0,857 | 0,893          | 0,202      | 0,669 | 0,832 | 0,612 | 0,825 |
|           | rarefil3          | 0,886          | 0,215      | 0,662 |       |       |       | 0,884          | 0,218      | 0,698 |       |       |       | 0,862          | 0,257      | 0,716 |       |       |       |
| Rfsaving  | rfsaving1         | 0,929          | 0,138      | 0,823 |       |       |       | 0,923          | 0,149      | 0,856 |       |       |       | 0,928          | 0,140      | 0,814 |       |       |       |
|           | rfsaving2         | 0,947          | 0,104      | 0,743 | 0,936 | 0,831 | 0,937 | 0,956          | 0,087      | 0,710 | 0,939 | 0,838 | 0,940 | 0,944          | 0,109      | 0,746 | 0,933 | 0,823 | 0,933 |
|           | rfsaving3         | 0,950          | 0,098      | 0,732 |       |       |       | 0,953          | 0,092      | 0,719 |       |       |       | 0,946          | 0,105      | 0,736 |       |       |       |
| Rfenv     | rfenv1            | 0,942          | 0,112      | 0,828 |       |       |       | 0,952          | 0,095      | 0,848 |       |       |       | 0,946          | 0,106      | 0,825 |       |       |       |
|           | rfenv2            | 0,963          | 0,073      | 0,802 |       |       |       | 0,954          | 0,090      | 0,854 |       |       |       | 0,959          | 0,081      | 0,802 |       |       |       |
|           | rfenv3            | 0,948          | 0,100      | 0,874 | 0,959 | 0,857 | 0,960 | 0,966          | 0,068      | 0,829 | 0,962 | 0,865 | 0,963 | 0,943          | 0,110      | 0,879 | 0,956 | 0,848 | 0,956 |
|           | rfenv4            | 0,922          | 0,150      | 0,887 |       |       |       | 0,918          | 0,158      | 0,889 |       |       |       | 0,915          | 0,163      | 0,905 |       |       |       |
| Rfaid     | rfaid1            | 0,931          | 0,133      | 0,706 |       |       |       | 0,915          | 0,163      | 0,676 |       |       |       | 0,900          | 0,191      | 0,697 |       |       |       |
|           | rfaid2            | 0,891          | 0,206      | 0,840 | 0,916 | 0,788 | 0,921 | 0,852          | 0,274      | 0,834 | 0,887 | 0,739 | 0,902 | 0,860          | 0,261      | 0,793 | 0,882 | 0,725 | 0,891 |
|           | rfaid3            | 0,952          | 0,093      | 0,660 |       |       |       | 0,941          | 0,114      | 0,637 |       |       |       | 0,939          | 0,119      | 0,637 |       |       |       |
| Valueenv  | valueenv1         | 0,835          | 0,303      | 0,939 |       |       |       | 0,833          | 0,306      | 0,925 |       |       |       | 0,803          | 0,356      | 0,911 |       |       |       |
|           | valueenv2         | 0,894          | 0,201      | 0,879 |       |       |       | 0,897          | 0,195      | 0,885 |       |       |       | 0,892          | 0,205      | 0,858 |       |       |       |
|           | valueenv3         | 0,904          | 0,183      | 0,865 |       |       |       | 0,884          | 0,218      | 0,881 |       |       |       | 0,854          | 0,271      | 0,883 |       |       |       |
|           | valueenv4         | 0,852          | 0,275      | 0,919 | 0,923 | 0,675 | 0,926 | 0,829          | 0,313      | 0,943 | 0,919 | 0,661 | 0,922 | 0,791          | 0,374      | 0,923 | 0,903 | 0,624 | 0,906 |
|           | valueenv5         | 0,827          | 0,316      | 0,918 |       |       |       | 0,804          | 0,353      | 0,939 |       |       |       | 0,838          | 0,297      | 0,911 |       |       |       |
|           | valueenv6         | 0,805          | 0,353      | 0,924 |       |       |       | 0,828          | 0,314      | 0,925 |       |       |       | 0,780          | 0,391      | 0,915 |       |       |       |
| Attitude  | attitude1         | 0,951          | 0,096      | 0,751 |       |       |       | 0,918          | 0,157      | 0,750 |       |       |       | 0,938          | 0,121      | 0,758 |       |       |       |
|           | attitude2         | 0,935          | 0,126      | 0,832 | 0,944 | 0,849 | 0,945 | 0,905          | 0,181      | 0,792 | 0,906 | 0,765 | 0,906 | 0,928          | 0,139      | 0,795 | 0,929 | 0,814 | 0,929 |
|           | attitude3         | 0,960          | 0,079      | 0,716 |       |       |       | 0,931          | 0,133      | 0,715 |       |       |       | 0,942          | 0,113      | 0,743 |       |       |       |

**Table 3. 3: Discriminant validity results**

|                  |              | <b>BEV</b>   |               |               |                |                 |              |              |                 |                 |  |
|------------------|--------------|--------------|---------------|---------------|----------------|-----------------|--------------|--------------|-----------------|-----------------|--|
| <b>AVE</b>       | <b>0,822</b> | <b>0,937</b> | <b>0,727</b>  | <b>0,838</b>  | <b>0,614</b>   | <b>0,831</b>    | <b>0,857</b> | <b>0,788</b> | <b>0,675</b>    | <b>0,849</b>    |  |
| <b>Construct</b> | <b>Fam</b>   | <b>Int</b>   | <b>Rarang</b> | <b>Ratime</b> | <b>Rarefil</b> | <b>Rfsaving</b> | <b>Rfenv</b> | <b>Rfaid</b> | <b>Valueenv</b> | <b>Attitude</b> |  |
| <b>Fam</b>       | 1.000        |              |               |               |                |                 |              |              |                 |                 |  |
| <b>Int</b>       | 0,119        | 1.000        |               |               |                |                 |              |              |                 |                 |  |
| <b>Rarang</b>    | 0,034        | 0,114        | 1.000         |               |                |                 |              |              |                 |                 |  |
| <b>Ratime</b>    | 0,019        | 0,113        | 0,517         | 1.000         |                |                 |              |              |                 |                 |  |
| <b>Rarefil</b>   | 0,07         | 0,065        | 0,488         | 0,424         | 1.000          |                 |              |              |                 |                 |  |
| <b>Rfsaving</b>  | 0,002        | 0,224        | 0,028         | 0,052         | 0,025          | 1.000           |              |              |                 |                 |  |
| <b>Rfenv</b>     | 0,005        | 0,287        | 0,031         | 0,062         | 0,015          | 0,338           | 1.000        |              |                 |                 |  |
| <b>Rfaid</b>     | 0,011        | 0,42         | 0,056         | 0,052         | 0,01           | 0,354           | 0,418        | 1.000        |                 |                 |  |
| <b>Valueenv</b>  | 0,067        | 0,164        | 0,003         | 0,005         | 0,011          | 0,106           | 0,077        | 0,114        | 1.000           |                 |  |
| <b>Attitude</b>  | 0,024        | 0,495        | 0,101         | 0,123         | 0,053          | 0,351           | 0,804        | 0,572        | 0,152           | 1.000           |  |

