An Empirical Explanation of the Natural-Resource-Based View of the Firm

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Abstract

To date the natural-resource-based view has been an abstract phenomenon, primarily used by academics to explain competitive sustainable operations. This paper attempts to go beyond this, responding to the need for explanation of the practical existence of the four natural-resource-based view resources in industry. Assuming a critical realist qualitative approach, in-depth interviews with sustainability experts in UK agri-food are undertaken. Findings demonstrate the existence of pollution prevention, product stewardship and clean technologies, and align with Hart's (1995) conceptualisation of sustainability as competitive resources. Whilst the fourth resource, base of the pyramid, cannot be empirically verified, a fifth resource of local philanthropy is uncovered and contributes to the growing body of knowledge surrounding competitive social sustainability. Findings also challenge the hierarchal presentation of the natural-resource-based view to implicate a more cyclical uptake. Thus, in offering the first empirical explanation of the natural-resource-based view, this paper overcomes a theory-practice gap to elucidate the feasibility, orchestration and value of resources in competitive and sustainable operations.

Keywords: natural-resource-based view; sustainable operations; competitiveness

1. Introduction

Hart's (1995) natural-resource-based view of the firm (NRBV) is a prominent theory in academia, emerging with particular significance in sustainable operations literature (Chicksand et al, 2012; Johnson et al, 2014; Marshall et al, 2015). Comprising four resources intended to maximise both sustainability and competitiveness, the NRBV may respond to the growing need for ecological and societal development in business operations. However, scholars highlight a lack of explanation of competitive resources in operations (Laosirihongthong et al, 2013; Hughes et al, 2018). Of particular significance are criticisms of infeasibility, which arise from the resource -based theory roots of the NRBV. The tacit nature of resources and their intended heterogeneity, scarcity, inimitability and nonsubstitutability (Powell, 1992; Lockett et al, 2009) has long warranted concerns of impracticality and unattainability (Grant, 1991; Lockett et al, 2009; Hughes et al, 2018). It is for such reasons that academics have argued NRBV resources do not exist in practice (Hart & Dowell, 2011; Ashby et al, 2012).

Such is the complexity of competitive resources that Lockett et al (2009) suggest it has deterred their empirical investigation. In particular it is argued that their tacit existence prevents observation (Butler & Priem, 2001), whilst their heterogeneity, scarcity and inimitability limits the value of their definition at all (Christmann, 2000). However, this is arguably a product of the positivistic dominance of resource-based theory research (Acedo et al, 2006), which is limited in its propensity to study intangibles and consider contextualities. The positivist reliance on tangible or measurable realities conflicts with the heterogenous and tacit nature of competitive resources. However, in failing to undertake empirical research, academia has done little to advance resource-based theory or the NRBV (Hart & Dowell, 2011). Moreover, claims that that the NRBV does not exist in practice can in part be attributed to

inadequate research methodologies, highlighting the need for an alternative approach (Acedo et al, 2006; Newbert, 2007).

In particular the need to examine the existence of NRBV resources in practice emerges with significance. Literature notes a lack of practical understanding of NRBV resources (Mencug & Ozanne, 2005) and their role in competitive sustainability (Li & Lui, 2014). Existing understandings of the NRBV are predominantly based on conceptualisation (e.g. Hart, 1995; 1997; Prahalad & Hart, 2002; Shi et al, 2012) or limited to a narrow focus (Marshall et al, 2015) exclusive of all four resources (e.g. Russo & Fouts, 1997; Aragon-Correa & Sharma, 2003; Mencug & Ozanne, 2005; Shi et al, 2012; Miemczyk et al, 2016). Hart & Dowell (2011, p1476) present this as a research gap, calling for the NRBV to be *'fully integrated into strategic management theory and practice'*.

Thus, the aim of this paper is to undertake qualitative empirical research of the NRBV to explore the practical existence of the four NRBV resources: pollution prevention, product stewardship, clean technologies and base of the pyramid. The research question guiding this is *how are NRBV resources manifest in practice?* This is supported by a critical realist philosophy and undertaken via in-depth interviews with sustainability experts operating in the UK agri-food sector. UK agri-food serves as an appropriate setting based on its reliance on the natural environment and its widely acknowledged expertise in sustainable operations (Department for Business & Innovation, 2013; Parliament UK, 2014; Tassou et al, 2014).

