Industry and Innovation

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ciai20

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To cite this article: Andra Riandita, Anders Broström & Raffaella Cagliano (22 Aug 2024): Partnering with green start-ups: a vehicle for eco-innovation?, Industry and Innovation, DOI: 10.1080/13662716.2024.2390012

To link to this article: https://doi.org/10.1080/13662716.2024.2390012

Published online: 22 Aug 2024.

INDUSTRY AND INNOVATION
https://doi.org/10.1080/13662716.2024.2390012

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

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Partnering with green start-ups: a vehicle for eco-innovation?

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ABSTRACT

Established firms are increasingly forming alliances with green start-ups, i.e. newly-started ventures dedicated to eco-innovation. This study explores the rationales for the initiation and continuation of such alliances. We investigate how established firms leverage these alliances to facilitate eco-innovation adoption alongside their pursuit of legitimacy. Findings from a case study on seven alliances focused on food waste reduction initiatives in Italy and Sweden indicate that legitimacy-seeking rationales are predominant during alliance formation. As alliances evolve, they transition into a phase where firms identify opportunities for eco-innovation, while ambitions of capability-building and new revenue creation shape the development of the alliances. This study contributes to eco-innovation and environmental alliance literature by showcasing how the pursuit of legitimacy facilitates established firms' adoption and implementation of eco-innovation through alliances with green start-ups.

KEYWORDS

Eco-innovation; green start-ups; environmental alliances; legitimacy; alliance rationale

JEL CLASSIFICATION

L24; O31; Q55

1. Introduction

The magnitude of global social and environmental challenges places business firms under constant scrutiny from their external stakeholders while trying to stay competitive. Due to their high visibility and widespread presence, large established firms are particularly strongly affected by expectations that they demonstrate ethically responsible behaviour regarding their environmental impact (Schaltegger and Burritt 2018). In order to meet such expectations and keep pace with competitors, firms need to consider opportunities to transform their business propositions by means of eco-innovation, i.e. development of new products, services, processes, and business models with environmental benefits (Kemp and Oltra 2011).

Eco-innovation requires firms to move away from business-as-usual practices and implement changes in their operation and mode of production activities. Most firms cannot pursue eco-innovation alone and need to develop new types of partnerships (De Marchi 2012; Frigon, Doloreux, and Shearmur 2020; Kobarg et al. 2020). For example, fashion incumbents like H&M and Zara collaborate with their suppliers in the

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development of products from renewable materials (Dzhengiz, Riandita, and Broström 2023); giant food manufacturers like Unilever partners with non-governmental organisations (NGOs) such as Marine Stewardship Council (MSC) (Dentoni, Bitzer, and Pascucci 2016); and major US firms cooperate with government agencies in promoting the adoption of clean technologies (H. Y. Lin 2019).

In a relatively recent development, established firms are increasingly also forming alliances with young entrepreneurial start-ups born with a specific objective and expertise in tackling environmental issues by introducing eco-innovation practices (Hübel, Weissbrod, and Schaltegger 2022; Riandita 2022). Some major industrial players even launch initiatives through a formalised programme (e.g. Unilever Foundry and HENRi@Nestle) to establish ties to such new ventures. In this study, we refer to such ventures as *green start-ups*. Green start-ups excel in integrating environmental and social value creation into their core business (Hockerts and Wüstenhagen 2010; Schaltegger and Wagner 2011) and are characterised by two main features. They command specific eco-innovation capabilities in terms of value proposition, creation, and delivery (Hübel, Weissbrod, and Schaltegger 2022) and enjoy a high level of environmental legitimacy due to their prominent sustainability ethos and engagement with broad stakeholders (Riandita et al. 2021). Partnering with green start-ups thus offers two types of potential benefits for established firms, and such partnerships are increasingly common – yet very little attention is given to this emerging form of alliance.

This study aims to analyse how established firms relate to this emerging category of external partners in their environmental initiatives. Extant alliance studies suggest that the established firms may benefit from their alliance relationship in several ways and that such benefits also drive firms' multidimensional strategic motives in alliance engagement (Das and Teng 2000; Hagedoorn 1993; Simonin 1997). Following the tradition in strategic alliance literature, we refer to such benefits and motives as *alliance rationales*.[1] Past studies of environmental alliances identify two distinct rationales: 1) to signal buy-in with broader agendas of sustainable transformation to gain legitimacy towards key stakeholders (Arya and Salk 2006; Delmas and Montes-Sancho 2010), and 2) to build new competencies enabling eco-innovation (Kobarg et al. 2020; Wassmer, Paquin, and Sharma 2014).

The first of these rationales can be described as a relatively passive and reactive mode of behaviour concerning environmentally motivated transformation, whereby firms exercise symbolic and financial 'arms-length' support for environmental causes rather than tackling them head-on (H. Lin 2012; H. Y. Lin and Darnall 2015). In contrast, competence-driven rationales for an alliance with a green start-up are associated with attempts to actively seek to shift operation and production processes towards enhanced efficiency and environmental performance. These attempts often entail substantive changes in the firms' mode of operation and core activities in the form of eco-innovation (Cassetta, Dileo, and Pini 2022; Kobarg et al. 2020).

Previous studies on environmental alliances have typically adopted a snapshot perspective at a specific stage, classifying alliances as being dominated by either competence-oriented rationales, where firms leverage alliances to facilitate eco-innovation, or strictly

[1]A set of factors that positively affect the estimated benefits of an alliance can constitute a *rationale* irrespectively of whether these benefits are eventually realised or not.

legitimacy-oriented rationales, where firms primarily use alliances as a signalling device (Jolink and Niesten 2020; H. Y. Lin and Darnall 2015; Wassmer, Pain, and Paquin 2017). In contrast, our study aims to investigate the interplay between legitimacy-oriented and competence-oriented rationales in forming and developing alliances. To this end, we adopt a temporal view to examine the alliance development through the formation, operation, and outcome stages (Das and Teng 2002).

Emphasising legitimacy-based motives alongside or instead of objectives of developing and diffusing eco-innovation has potential implications for understanding the role of alliances in firms' environmental initiatives. If pursued entirely for the sake of legitimacy, alliances can lead only partially – or marginally – to improved environmental performance since the increased reputation of the firm might only be based on stakeholders' perceptions rather than substantial changes in how business is managed (Bansal and Clelland 2004). Should alliances and other efforts fail to improve the firm's environmental performance, the firm may be accused of 'greenwashing' (Berrone, Fosfuri, and Gelabert 2017; Delmas and Cuerel Burbano 2011). Then again, previous research has indicated that certain types of symbolic measures may lead firms to substantive action in terms of environmental strategy (Hyatt and Berente 2017), and it is possible that partnering with green start-ups can play a role in shifting business practices even if the firms' engagement is initially driven by strictly legitimacy-seeking behaviour.

As our empirical setting, we focus on the issue of food waste. Food waste has been recognised as a particularly pressing issue globally due to its environmental, social, and economic significance (UNEP 2021). We perform empirical analysis through multiple case studies on seven alliances involving established firms collaborating with green start-ups in food waste reduction projects. Our observation covers 2017–2019, and we revisit the alliances in 2021.

The findings of our study suggest legitimacy-seeking from the alliance itself as the dominant rationale in the formation and outcome stages. As the alliances develop, many firms discover opportunities to build new capabilities and pursue new business opportunities in their interaction with green start-ups. We further demonstrate how the prevalence of each alliance rationale varies between the different stages of an alliance. In doing so, we provide insight into the relation between legitimacy-oriented and competence-oriented rationales identified in the established firms' alliances with green start-ups and their role in adopting and implementing eco-innovation.

