

# **Motivations of Environmental Alliances: Value Creation and Externalities**

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## **Abstract**

Environmental inter-firm alliances have increasingly become the corporate response to sustainability demands in society. Environmental inter-firm alliances exploit and explore environmental technologies to address new market opportunities while simultaneously seeking to generate positive environmental impacts. Compared to the well-established theories on motivations of strategic alliances, the research on the motivations of environmental inter-firm alliances has remained dispersed and underdeveloped. One of the striking idiosyncrasies of environmental alliances is the generation of environmental externalities, or in other words, the generation of environmental value associated with positive effects on air, water, land and biodiversity. Based on a systematic review of 121 articles on environmental inter-firm alliances, this paper shows that environmental value is not only beneficial for the environment but can be transformed into economic value for the alliance. The extension of the notion of value creation beyond the economic realm allows for a new classification of alliance motivations. The paper identifies motivations of environmental alliances that lead to the generation of environmental externalities, and motivations that internalize the externalities by creating economic value. The new classification illustrates that insights from existing theories on strategic alliances, including the resource-based view, resource dependence view, institutional theory and transaction cost economics, can be extended to understand the motivations of environmental inter-firm alliances.

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## Introduction

The literature on strategic alliances conveys a long tradition of factors explaining the motivations for inter-firm alliances (Ariño 2003; Christoffersen 2013; Christoffersen *et al.* 2014). In recent decades the list of alliance motivations has gradually expanded to include incentives related to the sharing of risks and costs, combining complementary resources and competences, accessing geographic markets and product domains, and creating legitimacy for the firm (Das and Teng 2000; Dacin *et al.* 2007; Jolink and Niesten 2012). Despite this variety of motivations, the ultimate objective of inter-firm alliances is the creation of economic value (Madhok and Tallman 1998; Lavie 2007; Nickerson *et al.* 2007).

However, in recent decades inter-firm alliances have emerged that do not only focus on economic value but also aim for environmental value, or better still, an integration of environmental and economic value (Lin 2012ab). These environmental alliances are inter-firm arrangements that aim “to create economic value by exploiting new market opportunities while simultaneously seeking to generate positive environmental impacts” (Wassmer *et al.* 2014). They engage in the exploration and exploitation of, for example, renewable energy, green transportation, sustainable textiles and organic products (Li *et al.* 2014; Stadler and Lin 2017). Extending value creation beyond the economic realm raises questions about the alliance motivations for creating environmental value (Meyskens and Carsrud 2013; Weber *et al.* 2017). Recent discussions on value creation in inter-firm alliances identify stakeholders beyond the boundaries of the alliance (e.g. Volschenk *et al.* 2016) and thereby propose a new field of enquiry that revolves around the differences between internal (to the alliance) value and external value, or *externalities*. This paper responds to the call for more studies that “analyse how the micro role of firms and industries interacts with a ‘macro-view’ of the world ... in order to better address ‘environmental externalities and collective action failures’” (Whiteman *et al.* 2013).

In this paper, we focus on two types of externalities. First, we identify environmental value as those contributions by environmental alliances that impact the environment in a positive manner due to benefits to air, water, land and biodiversity (Meyskens and Carsrud 2013). From the perspective of the alliance, environmental value is considered to be equivalent to positive environmental externalities, which occur when the positive environmental impacts result in benefits not compensated for by others (Eidelwein *et al.* 2018). Second, environmental alliances also create environmental knowledge value, due to the innovative nature of some environmental technologies (e.g. Ning and Wang 2018). When an alliance develops an environmental innovation, knowledge of the environmental technology spills over to society thereby creating environmental knowledge externalities (De Marchi 2012). Alliances and alliance partners will be stimulated to generate these two types of externalities when they can internalize some of the benefits, or in other words when they can create economic value by capitalizing on the environmental (knowledge) value that is jointly generated (Mailath *et al.* 2004).

This paper reviews 121 articles on environmental inter-firm alliances. A synthesis and re-assessment of these articles enable us to make several contributions to the literature. First, we offer a new classification of motivations of environmental alliances, by distinguishing between motivations that generate environmental externalities or environmental knowledge externalities, and motivations that create economic value by internalizing environmental externalities or environmental knowledge externalities. Second, we build this classification by illustrating that existing theories on strategic alliances, including the resource-based view, resource dependence view, institutional theory and transaction cost economics, can be extended to understand the motivations of environmental inter-firm alliances. For instance, firms collaborate in environmental alliances to share knowledge on sustainability, to reduce sustainability risk or to jointly respond to stakeholder pressures and thereby generate

externalities. Environmental alliances also create economic value by internalizing externalities, because they reduce transaction costs and enhance partners' competitive advantage and legitimacy. Third, we enhance our understanding of inter-firm alliances by showing that economic value cannot only be generated internally, but also by internalizing externalities or in other words by creating economic value from environmental (knowledge) value. The paper thus helps to understand when firms and their alliances are motivated to generate positive environmental impacts.

The paper is structured as follows. First, the theory section discusses the literature on inter-firm alliances, their motivations and the creation of economic value. It defines environmental inter-firm alliances and the generation and internalization of externalities. This section concludes by proposing a new classification of motivations of environmental alliances. Second, the methods section offers insights into our processes of screening, selecting and synthesizing the literature. Third, the results section reports on the evidence from the reviewed articles that builds the classification on motivations of environmental alliances. The final section discusses our contributions and offers several suggestions for future research.

## **Theory: Environmental Alliances, Value and Externalities**

### *Inter-firm alliances and economic value*

Within the management literature, inter-firm alliances come in a variety of definitions (Buckley and Casson 1989). The common denominator in these definitions of an inter-firm alliance is the reference to the “voluntary cooperative inter-firm agreement” (Das and Teng 2000, p. 33) “aimed at the development, manufacture, and/or distribution” (Zollo *et al.* 2002, p. 701) of products or services, which “can include contributions by partners of capital, technology or firm-specific assets” (Gulati and Singh 1998, p. 781) to “create economic value” for the alliance (Dyer *et al.* 2018, p. 137). Other definitions in the literature stress the temporality of

the agreement (e.g. Lavie 2007), the legality of the relationship (e.g. Volery and Mensik 1998), or the accumulation of knowledge and the creation of new opportunities offered through alliances (Zollo *et al.* 2002), yet the overall understanding is that alliances are expected to create more value than 'go-it-alone' approaches (Murray *et al.* 2005). Although some research streams do not restrict alliances to inter-firm agreements, this paper will be confined exclusively to cooperative agreements between firms.

In this paper we will define economic value as “the net rent earning capacity of an asset or resource, tangible or intangible” (Madhok and Tallman 1998, p. 328). In an inter-firm alliance, joint economic value is created by the alliance partners, which is value that the partners cannot achieve independently (Dyer and Singh 1998; Lavie 2006). Such a relational rent is a supernormal profit “created through the joint idiosyncratic contributions of the specific alliance partners” (Dyer and Singh 1998, p. 662). Figure 1 illustrates that the joint economic value is internally created within the inter-firm alliance (①).

In the definition of Madhok and Tallman (1998), the potential economic value is based on the rent earning capacity of the combined assets or resources in the alliance, minus the potential costs associated with transacting through an alliance. The potential value, rents and costs need not be realized and Madhok and Tallman (1998) go through great efforts to explain the factors internal to the alliance that reduce the difference between potential economic value and realized economic value. In the formation of the alliance the partners combine their unique resources to strengthen their mutual position (Barney 1991) and the value they realize jointly will be within the boundaries of the net rent earning capacity (Figure 1, dotted area ①).

### Motivations of inter-firm alliances

The literature on inter-firm alliances is built on a variety of theoretical perspectives, including the resource-based view (RBV), the resource dependence view (RDV), institutional theory (IT)

and transaction cost economics (TCE) (Kogut 1988; Eisenhardt and Bird Schoonhoven 1996; Parmigiani and Rivera Santos 2011; Jolink and Niesten 2012). Although these theories agree that firms enter into an inter-firm alliance because they are motivated by improvements in their value creation (Parmigiani and Rivera Santos 2011), the theories differ in terms of their emphasis on the specific motivations that contribute to the creation of economic value. In terms of the adopted Madhok and Tallman framework, some theories emphasize an increase in rents whereas other theories emphasize a decrease in costs to increase the realized value. This can be specified in the individual theories as follows.

One of the main motivations of inter-firm alliances offered by RBV is that firms are given access to the complementary resources of their partners (Glaister and Buckley 1996; Ireland *et al.* 2002; Niesten and Jolink 2015). These resources may consist of information, knowledge, capabilities and technology as well as production and distribution capacity and may increase the relational rents (Glaister and Buckley 1996; Gulati 1999; Ireland *et al.* 2002; Meier 2011). According to RDV, firms pursue access to these resources as a way to cope with uncertainty and respond faster to changes in industries and markets (Eisenhardt and Bird Schoonhoven 1996; Reid *et al.* 2001). In addition, IT argues that firms aim to reduce uncertainty by partnering with firms that already have a good reputation and legitimacy in an industry (Dacin *et al.* 2007). An alliance may transfer some of the partner's legitimacy to the firm and may convince others that the firm abides by the rules, values and norms of that industry (Eisenhardt and Bird Schoonhoven 1996; Parmigiani and Rivera Santos 2011). Other explanations, such as TCE, have proposed the reduction and sharing of transaction costs in an alliance as a strong motivation for inter-firm alliances (Glaister and Buckley 1996; Wassmer 2010; Meier 2011). Alliances reduce transaction costs by providing safeguards against the contractual hazards that result from opportunistic behaviour and investments in specific assets (Kogut 1988; Parmigiani and Rivera Santos 2011; Jolink and Niesten 2012).