As the first empirical exploration of NRBV resources in practice this paper offers contributions in the following ways. Theoretically, it provides empirical explanation of pollution prevention, product stewardship and clean technologies, overcoming the theory practice gap and contesting criticisms of infeasibility. It also adds to the growing

body of knowledge surrounding competitive social sustainability: first by reinforcing the significance of base of the pyramid and highlighting the need for further study; and second in the conceptualisation of a new social sustainability resource termed *local philanthropy* based on emergent interview findings. Further theoretical elaborations arise from emergent findings surrounding the circular orchestration of NRBV resources. Practically, this paper supports application of NRBV resources via their explanation and empirical validation of their feasibility and value in terms of competitive sustainability. This aligns with Hart & Dowell's (2011, p1476) desire for the NRBV to provide *'breakthrough strategies that actually resolve social and environmental problems'.* Reinforcing the significance of this is Garetti & Taisch (2012) who note a lack of guidance surrounding the practical implementation of sustainable operations. Methodologically, this paper deviates from the positivist dominance of resource-based theory literature (Acedo et al, 2006), employing a critical realist qualitative approach that permits observation of the NRBV's tacit and heterogenous resources.

2. Literature Review

2.1 Competitive Resources

Links between competitiveness and resources date back to Penrose (1959), in which firm growth and success is connected to effective execution of resources. Rubin (1973) added to this, discussing the need for groups of resources to work together. Expanding on these works, Wernerfeldt (1984) conceptualised the resource-based view of the firm, claiming that the firm itself is made up of resources, derived from organisational activities developed over time (Penrose, 1959) and external opportunities and threats (Barney, 1991). Such resources when '*presently scarce, difficult to imitate, nonsubstitutable and not readily available in scarce markets'* (Powell, 1992, p552) are

expected to generate a sustainable competitive advantage (Laosirihongthong et al, 2013; Marshall et al, 2015; Yu et al, 2017; Yusuf et al, 2017; Hughes, 2018). There are two founding arguments within this: resource heterogeneity results in uniqueness that contributes to competitive advantage; and resource immobility means such resources cannot be easily attained (Peteraf & Barney, 2003).

The competitive value, with regards to financial benefits, of resource-based theory has dominated literature (Grant, 1991; Hart, 1995; Russo & Fouts, 1997; Christmann, 2000; Barney, 2001; Shi et al, 2012; Yu et al, 2017; Hughes et al, 2018). However, as the name suggests, competitiveness is resource-based and thus subject to variance (Collis & Montgomery, 1995; Lockett et al, 2009; Marshall et al, 2015). More specifically, deriving competitiveness from heterogenous resources delivers heterogenous results that cannot be guaranteed (Amit & Schoemaker 1993; Hitt et al, 2015; Hughes et al, 2018). As such, resource-based theory does not contend that possession of a resource will result in competitive advantage, but that the effective exploitation of the right resources may deliver competitive benefits (Peteraf & Barney, 2003; Hitt et al, 2015; Marshall et al, 2015; Yu et al, 2017).

2.2 NRBV Resources

Expanding on this contention, Hart's (1995) NRBV argues that resources can be derived from ecological and societal issues and exploited for firm gain (Yusuf et al, 2017). Notably, this differs to existing sustainability frameworks of corporate social sustainability (Carroll, 1979) and the triple bottom line (Elkington, 1994) in that competitive exploitation maximises the business case for sustainability (Russo & Fouts, 1997; Shi et al, 2012). This assumes some logic, with sustainability presented as one of the most prominent opportunities for business in the 21st century (Ashby et al, 2012;

Pagel & Shevchenko, 2014). From a resource-based theory perspective, resource heterogeneity can be realised via diverse approaches to sustainability that support inimitability (McWilliams & Siegel, 2001; Ashby et al, 2012; Pagel & Shevchenko, 2014). Resource immobility can be recognised in the increasing complexities of ecological and social environments (Hart & Dowell, 2011; Shi et al, 2012) that support unattainability in sustainability (Abbasi & Nilsson, 2012). Pertinently, this is not to be simplified to the argument that sustainability offers a resource with which competitive advantage can be derived. Rather, firms who successfully identify and respond opportunities in the natural environment may benefit from sustainable and competitive gains, delivering competitive sustainability (Li & Lui, 2014). This inspired initial conceptualisation of three sustainability resources aimed at both sustainable advancement and firm gain: pollution prevention, product stewardship and sustainable development. Such resources are made up of internal organisational capabilities and routines and exploitation of external issues of environmental and social degradation (Hart, 1995; Hart & Dowell, 2011).