The remainder of the article is structured as follows. Next, the theoretical positioning of this paper is set out in terms of research on environmental alliances and eco-innovation, followed by a description of the research methods. The findings of the exploratory analysis are then presented and discussed. Finally, the concluding section summarises the paper's contributions and suggests lines of future research.

2. Theoretical background

In this study, we define environmental alliances as strategic long-term partnerships involving the adoption of any device, system, process, problem, programme, product, or service that is new to the organisation (Dougherty 1999) and benefits the environment (Kemp and Oltra 2011). Such relationships are arranged under specific contractual arrangements without stipulating the partners' exclusivity. Prior studies on

environmental alliances have identified competence- and legitimacy-driven motives as the most salient rationales behind the formation of such alliances (Kishna et al. 2017; H. Y. Lin and Darnall 2015; Wassmer, Pain, and Paquin 2017). Alliances motivated primarily by legitimacy gains tend to differ from competence-driven alliances in terms of activities and interactions. For instance, alliances used to manage social evaluation, reduce stakeholder pressures and enhance the credibility of existing business practices often involve NGO partners, are associated with weak-tie partner relations and, in comparison to alliances that are centred on the development and diffusion of new products and services, are less likely to be sustained over time (H. Y. Lin and Darnall 2015; H. Lin and Nicole 2010).

2.1. Alliances enabling environmental legitimacy

Legitimacy perspectives based on institutional theory have been commonly used to study environmental initiatives (Schaltegger and Hörisch 2017). This study focuses on environmental legitimacy as one specific form of organisational legitimacy. Expanding on the seminal work on legitimacy by Suchman (1995), environmental legitimacy is a generalised perception or assumption that a firm's environmental performance is desirable, proper, or appropriate (Bansal and Clelland 2004; Berrone, Fosfuri, and Gelabert 2017). Such legitimacy is conferred by external and internal stakeholders, who assess the extent to which the firm's structures and activities related to environmental initiatives appear to conform with their own distinct and diverse norms and expectations (Ruef and Richard Scott 1998; Suddaby, Bitektine, and Haack 2017). For an established firm with high visibility and broad international presence, external stakeholders may include state regulators, industry players, consumers, and community constituents. Media coverage has, therefore, been defined as a critical element in reaching out to those stakeholders (Deephouse and Suchman 2008). Internal stakeholders, particularly the employees, are equally important as legitimacy evaluations may affect their involvement and motivation to work for the respective firm (Deephouse and Suchman 2008).

While legitimacy perspectives can be generally applied to the study of corporate efforts to tackle environmental concerns, the formation of certain types of alliances can of themselves provide legitimacy for an established firm (Dacin, Oliver, and Roy 2007; Kumar and Das 2007). Affiliating with environmentally legitimate alliance partners can provide environmental legitimacy for the partnering firm by means of association and signalling (Post, Rahman, and McQuillen 2015; Stuart, Hoang, and Hybels 1999). For example, industry players may gain and maintain their environmental legitimacy by obtaining endorsement from reputable environmental non-profit partners, such as WWF and Marine Stewardship Council (Dentoni, Bitzer, and Pascucci 2016; Mousavi and Bossink 2020). Alliances with green start-ups may serve similar signalling purposes and associate the established firm with eco-innovation and transformative ambitions without necessarily committing to transform its operations and business practices.

2.2. Alliances enabling eco-innovation

In the study of alliances from a strategic management point-of-view, alliances are generally seen as enabling operational efficiency and developing new organisational

capabilities to underpin competitive advantage (Mudambi and Tallman 2010). Studies focusing on the latter type of perspective, which is particularly relevant to the study of eco-innovation, are typically grounded in the resource-based view of the firm (RBV).

Following the RBV perspective, the value of an alliance depends on the one hand, on the forms and modes of the partnership (Oxley 1997) and on the other hand, on partner complementarity, i.e. the extent to which a partner contributes resources and capabilities that a focal firm does command (Prashant and Harbir 2009). More specifically, alliances are perceived as a rational means to develop new competencies and capabilities when they require resources of imperfect mobility, imitability, and substitutability, which the partner firm commands (Barney 1991). An alliance is considered advantageous when resource interdependency (Chen and Chen 2002) is combined with sufficient trust, e.g. regarding the partner's reliability and capability. Notably, both of these factors can be managed within an alliance – that is, both partners can actively strive to more effectively leverage complementarities and build trust as an alliance develops over time (Zaheer, McEvily, and Perrone 1998).

In the case of alliances with green start-ups, key resources that the established firms want to access are likely to include knowledge, skills, and networks that allow a better understanding of new markets and future regulations and policies regarding emerging environmental challenges (Hübel, Weissbrod, and Schaltegger 2022). Resources in the form of technological know-how and solutions can also be expected to play important roles (Colombo, Grilli, and Piva 2006).

2.3. Rationales in different stages of alliances

In extant literature on environmental alliances, there is a tendency to adopt a static conceptualisation of alliance rationales and to empirically study such alliances using a 'snapshot' perspective focusing on either the formation or operation phases of alliances (Feilhauer and Hahn 2021a; Jolink and Niesten 2020; Klitsie, Ansari, and Volberda 2018). An essential contribution of these studies is that they document how alliances tend to be oriented towards different objectives.

Successful alliances have, however, been characterised as highly evolutionary (Doz 1996), with each alliance undergoing a sequence of learning cycles (Ring and Van de Ven 1994). Following the formation of an alliance, inter-organisational exchange occurs based on formal agreement and informal obligations (Doz 1996; Zajac and Olsen 1993). Experiences from this process may lead to reconfiguration and redefinition of an alliance over time (Madhavan, Koka, and Prescott 1998). Firms may develop a set of rationales for their alliance engagement rather than just a single rationale (Barringer and Harrison 2000), motivating a broader range of alliance activities than was initially foreseen.

Considering environmental alliances as dynamic processes that evolve through different stages (Klitsie, Ansari, and Volberda 2018) and where the firms may develop their capability to learn from and interact with each other (Dentoni, Bitzer, and Pascucci 2016), we adopt the framework of Das and Teng (2002) to conceptualise alliances as undergoing a formation stage, an operation stage, and (eventually) an outcome stage, to investigate the prevalence of different types of rationales in each stage and their

implications towards the adoption and implementation of eco-innovation. More specifically, the paper addresses following research question: *How do legitimacy- and competence-oriented rationales interact in the formation and development of alliances between established firms and green start-ups.*

3. Research methods

For the empirical investigation of environmental alliances, we conducted a set of qualitative case studies. Case study methodology serves our objective in understanding the dynamic of and building theory from a phenomenon in a specific context (Eisenhardt 1989; Gibbert, Ruigrok, and Wicki 2008), the emerging type of partnership between large established firms and green start-ups. The research design is a multiple case study of environmental alliances between established food industry firms and a green start-up on a project aiming at food waste reduction. Food waste is a major environmental concern with a substantial impact, with 17% of total global food production wasted at retail, food service and consumer level (UNEP 2021). Food waste has been associated with up to 10% of global greenhouse gas emissions (UNEP 2021). In European countries, an estimated 100 M tons of food waste is produced each year, and the costs associated with food waste are estimated to be approximately €143 billion (Stenmarck et al. 2016).