### *Identifying environmental alliances*

With the advent of environmental alliances, the question arises whether existing motivations of inter-firm alliances presented in the management literature are equally applicable to alliances that have a combined focus on economic and environmental value. This question obtains its legitimacy from the fact that, in recent years, firms have increasingly been confronted by pressures from stakeholders to respond to environmental rules and norms (Blind *et al.* 2017; Popp *et al.* 2011). These pressures take the form of policy and regulations on restricting carbon emissions or the use of toxic substances, but they also result from consumers demanding more environmentally friendly products (Berrone *et al.* 2013). The accumulation of consumer pressures for environmental norms has induced firms to present themselves as environmentally responsible change agents and has allowed them to adapt themselves in a manner that matches the new norms and the new competitive environment (Wassmer *et al.* 2014). To respond to these pressures, firms have opted to form alliances aimed at improving environmental sustainability (Mura *et al.* 2018).

The emergence of these environmental alliances has also been explained by competitive imperfections in factor or product markets and by regulatory failure (Den Hond 2010), offering opportunities to create new economic rents (Alvarez and Barney 2004; Callahan and Kloby 2007). These competitive and regulatory imperfections have induced firms to collectively pursue value through new market opportunities while simultaneously working toward positive environmental impacts (Wassmer *et al.* 2014). For example, General Motors and Honda Motor Co. formed an environmental alliance in 2017 to exploit the market of hydrogen fuel cells but simultaneously seek to mitigate greenhouse gas emissions (Wn.com). Research on alliances has sought to identify environmental alliances and to conceptualize the relations of the partners engaged in environmental improvements (e.g. Stadler and Lin 2017), such as relations between firms and government (Selsky and Parker 2010) or between firms and NGOs (Kourula and

Laasonen 2010). Within this body of research studies on environmental inter-firm alliances are either relatively scarce or dispersed across disciplinary boundaries (Wassmer *et al.* 2014).

Our study aims to fill this knowledge gap by analyzing environmental inter-firm alliances. We focus on environmental inter-firm alliances, because they are unique in their combined focus on economic and environmental value. We define environmental inter-firm alliances as voluntary inter-firm arrangements bringing together firms that exchange, share or co-develop environmental knowledge, products, services, technologies or business models (Stadler and Lin 2017) “to address environmental problems and common objectives that encourage the invention, manufacture, and marketing of green and sustainable products or technology” (Meyskens and Carsrud 2013) and thereby aim to create economic value by exploiting new market opportunities that generate environmental value (Wassmer *et al.* 2014).

#### Environmental value: Generating environmental externalities

Several authors have recognized that joint value creation can extend beyond the economic realm and may include the generation of environmental value (Meyskens and Carsrud 2013; Paquin *et al.* 2015; Weber *et al.* 2017). Recent discussions on joint value creation in inter-firm alliances identify stakeholders beyond the boundaries of the alliance (e.g. Volschenk *et al.* 2016), arguing that value creation may interact with stakeholders at different levels (e.g. Lepak *et al.* 2007). By allowing external parties to alliances to interact raises questions on a potential difference between internal (to the alliance) value and external (to the alliance) value, or *externalities*. Internal (to the alliance) value is mostly framed in terms of the economic value for the alliance, and has been discussed extensively in the strategic management literature in terms of its creation and its capture (e.g. Kale *et al.* 2000). External (to the alliance) value is mainly framed in terms of customer value (e.g. Bititci *et al.* 2004), but can in principle be



represented by any value ‘valued’ by non-alliance agents. Environmental value is by definition one kind of external value.

Environmental value has been defined as “value that is created at local, regional, national, and international levels that results in a positive effect on the environment due to benefits to air, water, land, and biodiversity” (Meyskens and Carsrud 2013, p. 74). Environmental value is often framed in terms of environmental efficiency gains, such as the reduction of waste or more efficient use of resources (Volery 2002; Antolin-Lopez *et al.* 2019). The concept of environmental value thus represents those contributions by alliances that impact the environment in a positive manner (see Figure 1, ②), and is therefore an external value (to the alliance) valued by local, regional, national, and international agents.

In the literature the complexity of the ‘value’ of natural resource has been extensively discussed. For example, Loomis *et al.* (1991) observed that environmental value is much more complex and often comprises a composite of many different kinds of value involving the value related to the commercial use or recreational use of the environment, the option demand from maintaining the potential to visit the environment in the future, the existence value derived from simply knowing the environment exists in a preserved state, the bequest value derived by individuals from knowing that future generations will be able to enjoy existence or use of the environment. The literature has also observed several complications that may arise when environmental value is compared to economic value. For example, environmental value is hard to compare to economic value when both are valued on different scales, which may be expected given the composite nature of environmental value (Vatn and Bromley 1994). But also, unless the environment is commoditized and valued in an exchange setting, the environmental value will need to fit into a rent-generating framework to be conceptually congruent with the mainstream debate on economic rent creation. It is for this reason that we argue that environmental value is not directly compared to economic value, but instead will offer

opportunities to create new economic rents for the alliance, and, from the perspective of the alliance, environmental value is equivalent to positive externalities.

Positive externalities occur when parties external to the alliance benefit from a good without incurring the full costs corresponding to the true value of the benefit received (Cohen and Winn 2007). Positive environmental externalities are externalities that occur when environmental impacts result in benefits not compensated for by other parties (Eidelwein *et al.* 2018). Some examples of initiatives that lead to positive environmental externalities are reforestation programs, carbon emission neutralization programs, use of raw materials from renewable sources, and investments in preservation and environmental education (Eidelwein *et al.* 2018; Pigou 1920). Since environmental alliances are defined as alliances that generate environmental value, they by definition create positive environmental externalities.

Environmental alliances also create positive environmental knowledge externalities, due to the innovative nature of some environmental technologies (e.g. Ning and Wang 2018). When an alliance develops an environmental innovation, knowledge of the environmental technology spills over (see Figure 1, ③) to other firms and society at large who benefit from the R&D investments of the innovating alliance (Cainelli *et al.* 2012; Faucheux and Nicolai 2011). In addition, the environmental innovation benefits society in the form of improvements in environmental sustainability (De Marchi 2012, p. 615; Faucheux and Nicolai 2011). In the discussion of environmental alliances, several authors have elaborated on the concept of value beyond economic value, arguing that alliances generate knowledge value in addition to economic value (Volschenk *et al.* 2016). As knowledge (and knowledge value) is less tangible than economic value it can become public knowledge for the industry or society at large (③), hence generating a positive externality. It is for this reason that we argue again that environmental knowledge value will offer opportunities to create new economic rents for the

alliance, and, from the perspective of the alliance, environmental knowledge value is equivalent to positive externalities.

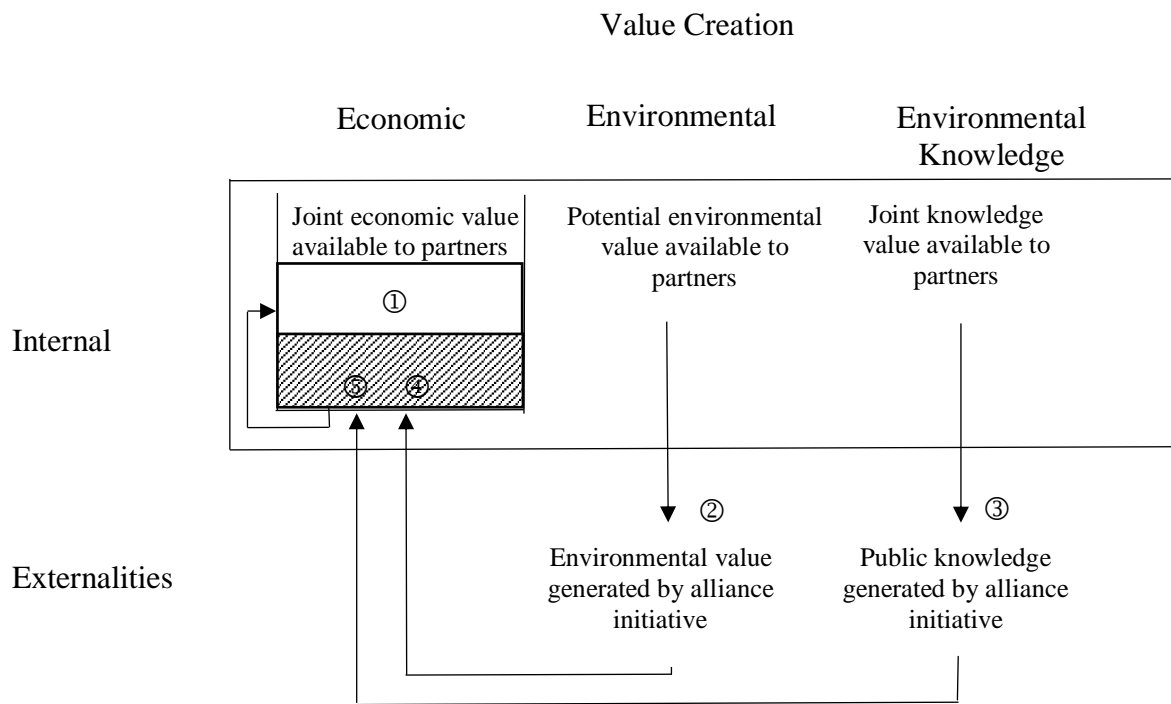


Figure 1. Value creation in environmental inter-firm alliances

Economic value: Internalizing environmental externalities

Positive environmental externalities can, however, be an obstacle to private initiatives and reduce or discourage investments in environmental sustainability (Corradini *et al.* 2015) when firms are unable to internalize these externalities. The internalization of externalities is here defined as the creation of economic value in an alliance by capitalizing on the environmental value that is jointly generated. We extend Madhok and Tallman's perspective to environmental alliances by viewing the internalization of externalities as the creation of economic value in an alliance that closes the gap between potential and realized economic value. Alliance partners may be persuaded to create environmental value when they are *jointly* able to internalize the externalities (Mailath *et al.* 2004); in other words, when they enhance the alliance's realized

rents by joining their resources and creating economic value from exploiting environmental technologies (e.g. Muradian and Rival 2012) (Figure 1, shaded area ④). Previous studies have identified payments for the provision of environmental services and positive reputation effects of promoting sustainability, as ways of internalizing positive environmental externalities (Bétrisey *et al.* 2016; Prakash and Potoski 2007). The potential to jointly internalize the externalities induces the alliances to jointly generate the externalities (Mailath *et al.* 2004).