More specifically**, Pollution prevention** seeks to promote environmental sustainability whilst simultaneously cutting costs and maximising efficiency throughout internal operations (Hart & Dowell, 2011). In preventing internal waste and emissions (Aragon-Correa & Sharma, 2003) costs associated with disposal are avoided and internal operations streamlined (Russo & Fouts, 1997; Christmann, 2000). **Product stewardship** extends environmental sustainability towards external operations, seeking conservation, avoidance of harmful substances and recyclability from a lifecycle perspective (Hart, 1995). Alongside environmental and economic advantages this is intended to permit access to scarce resources and the creation of wholly sustainable products as a source of competitive advantage (Ashby et al, 2012; Golicic & Smith,

2013). **Sustainable development** promotes the consideration of economic, environmental and social issues on a global scale (Hart, 1995; Shrivastava & Hart, 1995). New manufacturing processes in support of environmental advancement and new business markets in support of social advancement promote positive impact operations (Hart, 1997; Song et al, 2015). Opportunities for competitive gain arise in the creation of such processes ahead of competitors and access to new, unsaturated markets of the future (Hart, 1995).

However, whilst pollution prevention and product stewardship feature prominently and positively in literature (Russo & Fouts, 1997; Aragon-Correa & Sharma, 2003; Shi et al, 2012; Miemczyk et al, 2016), the same cannot be said for sustainable development. In fact, the resource did little to expand on the widely cited World Commission on Environment and Development's (WCED) (1987, p8) Bruntland report definition of sustainable development as meeting *'the needs of the present without compromising the ability of future generations to meet their needs'.* Similarities can also be noted with corporate social responsibility and the triple-bottom-line: both of which predate the NRBV and advocate the consideration of economic, environmental and social issues in business (Mencug & Ozanne, 2005; Markley & Davis, 2007; Matapolous et al, 2014). As such, Hart's (1995) sustainable development made little impact on growing academic and business interests surrounding the pursuit of economic, environmental and social issues on a global scale (Berger-Walliser & Shrivasta, 2015). Moreover, sustainable development overlooks the *'fundamental differences'* between environmental and social sustainability (Marshall et al, 2015, p674).

In response, sustainable development was divided in to two separate but interrelated, resources: clean technologies (Hart & Christensen, 1997) and base of the pyramid

(Prahalad & Hart, 2002). By exemplifying dispersed environmental and societal intentions this added definition to Hart's obscure and theoretically underdeveloped sustainable development (Ashby et al, 2012). **Clean technologies** seeks positive environmental impacts on a global scale via the development of new manufacturing systems, resulting in competitive pre-emption (Hart & Christensen, 1997; Hart & Milstein, 1999). More recent literature adds some reinforcement to this, presenting technology as an additional dimension to sustainability (Garetti & Taisch, 2012). **Base of the pyramid** focuses on global social development, promoting the development of new markets to stimulate economic growth in emerging markets whilst simultaneously creating unsaturated markets for expansion (Prahalad & Hart, 2002; London & Hart, 2004; Hart et al, 2016). Again this approach is reinforced in more recent literature, where it is argued that *'future business models should have a global marketing perspective, taking into account the development of new industrialised countries'* if sustainable business is to be realised (Garetti & Taisch, 2012, p88). Nonetheless, literature commonly disregards the division of sustainable development (e.g. Menuc & Ozanne, 2005; Matapolous et al, 2014) and remains dominated by pollution prevention and product stewardship (Hart & Dowell, 2011). The four NRBV resources are summarised in table 1, below.

Table 1 Depiction of Natural-resource-based view Resources in Literature

Resource	Description	Sustainability Benefit	Competitive Benefit
Pollution Prevention	Preventing the initial occurrence of waste and emissions throughout internal operations (Hart, 1995; Russo & Fouts, 1997; Aragon-Correa & Sharma, 2003)	Advanced minimisation of waste & emissions, resulting in environmental protection (Russo & Fouts, 1997; Aragon-Correa & Sharma, 2003; Hart & Dowell, 2011; Shi et al, 2012)	Competitive cost cutting via improved efficiency and reduced costs (Hart, 1995; 1997; Russo & Fouts, 1997; Christmann, 2000; Hart & Dowell, 2011).
Product Stewardship	Prioritisation of natural environment throughout entire lifecycle (Hart, 1995; Hart & Dowell, 2011)	Conservation, recyclability & avoidance of harmful substances from a lifecycle perspective (Hart, 1995; Shi et al, 2012; Miemczyk et al, 2016)	Differentiation via the creation of wholly sustainable products and access to scarce resources (Hart, 1995; Menguc & Ozanne, 2005; Ashby et al, 2012; Golicic & Smith, 2013; Miemczyk et al, 2016)
Clean Technologies	Investing in the technologies of the future in pursuit of environmentally sustainable operations (Hart, 1997; Hart & Milstein, 1999 Pernick & Wilder, 2007)	Positive environmental impacts in the long term (Hart, 1997; Pernick & Wilder, 2007; Hart & Dowell, 2011)	Competitive pre-emption via technologies & advanced manufacturing processes (Hart & Milstein, 1999; Hart & Dowell, 2011)
Base of the Pyramid	The alleviation of social ills via simulation of development at the base of the economic pyramid (Hart & Christensen, 2002; Prahalad & Hart, 2002; Hart et al, 2016)	Social sustainability in markets at the base of the economic pyramid (Hart & Milstein, 1999; Prahalad & Hart, 2002; Hart et al, 2016)	Market growth via access to scarce and unsaturated markets (Hart & Milstein, 1999; London & Hart, 2004; Hart et al, 2016)