We focus on food waste reduction projects involving established firms based in two European countries, Italy and Sweden. Italy is among the largest food producers in Europe by turnover, value-added, and number of companies (FoodDrinkEurope 2023), while Sweden is Europe's frontrunner in eco-innovation (Johansen 2022). Both countries set exemplary actions in their national food waste reduction programmes, as exemplified by the established national policy on food waste reduction measures (UNEP 2021; Johansen 2022).

We employ a theoretical sampling strategy to select cases for this study by selecting cases of environmental alliances likely to replicate or extend the emergent theory (Eisenhardt 1989). To this end, we choose partnerships involving established firms and green start-ups that include adopting a new device, system, process, product, or service to the firm and offer environmental benefits focusing on food waste reduction efforts (Dougherty 1999). The start-up partners should satisfy the criteria of 'green start-up' as developed in the influential study by (Hockerts and Wüstenhagen 2010) and be founded within 10 years before the data collection. To collect rich and varied insights, we selected established firms operating in different stages of the food supply chain (e.g. retailers, producers, and service providers), which allowed us to extend the theory to a broad range of firms (Eisenhardt 1989).

We follow Eisenhardt's (1989) suggestion to select between four and ten cases in order to establish external validity in multiple case study research. Our study comprises seven alliances between five established firms and seven green start-ups. While one established firm (Firm 4 or F4) collaborates with three start-ups (Start-up 4a, 4b, 4c or S4a, S4b, S4c), the other established firms collaborate with a single alliance partner. Moreover, our cases consist of alliances mainly initiated within a year before the first data collection period. This sampling choice increases the likelihood that informants can recall relevant events accurately to allow our observation of temporal embeddedness in each alliance (Langley

Table 1. Alliance description.

Firm	Expertise	Established	Alliance initiated	Project owner	Initial project	Revenue model
F1	Prepaid corporate services, including employee benefits and lunch tickets	1962	2016	CS manager	Doggy bags distribution to restaurants and companies within F1 network, food waste joint campaign in city events.	F1 sponsors S1 to produce doggy bags at a low price, F1 also gets shared revenue from sold S1 products in F1 e-commerce website
S1	Doggy bags producer	2016				
F2	Food producer, specialised in wheat-based products	1877	2013	Packaging research & Sustainability manager	F2 premium packaging made out of wheat waste as a marketing and communication tool	F2 supplies wheat waste for free, S2 produces premium packaging made out of the waste, F2 purchases the premium packaging
S2	Sustainable paper-based packaging producer	2009				
F3	Supermarket chain	1967	2017	Commercial manager & Marketing manager	Online platform and in-store food waste campaign for close-to-expiry F3 products, consumer purchase took place in F3 stores	F3 pays monthly subscription and shared revenue from products promoted through S3 platform
S3	Online retailer for close-to-expiry products	2015				
F4	Supermarket chain	1938	2016	Category manager	Private label juice made from fruit waste collected from F4 warehouse	F4 supplies fruit waste for free, S4a produces juice made out of the waste. F4 purchases the juice
S4a	Juice producer from fruit waste	2014				
F4	Supermarket chain	1938	2017	Innovation manager	Affiliation-based alliance; First project includes development of insects-based fish feed grown from F4 potato waste, to feed F4 fish products. Both potato and fish are F4 private label products	Non-financial transaction at the current stage
S4b	Sustainable food producer, including insect-based protein	2016				
F4	Supermarket chain	1938	2017	Sustainability developer	Online platform for close-to-expiry F4 products, consumer purchase took place in S4 platform	F4 receives shared revenue products promoted on the S4 platform
S4c	Online retailer for close-to-expiry products	2016				
F5	Furniture retailer & restaurant chain	1943	2015	Food project manager	Food waste measurement and reduction tools in F5 global restaurant chain	F5 pays annual subscription and purchases hardware equipment
S5	Developer of smart metre for food waste reduction	2013				

1999). An outline of each alliance, including information on its established year and activities, is presented in Table 1.

3.1. Data collection

Our study relies on two main categories of data sources: (1) semi-structured interviews with key persons involved in the alliance and (2) archival data, including public and private documents. The archival documents provide historical data, while the interviews offer historical and real-time information (Langley et al. 2013). We combine historical data and real-time observation for in-depth scrutiny of how the alliances unfold over time (Langley et al. 2013).

The primary data collection period lasted approximately two years, from early 2017 until the end of 2018, when theoretical saturation was reached (Eisenhardt 1989). In 2021, we revisited the cases to learn how the alliance relationship had developed beyond initiation and (early stage) continuation decisions through secondary data.

3.2. Interviews

Key informants from both sides of each alliance – established firms and their start-up partners – were interviewed. Established firms are represented by the project owner as our main informant, whose functional role varies between the organisations (see Table 2). Based on information from the project owner, we also interviewed other personnel involved in the alliance, e.g. sustainability managers. From the start-up partner, we talked to the CEO and other representative team members deeply involved in the partnership. Where possible and relevant, we interviewed more than one respondent from each firm to improve accuracy and minimise informant bias. In total, 18 informants were involved in the interview, allowing us to triangulate the project owner's perspective with the start-up perspective and corroborate information with the other informants.

We conducted two rounds of interviews with the project owner and the start-up representative at a 6-month interval. For other informants, we conducted one to two rounds of interviews. We performed 26 interviews, each lasting approximately 60 minutes for the first round and 30 – 90 minutes for the second round. The interviews were transcribed, resulting in a total of 212 single-spaced pages. Additionally, we sent follow-up emails for clarification or confirmation purposes.

3.3. Documents

Overall, we collected 96 archival documents, including 89 public and seven private documents from established firms and start-ups relevant to the alliances. Among the publicly available documents we use are all the sustainability reports ever released by the established firms. Other public documents include workshop materials, press releases, news articles, and webpages containing information on each alliance's activities. Private documents include privately shared project documents and emails of follow-up conversations with our informants. Archival data is beneficial for tracing event chronologies in

Table 2. Data sources.

Alliance	Firm	Respondents	Interviews	Documents	List of Documents
F1 with S1	F1 S1	• CS manager (2)* • CEO (2)	4	14	• 1 privately shared documents • 1 follow-up email • 4 reports • 2 workshop powerpoints • 1 press release, 2 webpages • 3 news and other
F2 with S2	F2 S2	• Sustainability professional (1) • Packaging research & sustainability manager (1) • Brand manager (1)	3	15	• 7 reports • 1 press release • 3 webpage • 4 news and other
F3 with S3	S3	• CEO (1) • Head of finance (2)	3	14	• 2 workshop powerpoints • 2 press releases • 6 webpages • 4 news and other
F4 with S4a, S4b, S4c	F4 S4a S4b	• Sustainability strategist (1) • Sustainability developer (2) • Category manager (1) • Innovation manager (1) • Former CEO (1) • Head of sales & marketing (1) • CEO (2)	9	35	• 3 privately shared documents • 2 follow-up emails • 9 reports • 1 workshop powerpoint • 6 press releases • 7 webpages • 7 news and other
F5 with S5	F5 S5	• Food project manager (2) • Food national manager (1) • CEO (2) • Head of strategy (2)	7	24	• 11 reports • 4 press release • 4 webpages • 5 news and other
Total			**26**	**102**	• 6 private documents • 90 public documents

*Number in brackets reflect the number of interview with each respondent.

a temporal manner (Langley et al. 2013) and providing information regarding events, objectives, and activities related to alliance development. Table 2 provides detailed information on our various sources of data.