Alliance partners that create environmental knowledge externalities will also want to jointly internalize these externalities, or in other words, they will want to create economic value from investments in environmental innovation (see Figure 1, shaded area ⑤). They may do so by commercializing the environmental innovation, or by collecting royalties from licensing the environmental technology.

#### *Motivations of environmental alliances that generate and internalize externalities*

The reason for forming environmental alliances in the presence of externalities thus stems from the benefits of a joint agreement; environmental alliances enable firms to jointly generate environmental externalities and to jointly internalize externalities that they would not have been able to generate or internalize on their own (Muradian and Rival 2012). Table 1 introduces our classification of reasons for forming environmental alliances, i.e. the environmental alliance motivations. The classification makes a distinction between environmental externalities and environmental knowledge externalities, and between the generation and internalization of these externalities. In this paper, we propose that firms are motivated to form environmental alliances for different reasons, depending on whether they generate or internalize environmental externalities or environmental knowledge externalities.

Table 1. Classification of motivations of environmental inter-firm alliances

|   | <b><i>Generating Externalities</i></b>  | <b><i>Internalizing Externalities</i></b>   |
|---|---|---|
| <b><i>Environmental Externalities</i></b>           | <b>1.</b> Motivations of environmental alliances that generate positive environmental externalities           | <b>2.</b> Motivations of environmental alliances that create economic value by internalizing positive environmental externalities           |
| <b><i>Environmental Knowledge Externalities</i></b> | <b>3.</b> Motivations of environmental alliances that generate positive environmental knowledge externalities | <b>4.</b> Motivations of environmental alliances that create economic value by internalizing positive environmental knowledge externalities |

Quadrant 1 contains the motivations of environmental alliances that generate positive environmental externalities. These are alliance partners that jointly exploit an existing environmental technology. An example is the environmental alliance between Nestlé (a food and beverage multinational) and Asia Clean Capital (a clean energy solutions provider in China). The partners agree to construct solar power panels on rooftops and Asia Clean Capital will provide the electricity from the solar system to Nestlé. The press release of the alliance announcement refers to the generation of positive environmental externalities: *“Together we have the opportunity to make an outstanding contribution to the environment through solar”* (Asia Clean Capital 2016).

Quadrant 2 contains the motivations of environmental alliances that create economic value by internalizing positive environmental externalities. Alliance partners that generate positive environmental externalities also wish to receive (some of) the benefits by internalizing them. The announcement of the alliance between Nestlé and Asia Clean Capital refers to the monetary savings achieved from contributing to the environment through solar energy: *“Electricity from the solar system will be provided to Nestle ... at competitive rates to ensure operational savings throughout the lifetime of the system”* (Asia Clean Capital 2016).

Quadrant 3 contains the motivations of environmental alliances that generate positive environmental knowledge externalities. These are alliance partners that jointly develop environmental innovations, and the new environmental knowledge has positive external effects on other organizations and the environment. An example of such an alliance is the R&D agreement between Applied Nanotech (a research and commercialization organization), Solexel (a solar PV module manufacturer), and YHCC (a producer of metal paste for silicon solar cells). The alliance will develop a novel solar paste technology “*to achieve an efficiency of over 22% in Solexel’s unique thin solar cells*” (Applied Nanotech Holdings 2013). A prominent indicator of technological change in the solar industry is PV module conversion efficiency (Huenteler *et al.* 2016). The alliance contributes to efficiency improvements in the industry which may have spillover effects, or as the press release of the announcement states the novel technology “*will benefit the PV industry*” (Applied Nanotech Holdings 2013).

Quadrant 4 contains the motivations of environmental alliances that create economic value by internalizing positive environmental knowledge externalities. Alliance partners that develop an environmental innovation will want to create economic value from the innovation (Adams *et al.* 2016). The solar R&D alliance illustrates how partners can internalize some of the benefits. The press release illustrates that Applied Nanotech receives royalties for its contribution to the development of the novel solar technology: “*The royalty that we [Applied Nanotech] receive from YHCC related to the sales of their solar paste products will be critical for our cash flow*” (Applied Nanotech Holdings 2013).

The new classification in Table 1 offers four categories of alliance motivations that illustrate why firms form an environmental alliance. Based on the evidence offered by our literature review on environmental alliances, we will populate the four categories and allocate alliance motivations to the four categories. This synthesis of our evidence will build a

classification that helps to understand which motivations generate or internalize environmental externalities or environmental knowledge externalities.

## **Methods**

The present review follows the protocol suggested by Tranfield *et al.* (2003) and used by Macpherson and Holt (2007), Boiral *et al.* (2018) and Watson *et al.* (2018). The protocol was adapted to our research topic in the three main stages of a systematic literature review: searching, screening and extraction/synthesis (Tranfield *et al.* 2003; Watson *et al.* 2018). In the first stage, we search for articles in high-impact journals and use keywords to select the relevant articles (Table 2). In the second stage, we screen the articles using a set of inclusion and exclusion criteria (Table 3). In the third stage, we use theory-driven content analysis to extract information from the articles and to synthesize the information into relevant categories (Table 4).

### *Searching*

To assess the motivations of environmental alliances in the relevant academic literature, we searched for articles in journals in four subject categories of the Social Science Citation Index (SSCI) of Web of Science. These categories are ‘management’, ‘business’, ‘environmental studies’, and ‘green and sustainable science and technology’. Although scholarly interest in environmental inter-firm alliances has grown tremendously in recent years, the research landscape remains fragmented, and this fragmentation likely stems from the fact that researchers from a broad range of domains have tackled domain-specific research issues on environmental alliances (Wassmer *et al.* 2014, p. 755). The inclusion of these four SSCI categories in our search for articles enabled us to find and connect this fragmented research.

Following López-Duarte *et al.* (2016), we restricted our search to high-impact journals, focusing on the journals in the first and second quartiles of the index, ranked by impact factor for each of the four categories. As suggested by earlier studies, high-impact journals structure the theoretical and empirical results in a field by establishing the status quo and by setting the agenda for future developments (Furrer *et al.* 2008; Keupp *et al.* 2012; Savino *et al.* 2017), ensuring the inclusion of articles that cover the dominant themes and debates in a field. Our focus on high-impact journals in four SSCI categories resulted in a search in 191 journals. We searched for articles in the 191 journals between 1972 and 2017 using the 1972-United Nations Conference on the Human Environment declaration as an impetus for academic research on sustainable development and a starting point for our search. We used combinations of the search terms ‘sustainable’, ‘renewable’, ‘natural environment’, ‘alliance’, ‘collaboration’, ‘cooperation’ and ‘partnership’ as detailed in Table 2, and searched for these terms in the entire text of the articles.

*Table 2. Combinations of search terms per selected journal*

| <b>Search string</b>  | <b>Scope</b> | <b>Date range</b>               |
|---|--------------|---------------------------------|
| (sustain* OR renew* OR “natural environment”) AND alliance      | Full text    | 1972-2017, including early view |
| (sustain* OR renew* OR “natural environment”) AND collaboration | Full text    | 1972-2017, including early view |
| (sustain* OR renew* OR “natural environment”) AND cooperation   | Full text    | 1972-2017, including early view |
| (sustain* OR renew* OR “natural environment”) AND partnership   | Full text    | 1972-2017, including early view |
| “environmental alliance”  | Full text    | 1972-2017, including early view |

### *Screening*

We only selected articles that focused on environmental sustainability and inter-firm alliances and excluded articles that exclusively focused on firm-NGO or firm-government collaboration. We used our definition of environmental alliances, as developed in the previous section, to



select the relevant articles even though the dispersed literature may use different terms to refer to these alliances. Table 3 offers more detail on our inclusion and exclusion criteria. This screening process resulted in 121 articles from 42 different journals. Appendix 1 lists the journals with two or more articles in the review. Although our search included the time frame 1972-2017, the first article that matched our inclusion and exclusion criteria was published in 1996. Figure 2 displays the number of articles on environmental inter-firm alliances in our review that have been published over time. As illustrated by this figure, the academic study of environmental inter-firm alliances gains momentum after 2007. The majority of the articles were published since 2014, indicating the relatively recent nature of the study of environmental inter-firm alliances.