|                  |              | <b>FCEV</b> |               |               |                |                 |              |              |                 |                 |  |
|------------------|--------------|-------------|---------------|---------------|----------------|-----------------|--------------|--------------|-----------------|-----------------|--|
| <b>AVE</b>       | <b>0,831</b> | <b>0,87</b> | <b>0,811</b>  | <b>0,843</b>  | <b>0,658</b>   | <b>0,838</b>    | <b>0,865</b> | <b>0,739</b> | <b>0,661</b>    | <b>0,765</b>    |  |
| <b>Construct</b> | <b>Fam</b>   | <b>Int</b>  | <b>Rarang</b> | <b>Ratime</b> | <b>Rarefil</b> | <b>Rfsaving</b> | <b>Rfenv</b> | <b>Rfaid</b> | <b>Valueenv</b> | <b>Attitude</b> |  |
| <b>Fam</b>       | 1.000        |             |               |               |                |                 |              |              |                 |                 |  |
| <b>Int</b>       | 0,227        | 1.000       |               |               |                |                 |              |              |                 |                 |  |
| <b>Rarang</b>    | 0,047        | 0,047       | 1.000         |               |                |                 |              |              |                 |                 |  |
| <b>Ratime</b>    | 0,08         | 0,043       | 0,481         | 1.000         |                |                 |              |              |                 |                 |  |
| <b>Rarefil</b>   | 0,047        | 0,073       | 0,253         | 0,125         | 1.000          |                 |              |              |                 |                 |  |
| <b>Rfsaving</b>  | 0,015        | 0,172       | 0,01          | 0,007         | 0,009          | 1.000           |              |              |                 |                 |  |
| <b>Rfenv</b>     | 0,034        | 0,208       | 0,003         | 0,006         | 0,009          | 0,296           | 1.000        |              |                 |                 |  |
| <b>Rfaid</b>     | 0,041        | 0,378       | 0,011         | 0,005         | 0,011          | 0,287           | 0,274        | 1.000        |                 |                 |  |
| <b>Valueenv</b>  | 0,033        | 0,064       | 0,003         | 0,002         | 0,001          | 0,074           | 0,083        | 0,137        | 1.000           |                 |  |
| <b>Attitude</b>  | 0,069        | 0,349       | 0,023         | 0,02          | 0,007          | 0,344           | 0,689        | 0,444        | 0,217           | 1.000           |  |

|                  |             | <b>Blind</b> |               |               |                |                 |              |              |                 |                 |  |
|------------------|-------------|--------------|---------------|---------------|----------------|-----------------|--------------|--------------|-----------------|-----------------|--|
| <b>AVE</b>       | <b>0,85</b> | <b>0,883</b> | <b>0,85</b>   | <b>0,788</b>  | <b>0,612</b>   | <b>0,823</b>    | <b>0,848</b> | <b>0,725</b> | <b>0,624</b>    | <b>0,814</b>    |  |
| <b>Construct</b> | <b>Fam</b>  | <b>Int</b>   | <b>Rarang</b> | <b>Ratime</b> | <b>Rarefil</b> | <b>Rfsaving</b> | <b>Rfenv</b> | <b>Rfaid</b> | <b>Valueenv</b> | <b>Attitude</b> |  |
| <b>Fam</b>       | 1.000       |              |               |               |                |                 |              |              |                 |                 |  |
| <b>Int</b>       | 0,127       | 1.000        |               |               |                |                 |              |              |                 |                 |  |
| <b>Rarang</b>    | 0,016       | 0,088        | 1.000         |               |                |                 |              |              |                 |                 |  |
| <b>Ratime</b>    | 0,033       | 0,103        | 0,625         | 1.000         |                |                 |              |              |                 |                 |  |
| <b>Rarefil</b>   | 0,082       | 0,047        | 0,457         | 0,463         | 1.000          |                 |              |              |                 |                 |  |
| <b>Rfsaving</b>  | 0,035       | 0,21         | 0,054         | 0,052         | 0,031          | 1.000           |              |              |                 |                 |  |
| <b>Rfenv</b>     | 0,023       | 0,41         | 0,055         | 0,058         | 0,015          | 0,308           | 1.000        |              |                 |                 |  |
| <b>Rfaid</b>     | 0,037       | 0,424        | 0,064         | 0,056         | 0,031          | 0,203           | 0,376        | 1.000        |                 |                 |  |
| <b>Valueenv</b>  | 0,018       | 0,15         | 0,037         | 0,023         | 0,005          | 0,038           | 0,092        | 0,123        | 1.000           |                 |  |
| <b>Attitude</b>  | 0,053       | 0,576        | 0,124         | 0,163         | 0,074          | 0,312           | 0,755        | 0,485        | 0,191           | 1.000           |  |

*Table 3. 4: Goodness of Fit*

| <b>GOF</b>   | <b>BEV</b> | <b>FCEV</b> | <b>BLIND</b> |
|--------------|------------|-------------|--------------|
| <i>RMSEA</i> | 0,050      | 0,044       | 0,049        |
| <i>CFI</i>   | 0,966      | 0,973       | 0,966        |
| <i>TLI</i>   | 0,961      | 0,968       | 0,960        |
| <i>SRMR</i>  | 0,039      | 0,041       | 0,047        |

### 3.5. Common method bias

Following Podsakoff et al. (2003), we addressed common method biases by adopting procedural approaches to minimise bias during data collection and applying statistical remedies ex-post to detect and eventually correct any residual bias.

Regarding the procedural approach, we employed an online survey platform that administered the questionnaire to the participants who consented to participate, ensuring their anonymity. Before starting the survey, participants were informed that there were no right or wrong answers, the data was solely for academic purposes, and that personal information would be kept strictly confidential. Emphasising these aspects helps alleviate participants' concerns and reduce social desirability biases.

As for the questionnaire design, we separated the measurement of predictor and criterion variables, which is crucial in studies exploring attitude relationships (Podsakoff et al., 2003). This procedure reduces the likelihood that respondents' answers to predictor variables will influence their responses to criterion

variables, thereby eliminating the effects of consistency motifs, implicit theories and tendencies towards acquiescence or lenient responding (Podsakoff et al., 2003; MacKenzie and Podsakoff, 2012). Furthermore, as Tourangeau et al. (2000) recommended, we employed well-established scales frequently used in previous studies to avoid ambiguous concepts, overly complex wording, and unclear syntax, all of which could confuse respondents and increase the risk of bias.

Concerning statistical methods for bias detection and control, we applied Harman's single-factor test. The results from each sample showed that the maximum variance explained by a single factor was well below 40% in every group, indicating that common method biases were not present in the data. Additionally, following Podsakoff et al. (2003), we conducted a confirmatory factor analysis (CFA) to assess whether a single factor could explain all data variances. The single-factor model demonstrated poor fit compared to the CFA of our hypothesised model, further confirming the insignificance of common method bias in our survey responses. **Table 3.5** compares the single-factor CFA and the goodness-of-fit indices for our models.