3.4. Data analysis

Our analysis combined procedures for grounded theory (Corbin and Strauss 1990; Gioia, Corley, and Hamilton 2013) and process study (Langley 1999). Our process of data analysis included four steps:

In *step one*, we constructed a database using qualitative analysis software to collect interview transcriptions and archived documents related to the particular alliance. Data from interviews and archival documents was synthesised into individual case records for each alliance. An individual case record consists of a chronology of events and activities of each alliance. We also constructed timelines for key events relating to firms' alliances on food waste reduction based on various data sources, as listed in Table 2.

In *step two*, we performed open coding of textual data from the interviews. The Atlas.ti software was used for the coding process to improve reliability and allow

replication by establishing a case study database which includes notes, documents, and interviews collected during the study. This step yielded a list of first-order codes based on in vivo terms used by the informants that we found in each case {Gioia, Corley, and Hamilton (2013) #598}. For example, our code of 'alliance formation generates public communication and media exposure' refers to the informants' account of the initial focus of the alliance as 'PR (public relations)' and 'exposure in media'. This step is mainly conducted by the first author, who discussed it continuously with the other authors. The rationale behind this tactic is that investigators who have not met the informants and have not become immersed in case details may bring a different and possibly more objective eye to the evidence.

Step three was a more deductive, theoretically driven stage involving an in-depth exploration of literature. A process of axial coding was followed, whereby the first-order codes were grouped into second-order theoretical themes (Corbin and Strauss 1990; Gioia, Corley, and Hamilton 2013). Following exemplars of grounded theory, we did not seek independence as we moved to second-order themes; instead, we considered the data and literature in tandem. As we return to the literature (e.g. Jolink and Niesten 2020; H. Y. Lin and Darnall 2015; Watson et al. 2018), we examined the data for the emergence of themes. We grouped and regrouped the first-order codes in a provisional table with a visual framework to organise those codes into emerging categories (Ravasi 2017). Through this process, we were able to identify clusters of second-order themes. For instance, we grouped 'co-development of green products' and 'joint research on sustainable food processing' into the second-order themes 'developing green products and processes' as well as codes on 'operational intervention', 'use of data', 'IT integration', and 'measurable target' into the second-order themes of 'integrating sustainability into operation' building on insights from relevant literature (e.g. Dzhengiz and Niesten 2020; Watson et al. 2018). Similarly, "public communication and media exposure, 'affiliation', 'joint lobby against the government', 'participation in events' and 'external recognition' were grouped into 'building external reputation' guided by insights from literature (e.g. Deephouse and Suchman 2008; H. Y. Lin and Darnall 2015).

We continued by outlining tentative theoretical dimensions from the emerging patterns. We focused our effort on analysing the relationship between each second-order theme. The relationship between the emergent second-order themes connected the empirical data to theoretical dimensions (Gioia, Corley, and Hamilton 2013). We arrived at our aggregate theoretical dimensions through various iterations and many in-depth discussions about the deeper theoretical meaning of the second-order themes. We clustered together sets of second-order themes under three theoretical dimensions of alliance rationales: (1) legitimacy-seeking, (2) capability-building, and (3) creating new revenue streams. In this step we reiterated between data and theory to clarify our findings and theoretical arguments. For instance, leveraging the insights from previous alliance studies on environmental capability (Dentoni, Bitzer, and Pascucci 2016; Dzhengiz and Niesten 2020; Watson et al. 2018), we arrived at the second theoretical dimension of 'capability-building' from an aggregate of three related second-order themes 'developing green products and processes', 'building sustainability-focused networks', and 'integrating sustainability into the core operation'. Our data structure is presented further in Table 3.

Table 3. Data structure.

First-order codes	Second-order themes	Aggregate theoretical dimension
• Use of alliance to meet regulatory and tender requirements • Established firm confronted environmental issues prior to alliance formation	Signaling compliance with regulation and stakeholders' expectation	**Legitimacy-building**
• Alliance formation generates public communication and media exposure • Food waste reduction generates public communication and media exposure • Alliance agreement based on non-binding affiliations • Alliance engagement in a joint lobby against government agencies • Alliance participation in campaigns, public events, and exhibitions • Awards and recognition of the alliance's outcome	Building external reputation	
• Established firm initiates internal events and campaigns with the start-up's involvement • Established firm invites employees' engagement in the alliance initiatives	Maintaining internal credibility	
• Co-development of green products and packaging • Joint research on sustainable food processing	Developing green products and processes	**Capability-building**
• Established firm seeks new trends around foodtech and start-ups arena • Established firm's participation in sustainability networks through the alliance	Building sustainability-focused networks	
• Alliance activities targeting operational intervention • Alliance activities involve IT-system integration between partners • Established firm uses food waste reduction data provided by the start-ups • Creation of measurable targets and KPIs for food waste reduction	Integrating sustainability into the core operation	
• Alliance activities on selling close-to-expiry products • Alliance involves sales through an online market platform	Generating shared-profit and new sales channel	**Creating new revenue streams**
• Alliance involves sales of commercially viable products • Alliance involves sales of new green products • Alliance facilitates online activities to increase consumer traffic to offline stores	Introducing revenue-generation activities	

We revisited the data repeatedly to compare and verify the occurrence of specific themes within the individual cases. We follow replication logic by considering cases that deviate from the emerging themes to refine and extend the theory (Eisenhardt 1989). For example, we found evidence for legitimacy-seeking and capability-building rationales across all cases, but creating new revenue streams was missing from F2-S2. We also rely on the literature to improve the internal validity of this study (Eisenhardt 1989) by making sense and tying the emergent theory with relevant studies (e.g. Hübel, Weissbrod, and Schaltegger 2022; H. Y. Lin and Darnall 2015; Wassmer, Pain, and Paquin 2017; Watson et al. 2018).

The final and critical stage in our research (step four) involved working with the aggregate theoretical dimensions and revisiting each case (Langley 1999). Specifically, we returned to our empirical data to consider the temporal development of alliances and alliance rationales by scrutinising events, feedback, and reflections. To this end, we employed a temporal bracketing strategy (Langley 1999) that simplifies the temporal flows of the alliance development over time (Gehman et al. 2017). The emerging temporal brackets helped us to decompose processes into phases (Gehman et al. 2017) and enabled us to summarise the alliances in sequential stages: (1) formation, (2) operation, and (3) outcome.

4. Findings

Our analysis points to a pattern of how established firms' rationales evolve across the formation, operation, and outcome stages of an alliance. We structure our findings on key events in Table 4 and further discuss the emerging dominant rationales in each stage of the alliances.

4.1. Formation stage

Our findings show that at its initiation stage, the formation of every alliance in our sample is driven by legitimacy-seeking purposes. While some firms already in the formation stage have ideas about opportunities involving competence building or new revenue streams, the initial phase of these alliances is dominated by various activities that allow firms to build environmental legitimacy.

All established firms seek to promote their alliances with sustainability partners in solving food waste problems through various communication efforts. Across every alliance in our cases, external communication opportunities were regularly mentioned as key motives for initiating the partnership. For example, F1 and F3 promote their affiliation with green start-ups by listing their name in various promotional materials. Other firms promote their newly formed ties with start-ups through media communication.

> [We talk] a lot, in newspapers and on the web, about S4c and food waste. It's good PR [public relations]. (F4)

Through newly formed alliances, firms signal to external and internal audiences about their contribution to solving sustainability issues. F1, for example, is involved in many public tenders that require firms to demonstrate their commitment to sustainability. The firm recognises its close relationship with S1 as an essential source of such legitimacy. The alliance allows the firms to foster their reputation as ethical and responsible companies. Established firms believe partnerships with new and small players who are vocal and active in promoting their message around sustainability and food waste may contribute positively to the image of the firms. The manager responsible for F1 describes the reason for initiating a tie with S1 as being closely related to their food waste mission.