The selection offered a methodologically diverse set of articles, with 47.9% qualitative studies, 32.2% quantitative studies, 17.4% of the articles focusing on conceptual issues and the remainder (2.5%) using mixed methods. In terms of the theoretical lenses employed, a large number of articles refer to alliance motivations based on institutional theory and the resource-based view, emphasizing legitimacy issues and the shared nature of sustainable efforts. Almost a third of the articles refer to alliance motivations from the perspectives of transaction cost economics and the resource dependence view, highlighting the need to reduce transaction costs and sustainability risks. The diversity of theories employed in the articles supports our focus on multiple theories while restricting our scope to the four most-applied theories in our sample.

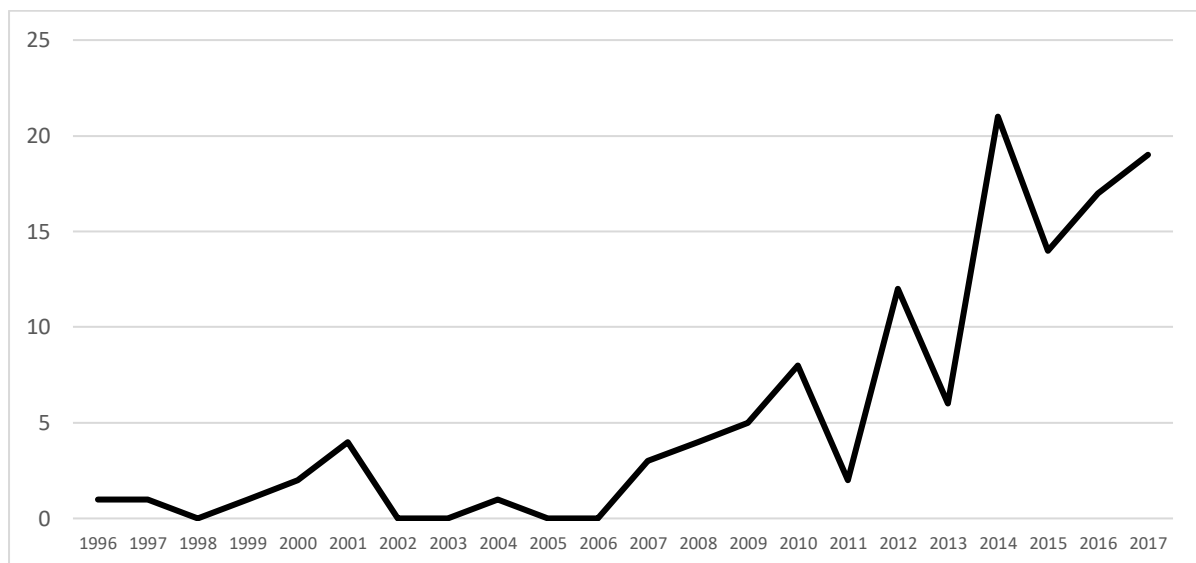
In the majority of the articles, alliances exploit or explore renewable energy technologies, such as solar power, onshore and offshore wind power, geothermal energy, hydropower and biomass (e.g. Post *et al.* 2015). In addition to these energy-related technologies, the articles focus on alliances in smart grids, electric and hybrid vehicles, green chemistry, sustainable textiles and fashion, and organic food (e.g. Li *et al.* 2014; Chkanikova 2016). A large number of articles study recycling and waste management (e.g. Posch 2010;

Aschemann-Witzel *et al.* 2017). Several articles address the challenges of joint actions to create more sustainable supply chains in a wide variety of technologies and industries (e.g. Beske and Seuring 2014; Blome *et al.* 2014).

*Table 3. Criteria for inclusion and exclusion of articles*

| Inclusion criteria  | Exclusion criteria  |
|---|---|
| Articles published between 1972 and 2017, including early view  | Articles published in a language other than English   |
| Article published in peer-reviewed journals   | Articles exclusively focusing on joint agreements between firms and government, NGO's or consumer organizations |
| Articles published in high-impact journals, in the 1 <sup>st</sup> and 2 <sup>nd</sup> quartiles of the SSCI, ranked by impact factor | Articles in which 'sustainable' refers to longevity or duration   |
| Articles focusing on inter-firm alliances   | Articles exclusively describing empirical examples or cases   |
| Articles addressing alliances that aim for a positive contribution to environmental sustainability                                    |   |
| Articles based on theoretical arguments   |   |

*Figure 2. Number of articles on environmental inter-firm alliances<sup>1</sup>*



<sup>1</sup> One article in our review was in press in 2017 during our search, but was published in 2018.

### *Extraction and synthesis*

The third stage of the systematic literature review is to extract the relevant information from the selected articles and to synthesize the results into a meaningful outcome. To extract the relevant information, the procedure was based on theory-driven content analysis, defined as “a research method that uses a set of procedures to make valid inferences from text” (Weber 1990, p. 9) in which the selected codes are predetermined by existing theory. Theory-driven content analysis is based on the interpretation of textual information in relation to a systematic codification process to categorize information around concepts or theories (Nowell *et al.* 2017). This content coding approach delineates the analysis within the contours of existing theories by using theory-driven markers (Krippendorff 2012). The content analysis method has been used in this systematic review for two reasons. First, like most systematic reviews, content analysis is used to extract the relevant information. Second, theory-driven content analysis enables the classification of information into explicative categories, and can thus organize the relevant extracted information in a way that ensures consistency and meaningfulness (Green 2004; Krippendorff 2012).

Our procedure contained two steps. First, we read the entire text of each article and coded statements in the text on generating and internalizing environmental externalities and environmental knowledge externalities, as described in more detail in Table 4. Second, we used the coded statements of our first step to identify the theory-driven markers on alliance motivations. Table 4 displays the markers that we used for the resource-based view, resource dependence view, institutional theory and transaction cost economics. This second step enabled us to allocate different alliance motivations to the four categories of generating and internalizing externalities. This step thus allowed us to identify why firms are motivated to form an environmental alliance to generate or internalize environmental externalities or to generate or internalize environmental knowledge externalities. We used the software Nvivo (11.4.1) to

code the text and the theory-driven markers. The following quote, taken from Grekova *et al.* (2016, p. 1861), can serve as an example of our two-step coding procedure: “*In environmental collaboration, supply chain partners leverage each other's resources and exploit learning and knowledge sharing opportunities to enhance environmental sustainability.*” Firstly, this entire sentence is coded as ‘generating environmental externalities’, as it illustrates that inter-firm alliances have a positive impact on environmental sustainability. And secondly, we code the sharing of resources and knowledge in that sentence as theory-driven markers of the resource-based view. To enhance the reliability and validity of the analysis, both authors coded the articles by relying on the existing theories and conceptualizations of constructs. Each author first confirmed the allocation to the four categories of externalities and the coding of theory-driven markers for a small group of articles, and then the combined results were used to extend the analysis to the complete set of articles (Massaro *et al.* 2016).

*Table 4. Coding of text and theory-driven markers used to code concepts*

| Concepts  | Coding of Text   |  |
|---|--|--|
| <i>Generating environmental externalities</i>   | Coding of text on environmental inter-firm alliances that have a positive impact on environmental sustainability                       |  |
| <i>Generating environmental knowledge externalities</i>   | Coding of text on environmental inter-firm alliances that have a positive impact on environmental innovation                           |  |
| <i>Internalizing environmental externalities</i>  | Coding of text on environmental inter-firm alliances that create economic value from a positive impact on environmental sustainability |  |
| <i>Internalizing environmental knowledge externalities</i>  | Coding of text on environmental inter-firm alliances that create economic value from a positive impact on environmental innovation     |  |
| <i>Alliance motivations</i> <ul style="list-style-type: none"> <li>• RBV:</li> <li>• RDV:</li> <li>• IT:</li> <li>• TCE:</li> </ul> | <b>Theory-driven markers</b>   | <b>Sources</b>   |
|   | Accessing, sharing, exchanging and transferring resources, information, knowledge, capabilities, competences, technology, markets      | Kogut 1988; Eisenhardt and Bird Schoonhoven 1996; Jolink and Niesten 2012      |
|   | Uncertainty reduction, risk reduction  | Kogut 1988; Eisenhardt and Bird Schoonhoven 1996                               |
|   | Legitimacy, reputation, institutions, standards, labels, certification, pressures, norms, rules, regulation, legislation               | Dacin <i>et al.</i> 2007; Jolink and Niesten 2012; Reinecke <i>et al.</i> 2012 |
|   | Specific assets, transaction costs, reduction of costs, opportunism  | Kogut 1988; Eisenhardt and Bird Schoonhoven 1996; Jolink and Niesten 2012      |

## Results

The classification of motivations of environmental alliances of Table 1 is populated with evidence from the reviewed articles and their use of the four theoretical perspectives: the resource-based view (RBV), the resource dependence view (RDV), institutional theory (IT) and transaction cost economics (TCE). Table 5 presents the new classification of the motivations encountered in the articles related to either the generation of externalities or the internalization of externalities, in the columns, and related to either environmental externalities or environmental knowledge externalities, in the rows. This section will discuss the alliance motivations in these four categories in detail.