*Table 3. 5: Single factor model comparison with study model*

| GOF          | BEV            |                     | FCEV           |                     | BLIND          |                     |
|--------------|----------------|---------------------|----------------|---------------------|----------------|---------------------|
|              | Internal Model | Single Factor Model | Internal Model | Single Factor Model | Internal Model | Single Factor Model |
| <i>RMSEA</i> | 0,05           | 0,203               | 0,044          | 0,208               | 0,049          | 0,201               |
| <i>CFI</i>   | 0,966          | 0,403               | 0,973          | 0,341               | 0,966          | 0,387               |
| <i>TLI</i>   | 0,961          | 0,361               | 0,968          | 0,294               | 0,96           | 0,344               |
| <i>SRMR</i>  | 0,039          | 0,194               | 0,041          | 0,199               | 0,047          | 0,188               |

## 4. Results and Discussion

### 4.1. Structural Equation Model findings

Building on the proven solidity of the measurement model, we constructed a structural equation model to test the proposed hypotheses. Using maximum likelihood estimation, the structural model demonstrated a good fit with the data. **Table 3.6** below shows RMSEA, CFI, TLI, and SRMR for each sample group, all exceeding the above-mentioned recommended thresholds (Hair et al., 2014). The findings are illustrated in **Table 3.7**, reporting  $\beta$  and p-values for each relationship of the model in each sample group.

*Table 3. 6: Goodness of fit of SEMs*

| <b>GOF</b>   | <b>BEV</b> | <b>FCEV</b> | <b>BLIND</b> |
|--------------|------------|-------------|--------------|
| <i>RMSEA</i> | 0.052      | 0.044       | 0.050        |
| <i>CFI</i>   | 0.964      | 0.972       | 0.965        |
| <i>TLI</i>   | 0.958      | 0.968       | 0.960        |
| <i>SRMR</i>  | 0.077      | 0.047       | 0.073        |

Table 3. 7: Structural equation model results

| <i>Path Analysis</i> |                    | BEV    |           | FCEV   |           | Blind  |           | Hypothesis Paths Conclusion |
|----------------------|--------------------|--------|-----------|--------|-----------|--------|-----------|-----------------------------|
| Independent Variable | Dependent Variable | Beta   | Pvalue    | Beta   | Pvalue    | Beta   | Pvalue    |                             |
| Rarang               | Attitude           | -0,113 | 0,046 *   | -0,021 | 0,583     | 0,068  | 0,161     | HP1: Supported              |
| Ratime               |                    | -0,061 | 0,239     | -0,003 | 0,939     | -0,194 | 0,000 *** |                             |
| Rarefil              |                    | -0,025 | 0,752     | -0,105 | 0,039 *   | -0,076 | 0,233     |                             |
| Rfsaving             |                    | -0,024 | 0,553     | 0,060  | 0,101     | 0,049  | 0,170     |                             |
| Rfenv                |                    | 0,653  | 0,000 *** | 0,567  | 0,000 *** | 0,584  | 0,000 *** |                             |
| Rfaid                |                    | 0,258  | 0,000 *** | 0,163  | 0,000 *** | 0,180  | 0,000 *** |                             |
| Fam                  | Rarang             | -0,149 | 0,003 **  | -0,236 | 0,000 *** | -0,099 | 0,051     | HP2a: Supported             |
|                      | Ratime             | -0,100 | 0,032 *   | -0,320 | 0,000 *** | -0,140 | 0,003 **  |                             |
|                      | Rarefil            | -0,139 | 0,000 *** | -0,147 | 0,000 *** | -0,178 | 0,000 *** |                             |
|                      | Rfsaving           | -0,036 | 0,454     | 0,073  | 0,154     | 0,136  | 0,003 **  | HP2b: Supported             |
|                      | Rfenv              | -0,004 | 0,952     | 0,127  | 0,012 *   | 0,109  | 0,031 *   |                             |
|                      | Rfaid              | 0,021  | 0,721     | 0,162  | 0,008 **  | 0,135  | 0,005 **  |                             |
| Value                | Rarang             | -0,023 | 0,769     | -0,029 | 0,738     | -0,330 | 0,001 **  | HP3b: Supported             |
|                      | Ratime             | -0,054 | 0,458     | 0,008  | 0,931     | -0,221 | 0,016 *   |                             |
|                      | Rarefil            | -0,036 | 0,470     | 0,007  | 0,904     | -0,045 | 0,515     |                             |
|                      | Rfsaving           | 0,455  | 0,000 *** | 0,335  | 0,000 *** | 0,281  | 0,002 **  | HP3a: Supported             |
|                      | Rfenv              | 0,484  | 0,000 *** | 0,348  | 0,000 *** | 0,536  | 0,000 *** |                             |
|                      | Rfaid              | 0,543  | 0,000 *** | 0,553  | 0,000 *** | 0,581  | 0,000 *** |                             |
| Fam                  | Attitude           | 0,030  | 0,275     | 0,031  | 0,266     | 0,022  | 0,394     | Hp4: Rejected               |
| Value                |                    | 0,169  | 0,000 *** | 0,209  | 0,000 *** | 0,240  | 0,000 *** | Hp5: Supported              |

Note: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , all in one tail.

As expected, the statistically significant relationships indicate that RF positively correlates with attitude, whereas RA shows a negative correlation. The analysis of the  $\beta$  coefficients reveals that, across all three samples, the cumulative statistically significant impact of RF exceeds that of RA, **H1** is thus supported. This finding supports the insights from Liberman et al. (2002) in CLT, which suggest that temporal distance in decision-making leads to overestimating positive aspects compared to negative ones (Trope et al., 2007). This amplified confidence is confirmed for product category evaluations and specific product assessments, highlighting the universality of this relationship. This evidence helps clarify the conflicting findings regarding the magnitude of the relations between RF and RA and attitudes observed in previous studies (Claudy et al., 2015; Yadav et al., 2022; Jan et al., 2023) demonstrating that, in high-construal situations, overconfidence arises, leading to an overestimation of benefits.

Across all three samples, Familiarity is negatively correlated with RA (except for Familiarity and RaRange in the blind sample, where the p-value approaches the threshold at 0.051). This consistency across samples confirms that information-seeking processes (Sheth and Venkatesan, 1968) address the need to reduce uncertainty, a major source of loss aversion (Kahneman and Tversky, 1979) and RA formation. **H2a** is thus supported. By demonstrating the significance of the role of information-seeking and analytical thinking (Familiarity) both in conditions where information is specific and readily available (Bev) or more blurry and uncertain (Blind group), our results highlight the universal role of familiarity in reducing perceived risk. This indicates that even when information is more abstract and, thus, less precisely assessable, RA's cognitive process is rooted in a psychological framework that includes concepts

such as sensemaking and psychological coherence (Claudy et al., 2015). Within this framework, individuals make sense of the information available before acting (e.g., Thomas et al., 1993) and interpret them based on self-concept coherence (e.g., Nowak et al., 2000). Thus, prior knowledge and experience are fundamental in providing meaning and coherence to evaluations, supporting the alternatives and justifying pro-environmental actions.