Table 4. Summary of findings.

	FORMATION STAGE	OPERATION STAGE			OUTCOME STAGE
Alliance	Legitimacy-seeking	Legitimacy-seeking	Capability-building	Creating new revenue streams	Legitimacy-seeking
F1-S1	• F1 sponsors S1 participation in public events • F1 distributes S1 doggy bags to F1 restaurant network for free • F1-S1 alliance was introduced in F1 public tender participation as an example of F1 sustainability commitment	• F1 seeks internal engagement by introducing the use of S1 doggy bags for the company's Christmas dinner • F1 and S1 in a joint lobby towards Italian government agency to apply laws regarding food waste and use of doggy bags	• Through S1's network, F1 joins the Observatory of Food Sustainability • S1 provides F1 data on the amount of saved food	• Insertion of S1 products in F1 e-commerce website	
F2-S2	• F2-S2 alliance was initiated to create sustainable packaging as F2 communication material		• F2-S2 R&D team co-develop sustainable packaging made out of F2 wheat waste		• F2-S2 co-developed product receives awards: Finalist – Luxe Pack in Green Awards 2014, Winner – Luxe Pack in Green Awards 2015, Bronze – A' Design Award and Competition 2015
F3-S3	• Online and in-store communication about F3-S3 collaboration on food waste reduction campaign		• IT system integration • S3 provides F3 with data on the amount of saved products, saved cost, CO_2 emissions, and promotional efficiency	• Sales of close-to-expiry F3 products • Increase consumer traffic to F3 stores	
F4-S4a	• F4 supplies fruit waste to S4 for free, and S4 produces bottled juice products out of the fruit waste • F4 purchases the juice from S4a and		• F4 and S4a co-create new recipes for the private label juice • F4 and S4a jointly develop transport and logistic operations of fruit waste collection from F4 warehouses	• F4 and S4a co-develop new products line made out of F4 fruit and vegetable waste, e.g. fruit shots, soups, ice cream. The new line is expected to generate profit	• F4-S4 co-developed product awarded Finalist – Nordic Council Environment Prize 2017

(*Continued*)

Table 4. (Continued).

	FORMATION STAGE	OPERATION STAGE			OUTCOME STAGE
Alliance	Legitimacy-seeking	Legitimacy-seeking	Capability-building	Creating new revenue streams	Legitimacy-seeking
	sells as a private label product, where profit is not expected		and stores around Sweden		
F4-S4b	• F4-S4b alliance was initiated as an affiliation-based partnership without a specific project • S4b presents insects-based protein research for F4 exhibitions and public relation events • F4 invites S4b founder for inspirational sharing sessions in F4 internal events targeted at employees and storeowners	• F4 and S4b involves in a joint lobby towards Swedish government agency in agriculture and food administration to advance the legislation regarding insect protein	• F4 and S4b initiated a joint research on insect-based fish feed for F4 private label fish products through utilisation of F4 potatoes waste • S4b provides F4 information and the latest development around start-ups and food-tech	• F4 sells S4b soy-based protein product, tempeh	
F4-S4c	• Media publication on F4-S4c alliance, where F4 is the first retailer partner of S4c		• F4 and S4c work together on IT system integration of (third-party) online sales • S4c provides F4 data on the amount of saved food	• Sales of close-to-expiry F3 products • Increase consumer traffic to F3 stores	• F4 publicly launched goal of halving food waste by 2025 • Continued attention to S4c refrigerators in selected F4 stores
F5-S5	• F5-S5 alliance was initiated upon stakeholder pressure on F5 horse meat issue • Media attention for F5-S5 alliance	• F5 seeks internal support by conducting internal survey on how F5-S5 alliance have influenced employees' behaviour towards food waste	• Through S5's network, F5 joins the executive coalition of Champions 12.3 • Operational intervention to reduce food waste, e.g. modification		• F5 publicly launched goal of halving food waste by 2020 • F5 wins Food Waste Award 2018 in Belgium in category the best caterer

(*Continued*)

Table 4. (Continued).

	FORMATION STAGE	OPERATION STAGE			OUTCOME STAGE
Alliance	Legitimacy-seeking	Legitimacy-seeking	Capability-building	Creating new revenue streams	Legitimacy-seeking
	• Published KPI based on number of meals		of portion size and menu • Project expansion to post-consumer plate waste reduction • S5 provides F5 with data on the amount of saved meal, cost, and CO2 emission • F5-S5 alliance co-develop the next generation of food waste smart metre based on AI technology		

> We tried to support an ethical new company because it was Italian and because it was addressing an Italian problem related to food waste. (F1)

F4's direct benefits from this involvement were opportunities to appear together with S4b at various public events. F4 invited S4b to an annual political summit in Sweden, where sustainability in the Swedish food industry was discussed. The CEO of S4b describes how his start-up was involved in several events and exhibitions with F4.

> They set up seminars and educational events where they showed off some innovation regarding future trends in food [. . .] I was there, and I held the seminar about future food and we also held an exhibition of our insect production there. We gave them those kinds of things. (S4b)

Our findings suggest that the established firms not only leverage their alliance relations with the green start-ups to reach out to external stakeholders; alliance activities have also been relevant in addressing employees and other internal stakeholders (in the case of F4: franchisee store owners). Gaining internal legitimacy may help firms raise employees' awareness and engagement with their sustainability strategies, as shown by S4a and S4b's involvement with F4's organisational activities.

> [S4b founder] has been in Helsingborg for inspirational days with the fruits and vegetables team, and he's been here as well for our dealers. So that's one thing, I mean, inspiration and trying to get people to think—yes, this is sustainable, like look at what you do. As we celebrated our 100-year anniversary last year, we also had him and his products, all the insects, around at the party. (F4)

> A target for us was to inspire our own team and people working in F4, but also other colleagues of ours in the fruit and vegetable business to do something, to do something creative with all the waste that we make in our part of the value chain. (F4)

4.2. Operation stage

As the alliances further evolve from the formation to the operation stage, we find that all alliances develop new features which are not primarily geared towards legitimacy benefits. In what follows, we delineate two important types of additional activities, aside from further legitimacy-seeking measures, that emerge in the operation stage of the alliances and their underlying rationale.

4.2.1. Legitimacy-seeking

While legitimacy benefits are most clearly pronounced in the initial stage of the alliances, firms continue to leverage the alliances to signal a commitment to a food waste reduction agenda to both external and internal audiences. In the second year of the alliance, F5 conducted an employee survey to study how their collaboration with S5 in reducing food waste at work premises affected their employees' behaviour towards food waste at home. The survey indicates that 50% of F5 employees working with this initiative are inspired to reduce food waste at home. In another case, F1 introduced their partnership with S1 to all the employees by utilising S1 doggy bags for the company's Christmas dinner.

> In Italy, we are three hundred people. We had a corporate party, and at the end of the party a lot of food was wasted, so we decided to use doggy bags for ourselves. (F1)

We also found indications of one type of legitimacy-oriented benefit realised only in the later stages of the alliances, namely joint lobbying. In a few cases, the alliances involve policy-influencing activities addressing the transition towards a more sustainable food sector. For instance, F1 urges the Italian government to apply stricter laws to tackle food waste, i.e. by following the example of France, where every food service provider is mandatorily required to provide doggy bags for consumers. In parallel, F4 promotes the advancement of legislation on insect protein from the Swedish authorities in agriculture and food administration. The combination of the established firms' access to high-level politicians and the start-ups' credibility as facilitators of environmentally oriented innovation would seem to offer potential opportunities in this context.