*Table 5. New classification of motivations of environmental inter-firm alliances*

|   | <i><b>Generating Externalities</b></i>  | <i><b>Internalizing Externalities</b></i>   |
|---|---|---|
| <i><b>Environmental Externalities</b></i>           | <b>RBV:</b> to share resources (e.g. waste and by-products), capabilities and information on sustainability of inputs<br><b>RDV:</b> to reduce sustainability risk; to increase bargaining power<br><b>IT:</b> to respond to stakeholder pressures; to set sustainability standards<br><b>TCE:</b> to invest in specific assets that support exploitation of sustainable products | <b>RBV:</b> to increase competitive advantage by sharing resources<br><b>RDV:</b> to enhance reputation by reducing sustainability risk<br><b>IT:</b> to enhance the firm's legitimacy<br><b>TCE:</b> to reduce transaction costs (e.g. sustainability monitoring costs); to reduce eco-opportunism |
| <i><b>Environmental Knowledge Externalities</b></i> | <b>RBV:</b> to share knowledge on environmental innovation<br><b>IT:</b> to respond to stakeholder pressures; to set standards for new sustainable technologies   | <b>RBV:</b> to enhance the firm's knowledge base<br><b>IT:</b> to enhance the firm's legitimacy<br><b>TCE:</b> to reduce transaction costs  |

### *Motivations of EAs that generate environmental externalities*

The articles in our review argue that in the pursuit of environmental sustainability alliances have an advantage over other governance forms, such as in-house or outsourced activities (e.g. Husted and de Sousa-Filho 2017). Several of these articles have commented on the rationale

for inter-firm alliances to promote sustainability. Bhattacharya and Polman (2017, p. 10) for instance state that “*no one company can solve the “tragedy of the commons” by going it alone*”. A similar observation is made by Scandellius and Cohen (2016, p. 173), arguing that “*collaboration and partnership will be critical as we work collectively on this journey towards a low carbon future*”. The common denominator in these articles is that joint action is not only necessary for a transition to sustainability, but also generates externalities. In a study on the role of environmental entrepreneurs, Corbett and Montgomery (2017) link joint action to the generation of externalities: “*collaboration between entrepreneurs can also increase the total pie available through positive externalities... (and these) collections of actors have been key to stimulating transformation around environmental concerns*” (Corbett and Montgomery 2017, p. 3).

Firms that jointly generate positive environmental externalities do so for different reasons. Table 6 offers several quotes from the articles in our review that reflect the different motivations of environmental alliances to generate positive environmental externalities, as represented by the resource-based view, the resource dependence view, institutional theory and transaction cost economics. One of the main motivations for joint activities is the access that alliances provide to valuable resources, capabilities and information. An example of this is resource sharing that increases energy and resource efficiency through the exchange of by-products or waste between different companies’ production processes (Bansal and McKnight 2000; Chertow *et al.* 2008; Deutz and Gibbs 2008; Patala *et al.* 2014; Nuhoff-Isakhanyan *et al.* 2017; Zeng *et al.* 2017). Firms also share information on the sustainability of production inputs. In a supply chain relation, buyers demand information from suppliers on the degree of sustainability of inputs (Pagell and Wu 2009; Posch 2010; Miemczyk *et al.* 2016), but buyers also ‘educate’ suppliers and provide them with knowledge on how to improve the sustainability of their inputs (Eccles *et al.* 2012; Turker and Altuntas 2014; Hajmohammad and Vachon 2016;

Överholm 2017). The exchange of these complementary resources between alliance partners facilitates the implementation of sustainable practices.

In supply chains buyers and suppliers generate positive environmental externalities because they are motivated to reduce sustainability risk often associated with sustainability shortcomings in the suppliers' practices or inputs (Beske and Seuring 2014; Akhavan and Beckmann 2017; Busse *et al.* 2017; Canzaniello *et al.* 2017). Buyers and suppliers jointly invest in sustainability initiatives, and the buyer encourages suppliers to make sustainability improvements (Hajmohammad and Vachon 2016). Long-term alliances between buyers and suppliers only work as a mechanism to reduce risk when buyers and suppliers are highly dependent on each other, or when the buyer is dominant and the suppliers are dependent on the buyer. Buyer power constitutes an effective tool for sustainability when it allows buyers to define and drive the sustainability agenda of dependent suppliers, ensure compliance, and stimulate joint activities around sustainability throughout their network of suppliers (Touboulic *et al.* 2014).

Firms also form alliances to generate environmental externalities to deal with pressures from external stakeholders, such as NGOs, consumers and regulators, demanding improvements in environmental performance (e.g. Cheung *et al.* 2009; Vurro *et al.* 2009; Chan *et al.* 2012; Lin 2012ab; Morali and Searcy 2013; Nidumolu *et al.* 2014; Wassmer *et al.* 2014; Ma *et al.* 2016; Zander *et al.* 2016). Pressures from NGOs and consumers can take any form, from environmental activism and lawsuits, mobilizing public sentiment and altering accepted norms, to aligning with influential regulators and investors, withdrawing important resources, and lobbying government on the detrimental environmental impact of firms and industries (Lin and Darnall 2015; Busse 2016; Radnejad *et al.* 2017). As a response to these pressures, firms enter into environmental alliances and jointly offer greener products, inform consumers on sustainability and motivate suppliers to adopt more sustainable practices (Sigala 2008; Morali

and Searcy 2013; Wassmer *et al.* 2014; Lin and Darnall 2015; Radnejad *et al.* 2017). The literature suggests that in response to pressures from regulators, firms use environmental alliances and networks to implement environmental rules, such as regulations on eco-efficiency, reverse supply chains and sustainable packaging (Patala *et al.* 2014; Grekova *et al.* 2016). However, environmental alliances are also used to create self-regulation mechanisms to jointly and voluntarily tackle environmental issues (Lin 2012a; Wassmer *et al.* 2014; Lin and Darnall 2015). Environmental alliances create new industry norms and standards and lobby for new rules and regulations to promote the transition to a more sustainable society (Camisón 2010; King 2015; Fischer and Pascucci 2017; Kishna *et al.* 2017).

Alternatively, some have proposed that investments in specific assets enhance cooperation between alliance partners and generate positive environmental externalities (e.g. Touboullic and Walker 2015). Chkanikova (2016) has shown that instead of delisting irresponsible suppliers, buyers invest in asset-specific investments to support the production of sustainable products. Once asset-specific investments have been made, firms will ensure that their supply chain partners are jointly pursuing sustainability, to avoid the misappropriation of specific assets (Blome *et al.* 2014). The increased asset specificity thus leads to the development of joint activities aimed at the promotion of sustainability (Chkanikova 2016).

*Table 6. Motivations of EAs that generate environmental externalities (emphasis added)*

| <b>Quote (theory)</b>   | <b>Source</b>                        |
|---|--------------------------------------|
| “Firms often seek out ECs (Environmental Collaborations) to access resources and capabilities required to green their operations and business practices.” (RBV)   | Wassmer <i>et al.</i> 2014, p. 763   |
| “In environmental collaboration, supply chain partners leverage each other's resources and exploit learning and knowledge sharing opportunities to enhance environmental sustainability.” (RBV)   | Grekova <i>et al.</i> 2016, p. 1861  |
| “Collaborative projects between the firm and its stakeholders should create the highest ESG (Environmental, Social and Governance) performance compared to in-house or outsourced initiatives because they represent the best way to bring to bear a range of resources and capabilities beyond those of the firm to solve the complex problems that sustainability presents for the firm.” (RBV)   | Husted and de Sousa-Filho 2017, p. 2 |
| “Companies seeking to improve their environmental performance should engage in the development of collaborative partnerships aimed at sharing complementary knowledge and capabilities or developing new ones. Firms must not only develop unique internal resources/capabilities, but they must leverage them to identify strategic partners, manage them collaboratively, and further evaluate them to meet future sustainability goals.” (RBV) | Touboullic and Walker 2015, p. 181   |
| “Supply managers adopt a collaborative approach to develop suppliers' sustainability-related capabilities and improve their ecological and social performance to mitigate any level of supplier sustainability risk in their interdependent relationships with suppliers.” (RDV)  | Hajmohammad and Vachon 2016, p. 59   |



|  |                                       |
|--|---------------------------------------|
| “Aiding the minimization of waste throughout the supply chain and any formal/informal alliances, will be a practice for <i>lessening potential liability risks</i> .” (RDV)  | Sarkis 2001, p. 670                   |
| “Such relationship management approaches of creating jointly owned product differentiation and encouraging substitutes in the form of new sustainability certification schemes allow the retailers to <i>augment their perceived power over suppliers</i> ” (RDV)  | Chkanikova 2016, p. 487-9             |
| ““ <i>Institutional pressures</i> ” include pressure from a variety of sources, including NGOs, stakeholders, governments, and industry. Firms use ECs (Environmental Collaborations) to address environmental issues proactively before government-imposed threats can be made or carried out.” (IT)  | Wassmer <i>et al.</i> 2014, p. 766    |
| “This sectoral collaboration forms the foundation from which to advocate for, define and promote <i>credible sustainability standards</i> .” (IT)  | Montgomery <i>et al.</i> 2012, p. 379 |
| “MNCs are working together in multibrand forums to <i>create standardized</i> social and environmental audit tools.” (IT)  | Plambeck <i>et al.</i> 2012, p. 46    |
| “Suppliers are more responsive to their customers' environmental performance requirements where increasing levels of <i>relationship-specific investment</i> occur.” “The positive relationship between <i>asset specificity</i> and GSCC (Green Supply Chain Collaboration) implementation indicates the willingness of Chinese manufacturing companies to engage in environment sustaining activities, especially with their investments in both human and physical assets.” (TCE) | Touboulic and Walker 2015, p. 181     |