Pertinently, such negligence of clean technologies and base of the pyramid arguably conflicts the intended interrelated nature of NRBV resources. That is, resource-based theory contends that competitiveness is rarely derived from a resource in isolation but rather from bundles of combined resources (Teece et al, 1997). Expanding on this, Hart (1995) argues that NRBV resources are of greater value when implemented conjunctively. A later paper places interdependencies between the resources, with pollution prevention, product stewardship and clean technologies presented as stages 1, 2 and 3 of environmental sustainability. Base of the pyramid emerges as the social counterpart of the NRBV, placing a reliance on clean technologies to support entry into and development of emerging markets (Prahalad & Hart, 2002; Hart, 2011; Hart &

Dowell, 2011). This facilitates a hierarchal presentation of the NRBV (e.g. Shi et al, 2012; Miemczyk et al, 2016) which is somewhat undermined by the study of resources in isolation. Moreover, such hierarchal presentation is based on theoretical propositions, with the empirical investigation of the orchestration of NRBV resources neglected entirely.

2.3 Theoretical Limitations

Also arising as a research gap in need of empirical investigation is the existence and value of NRBV resources in practice. That is, whilst the NRBV is widely discussed in literature and prominently applied as theoretical lens, understanding of the theory is limited to conceptualisation as opposed to empiricism. In fact, Hitt et al (2015) notes a distinct lack of empirical evidence of competitive resources altogether.

Worsening this are criticisms of the feasibility or practicality of competitive resources. More specifically, the intended heterogeneity, scarcity, inimitability and nonsubstitutability of competitive resources (Powell, 1992) threatens the feasibility and longevity of competitive resources (Teece et al, 1997; Fiol, 2001; Lockett et al, 2009). In addition, resource-based theory offers no practical guidance to support exploitation of competitive resources (Grant, 1991; Newbert, 2007; Lockett et al, 2009; Hitt et al, 2015). Hart's (1995) conceptualisation of the NRBV fails to overcome these theoretical limitations. This is in spite of the derivation of resources from the unpredictable natural environment which Li & Lui (2015) claim exacerbate issues of competitive infeasibility and impracticality. Such oversight has encouraged claims that NRBV resources do not exist in practice (Ashby et al, 2012), contributing to a theory-practice gap extending more than two decades (Hart & Dowell, 2011).

To some extent, this lack of empirical evidence can be attributed to inadequate methodologies. Acedo et al (2006) identified a positivist dominance in resource-based theory research, which based on its reliance on measurability and tangibility (Edwards et al, 2014), may be ill-equipped to study tacit and heterogenous resources. Reinforcing this, Butler & Priem (2001) claim that competitive resources are unobservable, whilst Lockett et al (2009) suggest that their empirical study is deterred by their ambiguity. Moreover, existing studies have suggested that empirical definition of resources undermines their intended immobility and heterogeneity definition (Black & Boal, 1994; Christmann, 2000; Barney, 2001). Whilst such concerns do warrant reflection, they also stress the need for a more qualitative approach to the study of competitive resources, and a research philosophy that permits access to intangibles and consideration of contextualities. Certainly, such qualitative investigation of the NRBV is long overdue.