4.2.2. Capability-building

In the operation stage of all the alliances we study, interactions between the established firms and the green start-ups evolved to include activities that constitute or facilitate eco-innovation. Drawing on the resource-based view of the firm, we refer to such activities as *capability-building*. The established firms leverage the partners' skills and knowledge to build new organisational capabilities in food waste reduction and thus contribute more significantly to the environmental cause at stake.

We found alliance events in this stage to comprise several activities around joint product and process development efforts. F4 learnt from their collaboration with S4a as they identified a range of fruits and vegetables that could provide adequate volume for juice production. In the following stage, they jointly created recipes for their private-label juice products. The F4-S4b partnership developed into a new joint effort when, a few months after the initial agreement, legislation changed to allow the use of farmed insects as fish feed. Seeing opportunities to develop common activities in this area, F4 and S4b set up joint research and development on insect-based fish feed. F4 aimed to create a *circular* product line for its private label range by utilising potato waste to feed insects and, in the next stage, to use the insects to feed fish. Both the potato and fish products were conceived as F4 private labels. Apart from potatoes, they also experimented with other types of waste, including byproducts from beer production.

Interactions with start-ups also facilitate the development of new organisational capabilities in the form of knowledge and networks. In particular, the alliances involving start-ups that may be described as technology-driven (S3, S4b, S4c) gave the established firms insights into the latest trends in the food-tech domain. We also found that, over time, many alliances allowed the firms to develop their network in relevant communities. The start-ups were connected to groups and networks related to sustainability in the food sector. Thus, through the alliance, established firms became actively involved in sustainability-oriented networking organisations. For example, S1 introduced F1 to the Observatory of Food Sustainability, where various Italian food industry actors convene to discuss joint actions towards a more sustainable food sector. F1 joined the Observatory and has continued to participate. S5 paved the way for F5 to be part of Champions 12.3, a global coalition dedicated to mobilising actions and accelerating progress towards achieving the United Nations Sustainable Development Goals (UN SDGs) target 12.3 on food waste reduction. The coalition membership comprises senior executives from

governments, businesses, international organisations, research institutions, farmer groups, and civil society.

Developing new joint processes and capabilities generally involves investments from both partners. F4 and S4a initially processed fruit waste only from an F4 warehouse, i.e. waste resulting from the transport process. Over time, the scope of waste collection expanded to include other sources of fruit waste from F4 stores across Sweden. With the help of S4a, F4 adopted their established logistics and transport system.

> They have actually come up with an internal solution where they can send the fruits back with returning trucks because they have trucks that go to the stores every day. So the stores have the possibility to return the fruits with the same truck that delivers milk etc. back to the warehouse and we can pick them up from the warehouse. (S4a)

> On some occasions we had pallets or containers go to the warehouse. And that's enormous, in one container you have 24 tons of fruit. So those 8,000 kilos [of fruit waste] in the beginning have become so much more. (F4)

The alliance between F5 and S5 started with a project of reducing food waste only within the F5 kitchen operation. As F5 found S5 to be a highly agile and flexible collaborator, F5 decided to expand the project by including post-consumer plate waste. By measuring consumer waste, F5 could apply operational interventions, e.g. portion size adjustment or menu modifications.

> The next step is now the first thing for the team to get four stores to measure the amount of food waste in those four stores and also try more operational interventions. So maybe they will try some other portion sizes, exchange some ranges, and do these kind of more operational hands-on tests to see if that impacts the food waste in a positive direction. (F5)

In some other alliances, the food waste reduction project involved firms adopting new technology that enables impact measurement. The start-up partners provide F1, F3, F4, and F5 with quantitative inputs on environmental and financial performance measurement, including data on the amount of food saved, CO_2 emission prevented, and cost reduction.

> We can see the effects [of efforts to reduce food waste] in the amounts of food that we have saved and it's quite a lot of food, they can report to us how much that we have saved through the app for example, and also report to the stores how much they have saved. (F4)

> What we are following now is the reduction in direct food cost, meaning more or less the exact amount of food cost that we are not throwing away. But what we do not include is the additional saving coming from less use of electricity, less cost for disposal, or less hours used by workers preparing food that is later thrown away. The benchmark figure there is that direct food costs constitute approximately 50% of the total savings. (F5)

In conclusion, we found that developing the alliance between established firms and their start-up partners involves various exploration and exploitation processes of new environmentally related knowledge and capabilities. These activities broaden the scope of alliances, increase the value of alliances to the participating established firms, improve the contribution of allied firms to food waste reduction, and leave them better prepared for further engagement in such activities. Apparently, however, these factors were not the primary motivation for the formation of alliances.

4.2.3. Creating new revenue streams

Alongside capability-building, analysis of our cases identified a further type of alliance component that emerged in the operation stage. While not immediately apparent as a major driver for established firms in our sample to embark on any of the alliances, we found that as the alliances developed, activities allowing the creation of new revenue streams for both partners were introduced.

In the F4-S4b long-term development project on insect protein, F4 was expecting to pioneer the first chain of a circular product line under its private label. In other alliances, new revenue streams were realised already during the operational stage, e.g. how the F3-S3 and F4-S4c alliances facilitated additional sales of products that would otherwise become waste.

F1 started their collaboration with S1 with various projects focused on legitimacy-building, i.e. events sponsorship. In a further stage, F1 started including S1 products on its e-commerce website while encouraging all restaurants within its network to repurchase doggy bags through its platform. Additional revenue came from marketing S1 products through the F1 e-commerce website.

The affiliation-based alliance of F4-S4b evolved into the co-development of a *circular* product line. However, since the joint project was years from producing a marketable product, an alternative short-term plan was devised for capitalising on their alliance relation. F4 introduced a new S4b product line, soy-based protein *tempeh* as a meat-alternative product, into their store offering. As in the case of the insect protein, F4 believed such a product also resonates with the partner's brand and image as sustainability-driven and innovative.

> Well, there are still a lot of questions that need to be answered. We're not there yet but in the meantime, they have also developed products from gray peas here in Sweden … so it's a product that can be sold. They produce it, and we are selling it. (F4)

We encountered a similar development in the F4-S4a alliance, in which the F4 project owner stated clearly that F4 did not initially expect to generate a profit from the collaboration, as juice production is highly dependent on the volume of their fruit waste, which is a significant commercial limitation. Nevertheless, the partners were making plans for other product lines that allow more reliable product availability and may, therefore, be commercially viable.

The generation of new business activities strengthened the alliance, and we hence interpret this type of activity as a rationale alongside the legitimacy-seeking and capability-building rationales outlined above. Similar to the activities whereby firms develop capabilities for in-house eco-innovation, these activities contribute to eco-innovation. The critical difference is that whereas capability-building activities involve exploring innovation opportunities within the perimeters of the established firm, the new revenue streams are brought about through the exploitation of novel products developed by the green start-up.