#### 4.2. Motivations of EAs that internalize environmental externalities

In addition to generating environmental externalities, environmental alliances are formed to create economic value from the benefits generated for the environment, or in other words, they are formed to internalize positive environmental externalities. The articles in our review argue that the creation of economic value is a key objective of inter-firm alliances that strive for environmental sustainability. Bhattacharya and Polman (2017, p. 3) indicate that “*sustainability involves creating value for all stakeholders in the ecosystem and viewing profits as a consequence of such value creation*”, and Kiron *et al.* (2013, p. 70) claim that “*collaboration with customers and having a business case are associated with creating economic value from sustainability activities and decisions*”. Different theories emphasize different aspects to economic value creation as motivations for forming environmental alliances. Table 7 offers quotes from the articles in our review that reflect these different motivations. Studies adopting the resource-based view demonstrate that the sharing of resources in environmental alliances to promote environmental sustainability will enhance the partners’ competitive advantage (e.g. Paulraj 2011; Miemczyk *et al.* 2016; Blome *et al.* 2014; Akhavan and Beckmann 2017). The resource dependence view argues that buyers and suppliers in environmental alliances jointly enhance their reputation, because joint efforts in

the supply chain reduce sustainability risk (e.g. Akhavan and Beckmann 2017; Li *et al.* 2014). Institutional theory analyses the buildup of partners' legitimacy as they jointly engage to promote environmental sustainability (e.g. Post *et al.* 2015; Kishna *et al.* 2017). Transaction cost economics focuses on the reduction of transaction costs as the economic rationale for engaging in environmental alliances, with cost reduction being achieved through the sharing of sustainability monitoring costs among partners, or the mitigation of eco-opportunism (i.e. hiding or distorting of information about the sustainability of inputs or misconduct in terms of ecological issues) (e.g. Cheng and Sheu 2012; Plambeck *et al.* 2012; Chkanikova 2016).

*Table 7. Motivations of EAs that internalize environmental externalities (emphasis added)*

| <b>Quote (theory)</b>   | <b>Source</b>                        |
|---|--------------------------------------|
| "The key focal firm-level consequence for all four EC (Environmental Collaboration) implementation forms is the potential to <i>create some level of competitive advantage</i> . Competitive advantage results from ... increasing revenues from new products and markets, through jointly developed and operated environmental systems and technologies." <b>(RBV)</b>   | Wassmer <i>et al.</i> 2014, p. 766   |
| "Companies seeking to improve their environmental performance should engage in the development of collaborative partnerships aimed at sharing complementary knowledge and capabilities or developing new ones. Co-operation <i>improves the competitiveness</i> of the chain while reducing environmental burdens." <b>(RBV)</b>  | Touboullic and Walker 2015, p. 181   |
| "The finding of a significant link between SSM (sustainable supply management) and sustainability performance (H5) provides empirical support for the notion that SSM is a relational capability that can enable firms to (1) gain access to resources, (2) learn new capabilities and (3) combine these relation-specific resources and capabilities in unique and collaborative ways, thereby <i>realizing competitive advantage</i> over competing firms that are unable to do so." <b>(RBV)</b>   | Paulraj 2011, p. 31                  |
| "Both cases confirm that CLSCs (closed-loop supply chains) <i>can provide competitive advantage</i> through securing access to "green" raw materials." <b>(RBV)</b>   | Mienczyk <i>et al.</i> 2016, p. 465  |
| "In close sustainability collaboration, firms especially share and transfer tacit knowledge as this is a key aspect for intensifying collaboration as well as <i>creating competitive advantage</i> ." "In order to contribute to a sustainable supply chain, the firm being located in between its customers and suppliers needs to ensure a sustainable in-house production process... it also needs to organize for integrating, transferring, and creating knowledge across the supply chain so as to also capture heterogeneous knowledge that might rest within other supply chain members. Doing so will <i>create a greater competitive advantage</i> since complementary resources and capabilities can be pooled and jointly exploited." <b>(RBV)</b> | Blome <i>et al.</i> 2014, p. 644-645 |
| "Partnering with others is a more effective form of <i>risk-reduction</i> because it can borrow legitimacy from other actors and secure the buying firm's reputation in the long term." <b>(RDV)</b>  | Akhavan and Beckmann 2017, p. 146    |
| "Besides the cooperation and coordination among the supply chain partners, a key concern of the SCG is reputation risk. Any mistakes made by the focal company in the role of coordinator of the supply chain, such as choosing suppliers without considering environmental or ethical concerns, would cause severe and increasing criticism on their social and environmental responsibilities. To manage and anticipate potential risks to the <i>focal corporate legitimacy and reputation</i> , sustainable governance is a common practice applied to supply chains." <b>(RDV)</b>   | Li <i>et al.</i> 2014, p. 826        |
| "The pro-environmental credentials that a large, socially challenged organization derives from forming an alliance with a smaller, socially responsible firm provides the large firm with <i>enhanced legitimacy</i> . Firms in the oil and gas industry may be able to <i>legitimize</i> their pro-  | Post <i>et al.</i> 2015, p. 426-7    |

|   |                                    |
|---|------------------------------------|
| environment position by forming alliances with partnering firms that have a strong reputation for environmental conservancy.” (IT).   |                                    |
| “Organizations may enter the business of sustainable technologies to <i>increase their legitimacy</i> as a socially responsible organization, and use alliances to pursue this motive.” (IT)  | Kishna <i>et al.</i> 2017, p. 3    |
| “Besides gaining more leverage to drive environmental improvement through collaboration, buyers can gain more reach by sharing <i>monitoring costs</i> .” (TCE)   | Plambeck <i>et al.</i> 2012, p. 48 |
| “The development of collaborative approaches becomes the economically rational choice of interorganizational relationship management to ensure the availability of sustainably produced supply and decrease the risk of suppliers’ <i>opportunistic behavior</i> .” (TCE) | Chkanikova 2016, p. 482            |

#### 4.3. Motivations of EAs that generate environmental knowledge externalities

Firms do not only form alliances to generate environmental externalities, but they also form alliances to produce environmental innovations and thereby generate positive environmental knowledge externalities. Dangelico *et al.* (2013, p. 645) have argued that due to the complexity of environmental issues, “*collaboration among the various companies in the product’s value chain...is essential for developing green products*”. These environmental innovations create environmental knowledge externalities by bringing new knowledge on environmental sustainability into the public domain, or as Sadovnikova and Pujari (2017, p. 5) have noted: “*in the green context, technology capabilities are not only more likely to be codified and disclosed via patents..., but because of the social desirability of green technologies, firms might be under pressure to share those in the public domain to facilitate the diffusion of green practices in society*”. The articles in our review have identified different motivations of firms to jointly pursue environmental innovations. Table 8 illustrates that these motivations stem from the resource-based view and institutional theory. A first motivation is the exchange of knowledge among alliance partners, which is a prerequisite for the development of environmental innovations (Dangelico *et al.* 2013; De Marchi and Grandinetti 2013; Peñasco *et al.* 2017). And secondly, firms develop environmental innovations as a collective response to coercive and normative pressures from stakeholders, and they jointly develop standards for the promotion of new sustainable technologies (Radnejad *et al.* 2017; Nidumolu *et al.* 2014).

Table 8. Motivations of EAs that generate environmental knowledge externalities (emphasis added)

| Quote (theory)   | Source                                 |
|--|--|
| “In industries in which environmental issues are becoming increasingly important, <i>knowledge exchange</i> for NPD becomes even more important.” “Firms that want to incorporate green issues into innovation projects need to <i>develop knowledge links</i> with a wide range of external parties to explore novel solutions to environmental design problems.” (RBV)   | Dangelico <i>et al.</i> 2013 p. 646    |
| “This characteristic is driven by the intrinsic complexity of green innovations, which may be addressed just by <i>combining a variety of specialist knowledge</i> and competences that are necessarily spread within different organizations. In order to tackle the complexity needed to pursue a proactive approach to the reduction of environmental impacts, companies are therefore required to develop cooperative relationships for innovations with several actors of their value network.” (RBV)   | De Marchi and Grandinetti 2013, p. 571 |
| “Cooperation with other partners in the value chain, which provides opportunities <i>to access knowledge</i> and networks, is generally considered a key driver of ecoinnovation.” “Eco-innovation requires more external sources of knowledge and information. Eco-innovators leverage on the competences of external partners to a higher extent than other innovators.” (RBV)   | Peñasco <i>et al.</i> 2017, p. 58, 61. |
| “The second driver is mainly based on institutional forces. Common environmental technical challenges have become a concern when the industry experiences <i>pressure from government</i> (i.e., coercive force) <i>and from society</i> (i.e., normative force) to adhere to environmental concerns. The environmental technical innovations are not being driven by a fundamental need to innovate our core business. They are being driven by, primarily, environmental externalities that are being imposed on the industry. The industry is not comfortable managing that on a company-by-company basis, so they see more of a collective response.” (IT)   | Radnejad <i>et al.</i> 2017, p. 19     |
| “In 2010 the unlikely pairing of behemoth Walmart and niche player Patagonia convened a group of 10 apparel companies in the belief that <i>the adoption of a single, standardized index</i> would drive efficiency and innovation across the apparel value chain and reduce environmental impact. The Sustainable Apparel Coalition, as the collaboration is known, <i>developed a measurement tool</i> called the Higg Index. Apparel brands have used the index to help reduce fabric waste through improved product design. And manufacturers have used it to justify investments in new capabilities like wastewater recycling and improved energy efficiency. The Higg Index is enabling systemic collaboration on innovative practices.” (IT) | Nidumolu <i>et al.</i> 2014, p. 6      |