Regarding **H2b**, our results confirm the expected positive relationship between familiarity and RF. This relationship is consistently observed across all three RFs in the Blind sample (where  $\beta$  are positive and p-values  $< 0.05$ ), but not in the BEV sample (all the p-values  $> 0.05$ ). To interpret this result, we should first highlight that RF and RA are not mirror constructs, and the underlying cognitive processes differ significantly (Claudy et al., 2015), explaining why the impact of familiarity on RF diverges from that on RA. The evaluation of benefits in the context of green products is tied to value-based considerations (Khan and Mohsin, 2017), and thus the formation of RF does not happen independently from people's beliefs (Claudy et al., 2013) or deep compatibility with personal values (e.g. Garcia et al., 2007; Karahanna, 2006; Kleijnen et al., 2009). In scenarios where information is readily available to consumers (e.g., the BEV sample), the elaborated information is technical, specific and linked to concrete characteristics, which may conflict with the more idealistic and purely value-driven dimension that guides the formation of RF. In this case, the prior experience developed might not support an enhancement of the RF. However, instead of negatively impacting the dependent variable, it generates an agnostic and sceptical response, providing non-significant relationships.

This dynamic differs when consumers evaluate a product category characterised by greater uncertainty. In such cases, where information is less accessible, scepticism toward specific technical features lacks a solid foundation. Here, the perceived familiarity with the product category enhances the perception of the benefits associated with the technology, demonstrating a stronger role for familiarity in shaping RF.

Consistent with our expectations for H2b, **H3a** is supported as environmental values are significant predictors of RF, with this relationship being statistically significant across all three samples (where  $\beta$  are positive and p-values < 0.05). These findings confirm that RF, particularly in the context of green products, are driven by value-based considerations (Khan and Mohsin, 2017). In this regard, prior studies' discordant results can be explained by considering the effect of CLT (Liberman and Trope, 1998) as the temporal distance influences the RF shaping process, leading consumers to adopt a more idealistic cognitive approach (Trope et al., 2007) and be less tied to analytical and rational dimensions. The universality of this relationship is proven by its significance and direction across the product category (Blind) and the specific product (BEV). Values are negatively associated with RA at the product category level but not universally, thus **H3b** is supported. Specifically, in the "Blind" sample, two out of three relationships are statistically significant with negative  $\beta$  coefficients, whereas in the FCEV and BEV samples, the relationships do not exhibit p-values < 0.05. In line with the theoretical predictions, the cognitive process underlying the formation of RA is grounded in the analytical evaluation of the phenomenon, wherein uncertainty and loss aversion play a crucial role in shaping the cognitions individuals will use to justify their behaviour.

In contexts of “handled risk”, which is typical for well-specified products, value-based considerations do not mitigate perceived risk, as the management of uncertainty shifts toward information-seeking and knowledge-based process. Conversely, when evaluations are made at the product category level, characterised by “inherent risk” and greater vagueness (Bettman, 1973), rational and analytical assessments become more challenging (Laroche et al., 2010). In such cases, part of the cognitive process shifts towards an idealistic dimension, partially driven by values. This result provides insight into the mixed findings in previous studies, where the relationship between environmental values and RA has shown inconsistent outcomes in terms of both significance and direction (Dhir et al., 2021; Sreen et al., 2023; Chatterjee et al., 2022) that might be attributable to differences into assessment from categorical dimensions to product specific once.

Familiarity is not positively associated with attitude, thus, in our setting, **H4** is not supported. Despite positive  $\beta$ s across all three samples, this relationship is consistently not significant with p-values  $> 0.05$ . This suggests that experience and knowledge of a given product, particularly in the case of risky and expensive purchase decisions, require more complex cognitive processing to translate into behavioural impact. This is partially supported by the previously identified effect concerning the relationship between familiarity and the reasons. These findings confirm that information enters the decision-making process and, before acting, the individuals interpret them under the framework of cognitive mechanisms such as sensemaking (e.g., Thomas et al., 1993) and psychological coherence

(e.g., Nowak et al., 2000). Then, they need to be processed before the formation of an attitude.

Values are positively associated with attitude, thus **H5** is supported. Positive and statistically significant coefficients among all the samples confirm the universality of this relationship.

This direct relationship integrates the mediated impact through reasons, underscoring the crucial role of values in shaping behaviours in the context of green products. In other words, environmental values not only influence the construction of reasons that further support decision-making but also directly activate attitudes toward the product (Bargh et al., 1996).

Our results indicate that this effect holds for both products and their category. However, the  $\beta$  values show a decreasing trend across samples, moving from Blind to Bev (e.g., BLIND  $\beta = 0.24$ ; FCEV  $\beta = 0.209$ ; BEV  $\beta = 0.169$ ). This suggests that in contexts where information is scarce or ambiguous (e.g., BLIND and FCEV), values play a more pronounced role in shaping attitudes, compensating for the lack of a robust rational-analytical process grounded in informational clarity. Conversely, when the context is more pragmatic and information is more specific and readily available (e.g., BEV), the relative impact of values diminishes, suggesting that more practical considerations emerge in the cognitive processes driving behaviour.

#### *4.2. Mediation analysis*

Mediation analyses helped further capture the underlying mechanisms across values, familiarity, reasons, and attitudes. In line with the conceptual framework highlighted in **Figure 3.1**, we examined the mediation role of reasons between Values and Attitude, as well as Familiarity and Attitude. **Table 3.8** shows the

Sobel's z test results which highlight the relative sizes of the indirect (i.e. mediated) and direct paths. The Sobel's test was computed with Stata software for statistical analysis.

Regarding the value-reasons-attitude relationship, both Reasons for Environment and Reasons for Aid partially mediate value and attitude across all three groups.

For example, in the BEV group, the Value-Attitude relationship shows a direct effect with  $\beta = 0.169$  (p-value <0.001), alongside an indirect effect through Rfenv with  $\beta = 0.316$  (p-value <0.001).

In the Blind group, the mediation also involves Reasons Against Time (RAtime), indicating an even stronger net impact of RaTime on attitude as its direct effect is partially offset by the positive mediating effect of 0.044, which softens the overall impact.

These findings further clarify the relationship between Values and Attitudes. The results corresponding to H5 underscored the universal direct influence of values in shaping attitudes toward green products, overriding rational cognitive processes. The mediation analysis reinforces these findings and integrates prior research (e.g., [Claudy et al., 2013](#)) by demonstrating that values are also universally processed through cognitive mechanisms underpinning the formation of RF. This process results in an indirect effect on attitude via mediation through RF, aligning with recent evidence in BRT studies ([Quian et al., 2023](#); [Virmani et al., 2023](#)).

As for the familiarity-reasons-attitude relationship, the mediation analysis provides new nuances concerning **H4**, revealing indirect effects of familiarity on attitude.