4.3. Outcome stage

As a further development, around half of the alliances we studied declined or terminated as the project ended, such as in the case of F1-S1 and F2-S2. Regulatory hurdles (regarding the use of

insect-based protein) impeded the development of the F4-S4b alliance that the partners were hoping for, and relationships waned after 2018. The start-ups S4a and S5 were sufficiently successful for the focal alliance to become less critical to them as they broadened their scope of operations over the 2019–2021 period. As regards the established firms' benefits from the alliances in a more mature stage, two types of patterns emerge from the data. First, we find indications of firms garnering valuable external recognition later in the alliances. During a visit from the responsible minister in 2020, the system of special refrigerators storing 'expired' food products for sale operated by S4c was presented as an integral part of F4's efforts to reduce food waste. Alliance activities have also allowed established firms to participate in sustainability-themed contests. For example, the F2-S2 collaboration won several green packaging awards between 2014 and 2015.

Similarly, the F4-S4a collaborative project was a finalist for the Nordic Council Environment Prize in 2017. Due to their alliance with S5, F5 won the Food Waste Award 2018 in Belgium for achieving 41% food waste reduction in a year. Such achievements may have granted the firms further positive publicity in terms of their engagement with sustainability.

Second, we find indications that the alliances help firms meet publicly announced food waste reduction goals. In the later stage of the alliance, F4 and F5 set an official target of halving their food waste by the end of 2020 and 2025, respectively. To follow up on these goals, both firms continuously report their progress in terms of the percentage of food waste reduction compared to the baseline year.

5. Discussion

Our case analysis of seven alliances shows that established firms pursue alliances with green start-ups following different rationales that evolve over time. At the initial stage, legitimacy-seeking rationales dominate firms' motives to engage in alliances with green start-ups. Following the development of these alliances, the opportunities for capability-building and creating new revenue streams are discovered, increasing the scope of many alliances. Through this process, the established firms increase their ability to tackle the food waste issue by means of eco-innovation.

In the remainder of this section, we discuss how legitimacy-seeking rationales relate to competence-driven rationales and how this contributes to firms' ability to transform their operations and business practices through substantive environmental actions.

5.1. Legitimacy benefits derived from alliances with green start-ups

Our analysis identifies two sources of environmental legitimacy from established firms' alliances with green start-ups. On the one hand, we find that firms derive legitimacy directly from their involvement in alliances with green start-ups. Through the lens of institutional theory, such benefits can be understood as enabled by the social, symbolic, and signalling characteristics of alliances (Dacin, Oliver, and Roy 2007; Kumar and Das 2007). Forming a tie with a start-up with pro-environmental credentials symbolises an established firm's commitment to eradicating food waste. The start-up partner provides a social endorsement to the established firm for signalling their sustainability ambition to external stakeholders, including consumers and policymakers, and internal stakeholders, particularly their employees, through

the firm's various means of communication (Baumann-Pauly et al. 2013; Deephouse and Suchman 2008). We also find indications that established firms can leverage the image of start-ups as being innovative and transformative. The established firm may, therefore, benefit from the spillover of such combined credibility (Post, Rahman, and McQuillen 2015; Stuart, Hoang, and Hybels 1999).

On the other hand, established firms also gain legitimacy by adopting and implementing eco-innovation practices in various food waste reduction initiatives enabled by the alliances. Along with the development of the alliances, firms continuously communicate new initiatives and milestones of their overall goals in food waste reduction. By setting and achieving ambitious goals to reduce food waste in some firms' business operations, the firms expect to derive environmental legitimacy from their transformed business practices and achieve their goals (Berrone, Fosfuri, and Gelabert 2017). To this end, the established firms leverage various media communications to reach out to external stakeholders and society at large (Deephouse and Suchman 2008).

5.2. Evolving rationales for the development of alliances with green start-ups

Our analysis suggests that the seven alliances we have studied may be driven by more than one type of rationale. However, the relevance of each type of rationale, as considered from the perspective of established firms, changes over time. In particular, if viewed from a snapshot perspective, an alliance may seem to be dominated by either competence-oriented or legitimacy-oriented rationales (H. Y. Lin and Darnall 2015; Wassmer, Pain, and Paquin 2017). Firms may employ a portfolio approach (Dzhengiz, Henry, and Malik 2023), where, e.g. alliances with NGOs and alliances with green start-ups play separate purposes. Still, we must also understand that rationales for a single alliance may change over time, and legitimacy theory as such does not shed further light on why and how alliances develop. This means that alliances in an eco-innovation context benefit from being studied through the joint lenses of legitimacy theory and more traditional theoretical perspectives such as the RBV. It also means that we need to apply both perspectives to understand how alliances between established firms and green start-ups are able to transform the initial ambitions of signalling environmental initiatives into substantive environmental actions (Hyatt and Berente 2017). Specifically, we find that instances of legitimacy being derived directly from an alliance are particularly prominent in the formation stage of the alliances. During the operation stage, capability-building rationales play a dominant role in parallel to the creation of new revenue streams. Finally, in the

Table 5. Rationales across alliance stages.

Rationale	Formation stage	Operation stage	Outcome stage
Legitimacy-seeking *(from alliance itself)*	Dominating	Present	Less relevant
Capability-building	Less relevant	Dominating	Less relevant
Creating new revenue streams	Less relevant	Present	Less relevant
Legitimacy-seeking *(from eco-innovation practices)*	Less relevant	Present	Dominating

outcome stage of the alliances, legitimacy-seeking rationales again play a dominating role. In contrast to the formation stage, however, legitimacy is derived from a successful implementation of eco-innovation practices on food waste reduction rather than from the alliance per se. Table 5 below summarises these patterns.

While these patterns regarding alliance outcomes are present across our seven cases, we do not suggest that all firms have similar intents and expectations regarding the evolution of rationales from the outset. In some of our cases, the data indicates that alliances were initiated in an open-ended fashion. In contrast, others were more connected to a well-defined ambition regarding food waste reduction. For example, ambitions to create new revenue streams are already embedded in the alliances F3-S3 and F4-S4c at the formation stage in the form of shared profit from every close-to-expire product sold through the online platform. Such gains are also achieved in the operation stage of these alliances. In the alliances F1-S1, F4-S4a, and F4-S4b, opportunities to develop new revenue streams are first identified in the operation stage of alliances. A similar pattern applies to capability-building. Legitimacy from implementing eco-innovation practices is, however, present as a relatively long-term ambition in all alliances – albeit with significant differences in how well-defined these ambitions are.

We suggest that the empirical observation of shifts in alliance rationales can be theoretically rationalised. To complement our understanding of alliance development from the institutional theory viewpoint in the previous section, we resort to the RBV perspective on alliance rationales, which sets resource complementarity between partners centre stage (Prashant and Harbir 2009). Partnering with green start-ups offers the established firms access to strategic resources in the form of capabilities that enable eco-innovation and stakeholder engagement (Riandita 2022). The resources and capabilities commanded by the green start-ups in our study are imperfectly mobile and imitable since they are rooted in expertise and technological developcific to the issue at hand (food waste) (Barney 1991).

Our findings reveal that the established firms draw on the alliances to develop new organisational capabilities in the form of green product development and manufacturing (F4-S4a, F4-S4b), supply chain and logistic improvement (F4-S4a, F5-S5), adoption of new technology (F3-S3, F4-S4c), and impact measurement (F1, F3, F4, F5). Furthermore, they also develop capabilities in managing and collaborating with stakeholders, not only the internal and immediate stakeholders, e.g. employees and customers (Baranova and Meadows 2017), but also the broader stakeholders in the industry and supply chain network such as those found in S5-F5 and S1-F1. These forms of environmental capabilities enable established firms to succeed with the adoption and implementation of eco-innovation through collaborative efforts (Watson et al. 2018).