#### 4.4. Motivations of EAs that internalize environmental knowledge externalities

Firms also engage in environmental alliances to benefit from the environmental innovations that they have shared in the public domain, or in other words, they jointly create economic value from the positive environmental knowledge externalities. The articles in our review have recognized that alliances for environmental innovation can benefit firms, or as Dangelico and Pontrandolfo (2015, p. 416) state: “*environmental collaborations with suppliers in new product development have a positive impact on a firm’s performance*”. The articles have identified different motivations that lead to the internalization of environmental knowledge externalities. Table 9 provides examples of these motivations that stem from the resource-based view, institutional theory and transaction cost economics. Firms engage in joint activities for

environmental innovation to tap into partners' knowledge, research results and patents on sustainable technologies (Brook and Pagnanelli 2014; De Marchi and Grandinetti 2013; Radnejad *et al.* 2017). In addition, they jointly develop sustainable technologies to enhance their legitimacy and reduce transaction costs in sustainable supply chains (Grekova *et al.* 2016; Touboullic and Walker 2015; Watson *et al.* 2018).

*Table 9. Motivations of EAs that internalize environmental knowledge externalities (emphasis added)*

| <b>Quote (theory)</b>   | <b>Source</b>                             |
|---|---|
| "A well-articulated strategic approach to innovation portfolio management could contribute in realizing the following benefits for companies: Collaborating to <i>tap into external knowledge that complements internal technology capabilities in areas of sustainability.</i> " <b>(RBV)</b>  | Brook and Pagnanelli 2014, p. 53          |
| "Firms whose innovation entailed environmental benefits are also better able to <i>tap into global flows of knowledge.</i> " <b>(RBV)</b>   | De Marchi and Grandinetti 2013, p. 577    |
| "They signed a joint venture agreement that allows the founders to <i>share their technologies, innovations, research results, and patent use rights</i> with each other without paying any royalty, as long as the usage of those assets is for environmental purposes in the oil sands industry. According to this agreement, each firm has the option to use the other members' patents without paying for them, as long as it also shares some of its own IP." <b>(RBV)</b> | Radnejad <i>et al.</i> 2017, p. 21        |
| "Environmental collaboration can influence firm performance. Sustainable process improvements can also be communicated to the customers as a part of <i>the firm's image.</i> " <b>(IT)</b>   | Grekova <i>et al.</i> 2016, p. 1862, 1864 |
| "Innovation for environmental sustainability requires firms to engage with external stakeholders to access expertise, solve complex problems, and <i>gain social legitimacy.</i> " <b>(IT)</b>  | Watson <i>et al.</i> 2018, p. 254         |
| "Environmental collaboration with customers prompts sustainable improvements in the internal processes and these improved processes bring about improved performance both in terms of <i>cost savings and market gains.</i> " <b>(TCE)</b>  | Grekova <i>et al.</i> 2016, p. 1868       |
| "Environmental innovation in industrial packaging systems requires a cooperative SC (supply chain) approach to ensure that environmental and commercial <i>costs are reduced and efficiencies optimised</i> for the chain as a whole." <b>(TCE)</b>   | Touboullic and Walker 2015, p. 181        |

## Discussion and Future Research

### *Discussion of results*

This study contributes to the literature on environmental inter-firm alliances. It has been widely recognized that the understanding of environmental inter-firm alliances has been impaired by the exclusive focus on economic value creation and appropriation in the alliance literature (e.g. Wassmer *et al.* 2014) and the potential of environmental alliances to generate public benefits through positive environmental impacts (Zimmerman *et al.* 2014). The determination of the motivations for environmental alliances has remained underexplored due to the simultaneous

presence of economic value and environmental value and the question how these can be combined into an alliance motivation. Based on the evidence of the articles in our review, environmental value was observed either from a societal perspective, in terms of the impact that the alliance has on the conditions of the natural environment, or from the alliance perspective, in terms of a value generated external to the alliance. We referred to the latter as positive externalities.

A synthesis and re-assessment of the articles in this review enable us to make several contributions to the literature. A first contribution lies in the understanding of environmental value as an alliance motivation. For this, we extended the Madhok and Tallman (1998) analysis on economic value of inter-firm alliances to environmental inter-firm alliances, by indicating that alliances could reach their full potential when the generated positive externalities are internalized. This led to a new classification of motivations of environmental alliances, by distinguishing between motivations that generate environmental externalities or environmental knowledge externalities, and motivations that create economic value by internalizing these externalities.

This new classification complements the extensive literature on motivations for inter-firm alliances investigating the adaptations firms make to changes occurring at the level of the organizational population (e.g. Koza and Lewin 1998; Reuer and Zollo 2000; Lin and Darnall 2015). Confronted with environmental challenges and opportunities at the level of the organizational population, firms will be motivated to enter into an alliance to either exploit their capabilities or to explore new opportunities (March 1991). Although many taxonomies of inter-firm alliances exist, mainly based on their form (e.g. Gulati and Singh 1998; Oxley 1997), our classification complements those taxonomies based on inter-firm alliance motivations (e.g. Parmigiani and Rivera-Santos 2011) by exploring the boundaries of the alliance and by

allowing external effects generated by the alliance to be part of the decision-making process of the firm.

A second contribution lies in the demonstration that existing theoretical motivations for strategic alliances, including from the resource-based view, resource dependence view, institutional theory and transaction cost economics, can be extended to understand the motivations of environmental inter-firm alliances. In the theoretical perspectives adopted here, the motivations for inter-firm alliances are shaped by the creation of economic value within the alliance. The same applies to perspectives not adopted here, such as agency theory or social network theory (Parmigiani and Rivera-Santos 2011). With the introduction of positive externalities, our paper shows that these same theoretical perspectives continue to explain alliance motivations, related to both the generation of environmental value or externalities and the creation of economic value through the internalization of externalities. For instance, firms collaborate in environmental alliances to share knowledge on sustainability, to reduce sustainability risk or to jointly respond to stakeholder pressures and thereby generate positive externalities. They also collaborate to reduce transaction costs and enhance their competitive advantage while pursuing environmental value, and thereby internalize (some of the) externalities.

The theoretical continuity into the conceptual domain of environmental alliances complements and extends the existing literature on strategic alliances but also addresses an incongruity in the literature on corporate contributions to environmental challenges (Wassmer *et al.* 2014). This study acknowledges the need and contributes to the call to “analyse how the micro role of firms and industries interacts with a ‘macro-view’ of the world ... in order to better address ‘environmental externalities and collective action failures’” (Whiteman *et al.* 2013). This study brings together the existing analyses in the literature on inter-firm alliances and environmental externalities and forges a better understanding.

A third contribution lies in enhancing our understanding of inter-firm alliances by showing that economic value cannot only be generated internally, but also by internalizing externalities or in other words by creating economic value from environmental value. The traditional approaches to internalizing externalities are Pigouvian subsidies, quota-based (cap-and-trade) policies, and Coase theorem-inspired bargaining (Kremer and Willis 2016; Sovacool 2011; Libecap 2016). In the context of inter-firm alliances, joint internalization of generated environmental externalities appears as a feasible approach in practice as well. Our paper thus extends the literature on the internalization of (positive) externalities to the alliance literature. We focused on environmental alliances offering evidence of corporate involvement in internalizing positive environmental externalities, illustrating how the motivations for environmental alliances can escape from the economy-environment dilemma (Pacheco *et al.* 2010).

#### *Future research*

Although this study illustrates that motivations for environmental alliances have been studied from an array of managerial perspectives, the results also highlight opportunities for further research, both theoretically and empirically. The observation that the motivation for environmental alliances was not only to generate externalities that are jointly created, but also to jointly internalize externalities leads to a myriad of issues leaving ample room for discussion, three of which may be singled out.

A first issue is whether environmental alliances will only generate externalities if, and only if, they are able to internalize (some of) these externalities, or in other words, whether environmental alliances will only generate externalities as long as they also create economic value. This issue resonates with a general perception in the reviewed articles that inter-firm alliances, and possibly firms in general, will only engage in environmental impact when it



serves their business interest. From the articles in the review no clear-cut archetype of environmental alliances emerges, but rather a spectrum presents itself in which some alliances accentuate their economic concern whereas others accentuate their environmental concern. In this sense, there always seems to be a balance between the generation of externalities and the internalization of externalities but the balance may differ between environmental alliances. This also implies that the motivations for environmental alliances may shift along this spectrum. These observations open up a new avenue of future research that may investigate what determines this balance or how it is maintained or changed over time by the alliance. Future research may find that the internalization of environmental externalities is a *conditio sine qua non* for the existence of environmental alliances, or that the internalization of environmental externalities allows for an increasing generation of environmental externalities.