**Table 3.8** illustrates that, across all samples, at least one reason mediates the relationship between familiarity and attitude. In particular, either partial or full mediation effects are observed. Specifically, RARange in the BEV group and RARefill in the FCEV group exhibit partial mediation. In contrast, RFEnvironment and RFAid, in both the FCEV and BLIND groups, as well as RATime in the BLIND group, demonstrate full mediation effects<sup>8</sup>.

Integrating these findings with the results from the SEM analysis - specifically the effects of familiarity on reasons (HP2a and HP2b) and on attitude (HP4) - we can provide a clearer understanding of the role of familiarity in the consumer cognitive process. Building on previous studies ([Witzling et al., 2015](#); [Trumbo and O’Keefe, 2001](#)), our findings confirm that experience and knowledge serve as foundational elements influencing attitude. This influence of familiarity on attitude is mediated through the operationalization of prior information and knowledge within the process of constructing reasons. The observed mediations expand upon prior research ([Rizzi et al., 2020](#); [Fischer and Frewer, 2009](#)), emphasizing that familiarity establishes an analytical basis for developing reasoning processes, which subsequently contribute to attitude formation. In other words, the effect of familiarity on attitude largely depends on the rational cognitive processes underpinning the construction of reasons.

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<sup>8</sup> For instance, in the FCEV group, the direct path from familiarity to attitude is not statistically significant (p-value = 0.266 > 0.05). However, the indirect effect via the RF Environment is significant, with a  $\beta$  coefficient of 0.072 and a p-value of 0.013 (< 0.05).

Finally, it is important to note that, while these results highlight the presence of mediated effects, they do not support the assumption of a universally valid mediation relationship, as differences emerge across groups (e.g., full mediation through **RFEnvironment** in one case versus partial mediation through **RARange** in another). Nevertheless, it is worth emphasizing that all samples exhibit either full or partial mediated effects of familiarity on attitude, consistently demonstrating a positive  $\beta$ . This reinforces the premise that familiarity indirectly contributes to attitude formation, further underlining its role in shaping consumer cognitive processes.

**Table 3. 8: Mediating test results**

| <i>Mediation Analysis</i>  | BEV               |                    |                                    | FCEV              |                    |                                    | Blind             |                    |                                    |
|----------------------------|-------------------|--------------------|------------------------------------|-------------------|--------------------|------------------------------------|-------------------|--------------------|------------------------------------|
|                            | Direct Effect     | Indirect Effect    | Type of mediation (partial / full) | Direct Effect     | Indirect Effect    | Type of mediation (partial / full) | Direct Effect     | Indirect Effect    | Type of mediation (partial / full) |
| Value=>Rarang=> Attitude   |                   | 0.003 (p = 0.771)  | No mediation                       |                   | 0.001 (p = 0.773)  | No mediation                       |                   | -0.023 (p = 0.200) | No mediation                       |
| Value=>Ratime=> Attitude   |                   | 0.003 (p = 0.528)  | No mediation                       |                   | 0.000 (p = 0.955)  | No mediation                       | 0.240 (p = 0.000) | 0.043 (p = 0.044)  | <u>Partial mediation</u>           |
| Value=>Rarefil=> Attitude  |                   | 0.001 (p = 0.771)  | No mediation                       |                   | -0.001 (p = 0.905) | No mediation                       |                   | 0.003 (p = 0.565)  | No mediation                       |
| Value=>Rfsaving=> Attitude |                   | -0.011 (p = 0.555) | No mediation                       |                   | 0.020 (p = 0.121)  | No mediation                       |                   | 0.014 (p = 0.205)  | No mediation                       |
| Value=>Rfenv=> Attitude    | 0.169 (p = 0.000) | 0.316 (p = 0.000)  | <u>Partial mediation</u>           | 0.209 (p = 0.000) | 0.200 (p = 0.000)  | <u>Partial mediation</u>           | 0.240 (p = 0.000) | 0.314 (p = 0.000)  | <u>Partial mediation</u>           |
| Value=>Rfaid=> Attitude    | 0.169 (p = 0.000) | 0.140 (p = 0.000)  | <u>Partial mediation</u>           | 0.209 (p = 0.000) | 0.091 (p = 0.000)  | <u>Partial mediation</u>           | 0.240 (p = 0.000) | 0.105 (p = 0.000)  | <u>Partial mediation</u>           |
| Fam =>Rarang=> Attitude    | 0.030 (p = 0.275) | 0.017 (p = 0.095)  | <u>Partial mediation</u>           |                   | 0.005 (p = 0.586)  | No mediation                       |                   | -0.007 (p = 0.255) | No mediation                       |
| Fam =>Ratime=> Attitude    |                   | 0.006 (p = 0.302)  | No mediation                       |                   | 0.001 (p = 0.939)  | No mediation                       | 0.022 (p = 0.394) | 0.027 (p = 0.022)  | <u>Complete mediation</u>          |
| Fam =>Rarefil=> Attitude   |                   | 0.003 (p = 0.753)  | No mediation                       | 0.031 (p = 0.266) | 0.015 (p = 0.069)  | <u>Partial mediation</u>           |                   | 0.014 (p = 0.245)  | No mediation                       |
| Fam =>Rfsaving=> Attitude  |                   | 0.001 (p = 0.642)  | No mediation                       |                   | 0.005 (p = 0.281)  | No mediation                       |                   | 0.007 (p = 0.211)  | No mediation                       |
| Fam =>Rfenv=> Attitude     |                   | -0.002 (p = 0.952) | No mediation                       | 0.031 (p = 0.266) | 0.072 (p = 0.013)  | <u>Complete mediation</u>          | 0.022 (p = 0.394) | 0.063 (p = 0.032)  | <u>Complete mediation</u>          |
| Fam =>Rfaid=> Attitude     |                   | 0.005 (p = 0.721)  | No mediation                       | 0.031 (p = 0.266) | 0.026 (p = 0.018)  | <u>Complete mediation</u>          | 0.022 (p = 0.394) | 0.024 (p = 0.015)  | <u>Complete mediation</u>          |

## 5. Implications

### *5.1 Theoretical Implication:*

Building on extant research that highlights the importance of prior experience in shaping consumer behaviour (Fischer and Frewer, 2009; Herrera and Blanco, 2011), this study introduces familiarity within the BRT model (Westaby, 2005) as a valuable predictor of reasons and attitudes. Our findings reveal that, in the context of green high involvement products, familiarity plays a critical role in alleviating uncertainty and concerns surrounding the decision, key factors in the development of RA for both specific products and product categories. Conversely, familiarity's influence on RF is limited to either the product category (e.g., blind evaluations) or the prospect product (e.g., FCEV). This indicates that when specific information is available, it might conflict with value-driven or idealistic inclinations; therefore, familiarity loses significance, leading to a more sceptical consumer approach.