Efforts geared towards products and process eco-innovation require close interaction and active engagement from both partners to be effective (Muscio, Nardone, and Stasi 2017). Over time, investments by both partners generate alliance-specific assets that enhance the alliance's value and enable eco-innovation (Zaheer, McEvily, and Perrone 1998). Specifically, many new capability needs are identified (Dentoni, Bitzer, and Pascucci 2016) that lead to enhanced environmental performance (Dzhengiz and Niesten 2020). Consequently, an alliance that initially was dominated by activities aligned with legitimacy-seeking rationales may develop new functions emphasising capability-building and the pursuit of new business opportunities over time.

While the enhanced environmental performance from the implementation of eco-innovation practices will only materialise in the long term, our observation suggests that the environmental capabilities also enable firms to enjoy the medium-term benefits of generating new revenue streams through, e.g. creation of green products (Dangelico, Pontrandolfo, and Pujari 2013). As exemplified by alliances F1-S1 and F4-S4b, creating a new offering will generally imply a need to develop engagement-related capabilities with various stakeholders beyond the alliance partner (Dangelico, Pontrandolfo, and Pujari 2013); hence outcomes of this type will generally be achieved at a later stage.

Compared to the other two types of rationales that we have investigated, the realisation of capability-building requires a significantly higher level of inter-partner trust and knowledge to identify and realise resource complementarities (Hübel, Weissbrod, and Schaltegger 2022; Kumar and Das 2007). We propose that the short-term gains in legitimacy and new revenue stream creation pave the way for alliances with green start-ups to flourish precisely because they 'buy time' for the partners to learn sufficiently much about each other's resources and opportunities for eco-innovation related to these resources.

Overall, we observed that the shift from legitimacy-seeking towards capability-building and creating new revenue activities has been central for all alliances to move from a purported ambition to actual capacity in tackling food waste issues, thus enhancing the firm's environmental performance. Legitimacy rationales in forming alliances can be associated with a passive stance towards pressure for transformation towards more sustainable practices, where a firm seeks to manage its reputation without changing its business operation. The legitimacy-seeking rationale for firms' alliances with NGOs, for example, has previously been associated with a symbolic way of addressing environmental challenges and, on the extreme side, a greenwashing effort (Delmas and Cuerel Burbano 2011; Torelli, Balluchi, and Lazzini 2020). Such responses have been criticised as leading to a somewhat limited and, if any, trivial impact on the underlying issues and challenges. However, when alliances initially driven by legitimacy rationales lead firms to identify and evaluate paths to the adoption and implementation of eco-innovation, these partnerships contribute to equipping firms to move away from strictly symbolic engagement to acquiring new competitive advantage and improve the sustainability of their operations and business offering through eco-innovation.

6. Conclusions

This paper analyses the emerging alliances between established firms and green start-ups for adopting and implementing eco-innovation. Specifically, we explore the interplay of different rationales of an established firm as it enters into and maintains such alliances. We find that while legitimacy-focused rationales play a key role in bringing the seven alliances that we study into existence, opportunities for building competencies that allow firms to engage more deeply with eco-innovation are crucial for such alliances to grow and flourish.

Our study connects the growing literature on environmental alliances and eco-innovation in two ways. First, the study illustrates the role of green start-ups as a relatively novel alliance partner for established firms and documents how these alliances contribute to the development and diffusion of eco-innovation. Specifically,

we describe how the alliances facilitate capability-building that is relevant to new product development and process efficiency efforts. However, we also show that this type of alliance can involve activities through which existing innovations developed by green start-ups achieve greater market exposure by being distributed through the sales channels of established firms. Therefore, our paper extends insights from previous studies highlighting established firms' interest in allying with green start-ups (Hübel, Weissbrod, and Schaltegger 2022; Riandita 2022). Second, the study provides novel insights into how the two salient alliance rationales based on legitimacy and capability-building pave the way to the established firms' adoption and implementation of eco-innovation. Within the broader literature on strategic management and sustainability, we find significant evidence that while certain types of symbolic measures are likely to lead to substantive action, it has also repeatedly been noted that arms-length engagement can keep an organisation from further engagement by reducing external pressure of compliance (Hyatt and Berente 2017). Our findings suggest that alliances with green start-ups may be less susceptible to this type of 'greenwashing' behaviour than many other measures (e.g. alliances with NGOs).

Furthermore, our study contributes to the environmental alliance literature by examining such alliance throughout the formation, operation, and outcomes stage, whereas previous studies have tended to focus on a particular phase of the alliance (e.g. Jolink and Niesten 2020; Klitsie, Ansari, and Volberda 2018). The study also offers insights into the boundary conditions of an institutionally-based theory of alliance rationales and complementarities between the institutional perspective and the more traditional RBV perspective in investigating firms' engagement with environmental alliances. A notable example of such complementarity is that it allows us to revisit classic problems, such as the relative virtues of alliances and acquisitions, for the specific case of alliances with green start-ups. Traditional RBV analysis of inter-firm relationships stipulates that alliances are preferred over acquisitions when the valuable assets of the target firm are mixed with non-desired but imperfectly separable assets (Das and Teng 2000). Our analysis shows how legitimacy benefits derived from the alliance themselves – benefits that would not be attainable if the firm acquired and integrated the start-up – further strengthen the appeal of arms-length relationships. In doing so, this study complements extant literature that examined such alliances through a single lens (e.g. Inigo, Ritala, and Albareda 2020; Kishna et al. 2017; H. Y. Lin and Darnall 2015; Wassmer, Pain, and Paquin 2017)

Our study has several limitations. In most of our cases, we observe the established firm's first experience allying with a green start-up – at least within the specific context of the alliance (food waste reduction). By focusing on the dyad interaction between the established firms and green start-ups, we have not considered whether the alliance development might also be influenced by other firm-level factors, e.g. sustainability and general alliance strategies. An empirical limitation is that the case study material we draw on is related to a single type of sustainability issue, and the selection of cases is limited to a single industry. As such, our conclusions regarding generalisability must be limited.

This study offers several potential avenues for future research. For example, future studies could investigate whether sustainability-oriented alliances set up by firms with repeated experience in establishing such alliances tend to follow a different pattern.

Future research may also benefit from investigating patterns of co-evolution between firms' general alliance, sustainability, and innovation strategies. Finally, our conceptualisation of alliance rationales as shifting focus over time calls for further research on how firms can and should manage their alliances with green start-ups (and similar partners). The existence of partly parallel rationales in an alliance can also be argued to require more multifaceted management of the individual alliance. Many sustainability alliances, such as most cross-sector partnerships, are managed by managers whose roles are directly linked to sustainability (Feilhauer and Hahn 2021b). 'Traditional' alliances, which are less strongly driven by legitimacy-oriented rationales, are anchored in the organisation differently, with direct linkages to the line organisation and – in many established firms – through a dedicated alliance management function (Kale, Dyer, and Singh 2002; Russo and Vurro 2018). Sustainability alliances motivated by 'Traditional' alliance rationales related to capability-building ambitions would, similarly, need to be anchored well beyond the sustainability management function. With alliances with green start-ups being significantly driven by both types of alliance rationales, albeit with distinct emphasis across phases, we may expect that firms are required to integrate their sustainability management with other relevant functions in navigating their relationships with start-ups. In other words, we expect firms to shift management of legitimacy-seeking alliance activity closer to their core operations. This shift in management practice may contribute to moving sustainability initiatives closer to firms' central operations (Ivory and Bradley MacKay 2020). These tentative conclusions do, however, need to be further explored and empirically investigated in further research.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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