A second issue concerns the theoretical underpinning of the motivations. As the articles in this study show, the arguments for environmental alliances run parallel with the existing motivations of inter-firm alliances in the strategy literature (Eisenhardt and Bird Schoonhoven 1996; Parmigiani and Rivera Santos 2011) but differ in the particularities associated with environmental alliances, such as externalities. This study has offered a new classification that allocates alliance motivations from the different theories to four categories, depending on whether they generate or internalize environmental (knowledge) externalities. However, this study is not able to draw conclusions on how motivations of environmental alliances change over time. Future research may study the chain of events leading from environmental innovation to the exploitation of environmental products and services. By addressing this chain of events, longitudinal research may encounter the hybrid nature of motivations, and may clarify what combinations of management theories we need to understand the dynamics of alliance motivations.

The third issue concerns the appropriation of internalized externalities. The literature on inter-firm alliances has persistently addressed the appropriation of economic value to the partnering firms (Lavie 2007). Within the articles reviewed in this study the motivations of environmental alliances that internalize externalities appear to be less concerned with the intra-alliance appropriation of the externally obtained economic value and much more with intra-alliance Pareto improvements. Intra-alliance Pareto improvements are reported by the articles in this study when competitive advantage accrues to alliance partners due to access to sustainable resources in the alliance, but also when legitimacy is enhanced through a socially responsible partner firm or when an environmental standard is agreed among alliance partners. In these articles the internalization of externalities is mainly viewed from the alliance perspective rather than from the firm perspective. Future research on the process of the internalization of environmental externalities would be able to address the issue of appropriation in a more definitive manner. The internalization of externalities is not only at the heart of environmental alliances but a better understanding of the process itself could explain corporate involvement in a more environmentally motivated future.

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| Journal Title   | No. of articles |
|---|-----------------|
| Journal of Cleaner Production   | 23              |
| Journal of Supply Chain Management  | 9               |
| Industrial Marketing Management   | 9               |
| MIT Sloan Management Review   | 9               |
| Journal of Business Ethics  | 7               |
| Journal of Purchasing and Supply Management<br>(European Journal of Purchasing & Supply Management) | 5               |
| Journal of Product Innovation Management  | 4               |
| Corporate Social Responsibility and Environmental Management<br>(Eco-Management and Auditing)       | 3               |
| European Management Journal   | 3               |
| International Journal of Operations & Production Management   | 3               |

|   |            |
|---|------------|
| International Journal of Physical Distribution & Logistics Management | 3          |
| Journal of Knowledge Management                                       | 3          |
| Long Range Planning   | 3          |
| Supply Chain Management – An International Journal                    | 3          |
| Business & Society  | 2          |
| Business Strategy and the Environment                                 | 2          |
| Harvard Business Review   | 2          |
| Omega   | 2          |
| Regional Studies  | 2          |
| Renewable and Sustainable Energy Reviews                              | 2          |
| Articles in remaining journals  | 22         |
| <b>Total</b>  | <b>121</b> |

Appendix 1 Journals with two or more articles in the review

|    |   |     |  |
|----|---|-----|--|
| 1  | Akhavan and Beckmann (2017)             | 62  | Lin (2012a)                            |
| 2  | Aschemann-Witzel <i>et al.</i> (2017)   | 63  | Lin (2012b)                            |
| 3  | Ashraf <i>et al.</i> (2014)             | 64  | Lin and Darnall (2015)                 |
| 4  | Bansal and McKnight (2009)              | 65  | Ma <i>et al.</i> (2016)                |
| 5  | Beske and Seuring (2014)                | 66  | Mariadoss <i>et al.</i> (2016)         |
| 6  | Bhattacharya and Polman (2017)          | 67  | Marques (2017)                         |
| 7  | Blome <i>et al.</i> (2014)              | 68  | Medlin and Törnroos (2014)             |
| 8  | Bowen <i>et al.</i> (2001)              | 69  | Medlin and Törnroos (2015)             |
| 9  | Brook and Pagnanelli (2014)             | 70  | Meyskens and Carsrud (2013)            |
| 10 | Brown <i>et al.</i> (2007)              | 71  | Miemczyk <i>et al.</i> (2016)          |
| 11 | Busse (2016)                            | 72  | Montgomery <i>et al.</i> (2012)        |
| 12 | Busse <i>et al.</i> (2017)              | 73  | Morali and Searcy (2013)               |
| 13 | Camarinha-Matos (2016)                  | 74  | Nidumolu <i>et al.</i> (2014)          |
| 14 | Camisón (2010)                          | 75  | Nielsen <i>et al.</i> (2017)           |
| 15 | Cantner <i>et al.</i> (2016)            | 76  | Nuhoff-Isakhanyan <i>et al.</i> (2017) |
| 16 | Canzaniello <i>et al.</i> (2017)        | 77  | Ofori (2000)                           |
| 17 | Castro (2015)                           | 78  | Olsen <i>et al.</i> (2017)             |
| 18 | Chan <i>et al.</i> (2012)               | 79  | Överholm (2017)                        |
| 19 | Chen and Hung (2014)                    | 80  | Pagell <i>et al.</i> (2004)            |
| 20 | Cheng and Sheu (2012)                   | 81  | Pagell and Wu (2009)                   |
| 21 | Chertow <i>et al.</i> (2008)            | 82  | Patala <i>et al.</i> (2014)            |
| 22 | Cheung <i>et al.</i> (2009)             | 83  | Paulraj (2011)                         |
| 23 | Chiesa <i>et al.</i> (1999)             | 84  | Peñasco <i>et al.</i> (2017)           |
| 24 | Chkanikova (2016)                       | 85  | Pinkse <i>et al.</i> (2014)            |
| 25 | Corbett and Montgomery (2017)           | 86  | Plambeck <i>et al.</i> (2012)          |
| 26 | Crespin-Mazet and Dontenwill (2012)     | 87  | Posch (2010)                           |
| 27 | Dangelico <i>et al.</i> (2013)          | 88  | Post <i>et al.</i> (2015)              |
| 28 | Dangelico and Pontrandolfo (2015)       | 89  | Radnejad <i>et al.</i> (2017)          |
| 29 | Day and Schoemaker (2011)               | 90  | Reefke and Sundaram (2017)             |
| 30 | De Giovanni and Esposito Vinzi (2014)   | 91  | Reinecke <i>et al.</i> (2012)          |
| 31 | De Marchi and Grandinetti (2013)        | 92  | Reniers <i>et al.</i> (2010)           |
| 32 | Deutz and Gibbs (2008)                  | 93  | Rosa and Beloborodko (2015)            |
| 33 | Eccles <i>et al.</i> (2012)             | 94  | Russo and Vurro (2010)                 |
| 34 | Egels-Zanden <i>et al.</i> (2015)       | 95  | Sadovnikova and Pujari (2017)          |
| 35 | Erkus-Ozturk and Eraydin (2010)         | 96  | Sarkis (2001)                          |
| 36 | Fischer and Pascucci (2017)             | 97  | Scandellius and Cohen (2016)           |
| 37 | Fleith De Medeiros <i>et al.</i> (2014) | 98  | Seshadri (2013)                        |
| 38 | Formentini and Taticchi (2016)          | 99  | Sharma <i>et al.</i> (2010)            |
| 39 | Gimenez and Tachizawa (2012)            | 100 | Sheu (2015)                            |
| 40 | Giraud <i>et al.</i> (2014)             | 101 | Sigala (2008)                          |
| 41 | Gotschall (1996)                        | 102 | Slawinski and Bansal (2015)            |

|    |                                  |     |                                      |
|----|----------------------------------|-----|--------------------------------------|
| 42 | Grekova <i>et al.</i> (2016)     | 103 | Slotegraaf (2012)                    |
| 43 | Gupta <i>et al.</i> (2014)       | 104 | Tamayo-Orbegozo <i>et al.</i> (2017) |
| 44 | Hajmohammad and Vachon (2016)    | 105 | Tesfay (2014)                        |
| 45 | Halila (2007)                    | 106 | Touboulic <i>et al.</i> (2014)       |
| 46 | Handfield <i>et al.</i> (1997)   | 107 | Touboulic and Walker (2015)          |
| 47 | Hellström <i>et al.</i> (2105)   | 108 | Turker and Altuntas (2014)           |
| 48 | Hopkins (2009)                   | 109 | Van Hoof and Thiell (2014)           |
| 49 | Hopkins (2010)                   | 110 | Verdecho <i>et al.</i> (2012)        |
| 50 | Husted and de Sousa-Filho (2017) | 111 | Vurro <i>et al.</i> (2009)           |
| 51 | Jernström <i>et al.</i> (2017)   | 112 | Wassmer <i>et al.</i> (2014)         |
| 52 | Kandaramath <i>et al.</i> (2015) | 113 | Watson <i>et al.</i> (2018)          |
| 53 | Kennedy <i>et al.</i> (2017)     | 114 | Winston (2014)                       |
| 54 | King (2015)                      | 115 | Wolf and Seuring (2010)              |
| 55 | Kirchoff <i>et al.</i> (2016)    | 116 | Woo <i>et al.</i> (2016)             |
| 56 | Kiron <i>et al.</i> (2013)       | 117 | Young (2000)                         |
| 57 | Kishna <i>et al.</i> (2017)      | 118 | Zander <i>et al.</i> (2016)          |
| 58 | Kolk and Pinkse (2008)           | 119 | Zeng <i>et al.</i> (2017)            |
| 59 | Korhonen (2001)                  | 120 | Zimmermann <i>et al.</i> (2014)      |
| 60 | Leal-Millán <i>et al.</i> (2016) | 121 | Zsidisin and Siferd (2001)           |
| 61 | Li <i>et al.</i> (2014)          |     |                                      |

*Appendix 2 Articles in the review*