Furthermore, we identify recurring mediation effects of reasons in the relationship between familiarity and attitude. This result aligns with earlier studies (Sirdas and Koukios, 2004; Rizzi et al., 2020), highlighting the varying impact of information exposure depending on the nature of the product, from impulsive purchases to complex and highly expensive ones. Our findings suggest that exposure to information in complex purchase decisions effectively influences attitudes through reasons. This evidence underscores the distinction between familiarity and values: while environmental values play a pivotal role in promoting green behaviours by bypassing rational-cognitive processes and directly influencing attitudes, familiarity affects attitudes exclusively through the mediation of reasons.

Building on this, our study also contributes to delving deeper into the cognitive processes underlying the formation of reasons and exploring their dynamic across the category, prospective and existing products. This analysis highlights both universal and case specific relationships in the formation of reasons, yielding significant insights into understanding the nature of RA and RF. Firstly, we found that RF is a value-driven construct, where environmental values act as predictors regardless of product specificity, which enriches the existing literature on RFs (Pieters and Zeelenberg, 2005; Khan and Mohsin, 2017; Garcia et al., 2007) by demonstrating the universality of this relationship. Conversely, RA is a more analytically and rationally driven construct, with stronger relations with familiarity than values because of the effectiveness of knowledge in mitigating uncertainty and loss aversion (Kahneman and Tversky, 1979; Neumann and Böckenholt, 2014). Interestingly, in the context of category-level analysis, values and familiarity have similar effects in reducing RA and intensifying RF. However, at the product-specific level, their roles become antithetical: familiarity reduces RA, while values amplify RF. This finding further illustrates the distinct nature of RF and RA constructs (Westaby, 2005; Claudy et al., 2015), explaining how evaluative-behavioural processes vary across objects that evoke rationality and idealism differently.

As a third key contribution, our study draws attention to the importance of temporal distance, as highlighted by CLT (Liberian and Trope, 1998), in applying BRT. Despite its established status in behavioural research, CLT's core insights are rarely considered in the interpretation of BRT results. We investigate consumer responses in contexts where temporal distance is consistently high across all three clusters, a fundamental aspect in interpreting the relationships among BRT variables, particularly between reasons and attitudes. Specifically,

we demonstrated that temporal distance fosters overconfidence (Lieberman et al., 2002; Trope et al., 2007), amplifying the effect of RF on attitude compared to RA. This finding is valuable for interpreting conflicting results in recent literature (Yadav et al., 2022; Jan et al., 2023; Qian et al., 2023) as caused by weak comparability of studies on different technologies or adoption processes (Claudy et al., 2015) because of their differences in the temporal distance among the evaluated scenarios.

Finally, our study contributes to the foundation of BRT literature by investigating its relations across concept, prospective and existing products, which are three typical subjects in technology adoption studies. This approach shows that BRT reveals different cognitions when the consumer shifts from a product category to a specific product, proving the adaptive nature of the cognitive processes influencing the adoption of emerging technologies, particularly within the context of green products.

By doing so, the study delves deeper into the underlying mechanisms shaping the formation of reasoning constructs, offering enhanced insights into their nature and unravelling universal and category or product-specific relationships.

### *5.2 Practical and Managerial Implication*

This study serves as a foundation for researchers to delve into the behavioural aspects of green mobility adoption. However, its contribution extends beyond the specific context, offering insights applicable to green innovation and technology adoption across various domains.

The development processes for new technologies aimed at reducing greenhouse gas emissions often start at a conceptual or categorical level. They subsequently

undergo a grounding process, transitioning through the prospective product stage and ultimately reaching the existing product stage. Despite the promising environmental outcomes these technologies offer, their adoption is rarely seamless. Thus, it is crucial for companies to understand how to engage end-users throughout the technological evolution and the broader sustainable transition. For instance, in our study, while battery electric vehicles (BEVs) are technologically ready and competitive with traditional models, this green technology is still far from becoming a standard.

Our study sheds light on how to promote concept and specific products from a BRT perspective. For example, the formation of RA is strongly linked to values at the category level. Yet, this relationship weakens as the focus shifts to specific products, highlighting a stronger connection with information and experiential factors. An opposing dynamic occurs with familiarity, strongly associated with RF at the category level, but weaker at the product-specific stage.

These findings emphasise the importance of engaging consumers with the product throughout all phases of new technology development using targeted actions.

From an R&D management and marketing perspective, these insights are invaluable. For R&D, they highlight the need to carefully interpret survey findings related to prototype-stage products, as relationships among variables can shift significantly when the product is market-ready. In terms of communication, consumers are exposed to many stimuli, ranging from value-driven messaging to highly technical content. Our findings clarify the psychological mechanisms at play, shedding light on the dominance of value-based or pragmatic reasoning related to the product stage.

Finally, this research reaffirms the pivotal role of environmental values in driving the green transition, challenging purely technocentric perspectives. This insight is particularly relevant for policymakers, underscoring the importance of communication strategies, education, and policies that foster a value paradigm aligned with sustainability principles.

## **6. Conclusions, limitations, and further research**

Our study revealed the factors influencing consumer inclination towards green vehicles and unravelled the cognitive processes that underpin consumer engagement across the category and specific products. More specifically, it compared BRT insights concerning three subjects typically used to engage consumers with green technology: *concept*, *prospective*, and *existing products*. As a result, this study offers novel insights into the underlying rationales of the BRT constructs, a better understanding of the nature of each variable and, ultimately, of the underlying process of information assimilation and evaluation. Like any study, this study presents limitations and opportunities for complementary research.

Firstly, our study, aimed at investigating the differences that arise when evaluations shift from category to prospect to product, excluded the variable intention (the final construct of BRT) due to the inability to examine intention concerning products not yet available on the market. However, we recommend that future research integrate a longitudinal perspective on market-available products to validate our findings by incorporating the intention variable within the familiarity-extended BRT framework. In this regard, we emphasise that our study is the first to investigate the impact of familiarity on reasons and attitudes

within a BRT framework, which warrants further exploration in subsequent studies adopting different research settings or non-cross-sectional logic.

Concerning our sample and setting, it is important to note that our study was conducted within a single country (Italy) and focused on green vehicles. While this approach provided greater homogeneity among respondents, extending the analysis to additional countries and technologies would be beneficial to confirm the generalisation of our insights.

Concerning our methodological design and questionnaire administration, we positioned respondents at a similar level of temporal distance, aligning all participants with a decision projected moderately far into the future (based on CLT). Future studies could strengthen and extend our findings by examining how different levels of temporal distance influence the relationships between variables, potentially revealing varying impacts across distinct time horizons.

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## ***CHAPTER 5: CONCLUSIONS***



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This dissertation aims to explore the role of firms as pivotal agents in the sustainability transition.

The capacity of companies to act as catalysts for the transition while navigating its inherent complexities and maintaining competitive balance is a highly relevant issue, particularly in the current business and social context. To better contextualize the topic, it is useful to highlight certain contemporary phenomena that, during the development of this thesis, underscored the critical importance for firms to act promptly by adopting appropriate strategies and tools to avoid passively enduring the transition. A striking example is the current crisis affecting the European automotive sector.

The Commission's directive to phase out internal combustion engines by 2035 ([EU 2023](#)) has compelled European manufacturers to overhaul their production systems in order to meet new regulatory requirements and align with the evolving market landscape. However, the industry's delayed approach to embracing the transition has contributed to a sector-wide crisis. Many companies are now reacting to the transition rather than driving it, resulting in a significant loss of competitive ground. This systemic unpreparedness is evident in several critical areas, including shortages of critical raw materials, the absence of a robust supply chain, the challenging conversion of firms' production cycle, and among others, a technological lag compared to other global competitors. Therefore, industry leaders and policymakers have raised numerous claims arguing that transforming the European automotive sector toward zero-emission mobility is unachievable without a loss of competitiveness.

Interestingly, amidst this crisis and despite many companies, governments and consumers are highlighting the automotive transition as infeasible, the best-

selling car in Europe at the time of writing is an electric vehicle manufactured in California named Tesla Model 3<sup>9</sup>.

The Tesla case study is highly articulated and cannot be simplistically adopted as a reference for companies with different volumes, histories, and organizational structures, such as the European automotive incumbents. Nevertheless, it is valuable to examine the distinct approach pursued by the company.

Tesla, for example, adopted an ecosystem-oriented approach by making substantial investments across multiple segments of the emerging market to facilitate the scaling of its products. The company prioritized early investments in fast-charging infrastructure, even before achieving high sales volumes, effectively addressing the "chicken-and-egg" dilemma between car manufacturers and charging station operators. These proprietary charging stations offered Tesla customers a distinct service, including real-time visibility of station availability, as well as personalized access and pricing mechanisms (Anderson, 2022). Moreover, Tesla pursued strategic partnerships with key battery cell suppliers such as Panasonic, CATL, and LG, while simultaneously advancing its in-house technologies. The company also secured upstream control by sourcing raw materials directly. These proactive efforts to shape market

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<sup>9</sup> This section of the discussion uses the automotive sector as a representative example of a broader array of transitioning markets, characterized by significant challenges and opportunities. Tesla serves as a case study to highlight the pivotal role a single company can play in profoundly shaping market dynamics. However, we acknowledge that this is not the only viable model. For instance, the Chinese approach represents a contrasting paradigm, where the transition to electric mobility is centrally driven through substantial government intervention, including subsidies, usage restrictions, and significant investments in infrastructure, such as charging stations. This exemplifies a policy-driven transition at the opposite end of the spectrum. For the purposes of this analysis, we instead focus on the role of the firm as a key actor in the transition process. This perspective, often less explored, forms the core of this thesis, emphasizing the company as a leading force in market transformation.

conditions and establish control over critical points in the ecosystem later became a cornerstone of Tesla's competitive advantage.

This example challenges the idea of companies reactive passively to regulatory and systemic changes illustrating how the initiative of a private enterprise can significantly contribute to the shaping of a new ecosystem based on sustainability principle. Tesla's phenomenon is compelling, as it not only influenced the development of electric mobility beyond regulatory requirements but also secured a substantial competitive advantage in the automotive sector, a market traditionally seen as impenetrable for new entrants.

This instance highlights the significant role companies can play in driving market transformation toward sustainability. These reflections prompted my interest in understanding how companies, including those not originally founded on sustainability principles, can not only withstand the transition but also emerge as leading players in the process of forming new sustainability-oriented markets. Today, more than ever, it is of paramount importance to examine the ways in which firms can influence market dynamics in a manner that is both environmentally sustainable and economically viable, with the objective of ensuring a smooth and beneficial transition.

Building on lessons learned from diverse empirical examples and grounded in a robust body of management literature, this dissertation was developed to explore how firms can actively navigate the sustainability transition rather than merely reacting to it. To this end, I examined three key dimensions of business operations: the strategic level, which reflects the firm's vision and market positioning; the operational level, which encompasses investment activities and the structuring of supply chains; and, finally, the commercial level, which sheds

light on marketing strategies and their role in fostering connections with the end customer.

The three essays developed into this dissertation offer valuable insights into key and essential aspects of transition research, with a primary focus on the role of the firm. However, it is important to acknowledge that this research cannot provide a comprehensive understanding of the dynamics through which firms can serve as catalysts for new market models while advancing the sustainable transition. This section thus summarizes the main findings and contributions of our work while identifying opportunities for further exploration for scholars engaging with these research streams.

**Key findings:**

Through three distinct essays, this research examines: (1) how firms operating in sustainability-oriented emerging markets pursue strategic positions that balance the creation of new green markets with competitive equilibrium, (2) the managerial practices that enable collaborative initiatives among diverse companies to drive supply chain development projects, laying the groundwork for the establishment of new green markets, and (3) the commercial dimension, focusing on consumer responses to green technology adoption.

Together, these three contributions deepen the understanding of how firms shape emerging sustainability-oriented markets, addressing multiple academic gaps and offering valuable insights for theory and practice.

The first essay extends the market-shaping literature ([Nenonen et al., 2014](#); [Nenonen, Storbacka, and Windahl, 2019](#); [Storbacka, 2022](#)) by identifying specific positioning dynamics for various actors involved in the construction of

sustainability-oriented markets. By highlighting the *control points* associated with different market-shaping roles and the underlying positioning mechanisms, this study provides a clear depiction of firms' agency in the market formation process. It sheds light on strategic positioning dynamics and underscores the importance of adopting a systemic value-creation approach, with a focus on timing to enable value capture at a later stage.

The second study leverages two theoretical frameworks from traditional management literature that have been employed to explain success in collaborative ventures namely Relational View (Dyer and Singh, 1998) and Alliance Management Capabilities (Schilke, 2014; Schreiner et al., 2009). By integrating these frameworks into the context of *sustainability-oriented collaborations*, several managerial configurations were identified, enabling firms to perform effectively even when handling the peculiar constraints of projects aimed at creating new sustainable markets. This contribution proposes tailored collaborative models and highlights the specific attributes that make certain configurations preferable over others. By doing so, this study moves beyond generic approaches, offering a nuanced understanding of the unique features and requirements of sustainability-oriented collaborations.

The third study examines consumer responses to green technologies, with a focus on the cognitive aspects driving behavior. Through the lens of Behavioral Reasoning Theory (Westaby, 2005) this essay explored the variables influencing consumer decision-making when evaluating green products. This research clarifies the determinants of psychological processes and the shifts that occur when consumers assess options with varying degrees of technological readiness and temporal distance (Lieberman and Trope, 1998). This study not only refines

the scope and application of Behavioral Reasoning Theory but also provides firms with insights into the critical levers for bridging the gap between end consumers and emerging technologies. The analysis offers considerations for a targeted approach that aligns strategies with different stages of the product development cycle.

**Theoretical Frameworks and Methodologies:**

From a theoretical and methodological perspective, recent studies emphasized the importance of employing a diverse range of approaches in transitions research (Köhler et al., 2019). Integrating models and methodologies commonly used in management studies and adapting them to address transition-related research questions offers significant potential for advancing the field. This dissertation represents an effort to leverage theories and methods rooted in the fields of management and social sciences to explore the systemic contribution of firms to the transition process.

**Study 1** adopted the control point perspective - a theoretical lens primarily utilized in digital business contexts – to integrate the market shaping literature applied to the development of a sustainability-oriented market ecosystem. Employing a multiple case study design, the findings support theory-building, thereby enriching the literature on market-shaping roles within the sustainability domain (Flaig and Ottosson, 2022).

Similarly, **Study 2** is to the best of my knowledge one of the first in its effort to integrate the Relational View (Dyer and Singh, 1998) and Alliance Management Capabilities (Schilke, 2014; Schreiner et al., 2009) to better understand the unique characteristics of sustainability-oriented collaborations and the tools

required to manage them effectively. To this end, this paper utilized the QCA (Qualitative Comparative Analysis) methodology (Ragin, 2000, 2009). Originally developed within the social sciences, QCA proved effective in capturing the complexities underlying complex social phenomena. Combined with comprehensive follow-up interviews, QCA allowed to identify the combinations of factors (e.g., RV and AMC constructs) that produce specific outcomes. This approach provided a deeper understanding of their underlying rationale and the interplay between these constructs. Unlike traditional statistical models based on inferential algebra, QCA can identify the coexistence of antithetical attributes as success factors, an essential feature for capturing the nuanced dynamics often observed in social sciences. Through this approach, I proposed relational models for sustainability-oriented collaborations that treat the components of these theories as adaptive rather than universally applicable. This methodological innovation offers context-sensitive insights into the dynamics of sustainability-oriented collaborations (SOCs).

Finally, **Study 3** employed the Behavioral Reasoning Theory (Westaby, 2005) to explore the psychological dynamics driving consumer propensity toward green technology adoption. Using a structural equation modeling (SEM) approach, this essay identified statistically significant differences in consumer cognitive processes when assessing products at varying stages of readiness. These psychological insights provide a valuable foundation for developing communication strategies aimed at more effectively engaging retail markets with green emerging products. Once again, the integration of theoretical frameworks and methodological models borrowed from social science literature enabled to

uncover actionable dynamics crucial for firms navigating sustainability-oriented emerging markets.

The theoretical and methodological approach adopted in this dissertation is particularly innovative. The three essays propose the application of theories and methodologies typically employed in the business domain (e.g., managerial literature) to deepen the understanding of the systemic contribution of firms to the sustainable transition. This effort aligns with the calls from scholars contributing to transition research, who have emphasized that bridging different strands of research can open new perspectives and enrich the understanding of complex phenomena (Geels, 2010).

#### **Limitation and further research**

The ambitious goal of understanding how firms can transform markets to not only positively impact the environment and society but also strengthen their competitive position is central to this dissertation. While recognizing the theoretical and managerial contributions emerging from this research, it is important to highlight that the journey toward supporting the sustainability transition is far from complete and requires continued efforts and diverse contributions. This dissertation, through its essays, identifies new avenues for further exploration.

In **Essay 1**, I applied the control point perspective for the first time to analyze market-shaping roles and their approaches in the context of sustainability-oriented markets. This study represents the initial application of this theoretical lens in a manufacturing setting focused on sustainability. Future studies could extend this perspective by investigating the functioning of control points in

different sustainability-oriented markets and examining their contribution to the development of emerging ecosystems.

Additionally, the analysis on the green hydrogen market offers a vertical perspective on this specific sector. However, it is important to recognize that the coexistence of transformative tensions across industries may yield unexpected synergies and developments (Köhler et al., 2019). For instance, the ongoing digital revolutions, particularly considering the advancements in artificial intelligence, offer a compelling research opportunity to examine how these technologies can impact markets such as green energy deployment and net-zero manufacturing. Exploring their integration into the sustainability transition process could provide valuable insights into how digital innovations drive market transformation and support sustainable development. Investigating the interplay between technological revolutions across industries could offer new strategic approaches to transitions and identify novel control points that contribute to systemic development while safeguarding firms' competitive positions.

Building on these insights, **Essay 2** delves into cross-sectoral collaborations, which includes collaborative efforts among players coming from different sectors (e.g. partner heterogeneity). However, this study, based on 16 sustainability-oriented collaborations, presents findings that could be validated through broader sample sizes. Furthermore, while this research focuses on in-progress projects with the potential to become foundational pillars of new value chains, future studies could adopt longitudinal approaches to investigate completed projects. Such analyses would help identify the relational and

managerial components that produce optimal outcomes, offering a more comprehensive understanding of successful collaboration models.

Combining the considerations outlined above with the scope of **Essay 1** and **Essay 2**, I emphasize that understanding how firms can effectively shape emerging sustainability-oriented markets requires a dual focus. On one hand, it involves strategic positioning and the identification of critical control points within ecosystems, as explored in **Essay 1**. On the other, it necessitates the development of tailored managerial practices for fostering collaborative initiatives, as demonstrated in **Essay 2**, to build the foundational structures of new markets. This integrated approach highlights the interplay between strategic vision and operational execution in driving sustainable market transitions. However, the above analysis did not take into account the presence of actors that resist change to maintain their dominance in existing markets ([Wells and Nieuwenhuis, 2012](#); [Smink et al., 2015](#)) thus the picture presented do not assess the role, actions and related effects of players trying to maintain their status quo into existing markets. Understanding the strategies, lobbying efforts, and actions of firms hindering market evolution, represents an important research avenue for completing the picture of firm behavior in sustainable transition contexts.

On this note, the pace of transition emerges as a crucial area of concern, particularly given that slow progress poses significant challenges ([Sovacool, 2016](#)). Why do some markets transform rapidly while others take decades to evolve? What factors contribute to this slow pace, and how can they be tackled? Future research, investigating the influence of actors with conflicting interests and their impact on the speed of change could provide insights into effective

intervention strategies to accelerate transitions while offering tools to predict the timing and trajectory of ongoing changes.

Finally, **Essay 3** focuses on the cognitive processes influencing consumer decision-making when evaluating products at varying levels of market readiness. While this study maintained a uniform psychological distance across the three samples analyzed, future research could validate these findings by employing a methodological architecture that examines consumer responses at different levels of psychological distance. Such studies could confirm the results of this essay and emphasize the importance of communication strategies tailored to the psychological distance and product market readiness dimensions.

Moreover, this essay offers seminal insights into marketing strategies and their effects on consumer behavior. However, this study did not develop specific marketing strategies nor assess how exposure to different types of communication might influence consumer responses. To address this, future research could employ comparative analyses to examine the impact of various communication strategies, providing a deeper understanding of how to effectively engage and sensitize markets during the development of an emerging market.

This work provides a significant contribution to both the theoretical and managerial understanding of sustainability-oriented market shaping and opens new avenues for research by identifying critical gaps. These contributions collectively serve as a foundation for advancing both scholarly inquiry and practical solutions to accelerate and navigate the complexities of the sustainability transition.

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