3. Methods

Having examined the literature and concluded that there is a theory-practice gap, the authors set out to investigate evidence of NRBV in practice. The aim of this paper is to undertake qualitative empirical exploration of the NRBV to evidence the practical existence of pollution prevention, product stewardship, clean technologies and base of the pyramid. The research question guiding this is *how are NRBV resources manifest in practice?*

Departing from the positivist dominance of resource-based theory research (Acedo et al, 2006), this was supported by a critical realist research philosophy. Critical realism escapes the extremes of positivism (Ackroyd, 2004) to recognise the reality of the natural order, events and discourses of the social world (Bryman & Bell, 2011). In

doing so, observation of intangibles and consideration of contextualities is supported, facilitating access to the NRBV's tacit and heterogenous resources. In guiding the direct study (Easton, 2010; Ryan et al, 2012) of organisational mechanisms and business structures, critical realism is of growing significance in operational studies and the explanation of *'clearly bounded, but complex, phenomena'* (Hanna & Jackson (2015, p788). In this case, critical realism stimulates the belief that the NRBV exists as its own entity in real-life business environments to be observed and explicated. This challenges NRBV criticisms of inexistence and infeasibility which may be linked with inadequate research methodologies.

The critical realist often relies on discourse and causal language to explicate tacit knowledge and explain phenomena (Easton, 2010). Thus, to observe and explain NRBV resources a qualitative approach comprising in-depth interviews was adopted. In-depth interviews permit the explication of tacit phenomena via analysis of discursive data (Saunders et al, 2012). Such interviews facilitate interactive engagement between phenomena *(NRBV)* and real-life *(practice)* (Ackroyd, 2004), with researchers and interviewees playing fundamental roles in the creation of knowledge (Edwards et al, 2012). Undertaking qualitative research interviews takes a lot of planning and preparation. In terms of the interview design process, many decisions must be carefully considered, such as who to interview, how many interviewees will be required, type of interview to conduct, and how the interview data will be analysed (Qu & Dumay, 2011). The following sections outline some of the considerations in this research.

3.1 Sampling & Recruitment

Selecting a contextual setting is of great importance (Bryman & Bell, 2011), and in this case the UK agri-food sector was selected for both theoretical and practical reasons. Theoretically, there exist correspondences between Hart's conceptualisation of the NRBV and agri-food's dependency on natural resources and prioritisation of sustainability as a competitive advantage. Moreover, agri-food features in several prominent papers included in the critical literature review (e.g. Jensen et al, 2013; Cuerva et al, 2014; Matapolous et al, 2014). Practically speaking, UK agri-food food assumes considerable expertise in innovative sustainable operations (Jensen et al, 2013; Tassou et al, 2014; Parliament UK, 2014; Department for Energy and Climate Change, 2016), and as such agri-food companies may possess tacit knowledge relevant to this study. In addition, the NRBV arguably offers a means by which to address demand for enhanced competitiveness and sustainability throughout UK agri-food (Environmental Sustainability KTN, 2015).

As such, UK agri-food companies that demonstrated some experience of the natural-resource-based view resources were sought. Non-probability sampling supported this, allowing the researcher to exercise judgement and use theoretical parameters to select the most relevant organisations (Saunders et al, 2012). NRBV resources served as theoretical parameters: advanced interests in waste and pollution implicated pollution prevention; discussions of sustainable food chains or a lifecycle approach implicated product stewardship; sustainable technologies, processes or systems in support of positive environmental impacts implicated clean technologies; and concern for social issues or presence in emerging markets implicated base of the pyramid. Organisations that presented such aspects in a competitive context were prioritised. As sub-sector, company size, location or operational function did not feature in selection criteria,

relevant privately-owned companies, government bodies and research bodies were identified from online searches.

In total, 114 relevant organisations were identified, and considered as 'critical cases' (Saunders et al, 2012). Pertinently, those identified represented companies that have successfully exploited sustainability for competitive gain in line with the NRBV resources. Taking into consideration the heterogeneity, scarcity, inimitability and nonsubstitutability of competitive resources (Powell, 1992; Lockett et al, 2009), such companies can be considered leaders in competitive sustainability in UK agri-food as opposed to best-practice. Where possible, individuals within these organisations were targeted on account of their knowledge of, or proximity to, NRBV resources and contacted via email to request interview. Interviewees were offered face-to-face, skype or telephone interviews, with the latter proving the most popular.

In total, 27 of the 114 contacted agri-food organisations agreed to participate *(table 3),* a response rate of 23%. Interviewees themselves were targeted on account of their proximity to the NRBV resources and included managers, CEOs, agronomists, environmental officers and commercial directors, each of which the critical realist considers an expert on account of their first-hand experience (Edwards et al, 2012). In order to promote triangulation and maximise responses, more than one Interviewee from each organisation was sought for interview. Moreover, secondary materials in the form of company reports, media reports and online information was reviewed and in some cases included for discussion in interviews.

The 27 agri-food organisations included micro, small, medium and large enterprises operating in various stages in the supply chain and across multiple agri-food sub-sectors. There are two reasons for this. First, NRBV literature does not place emphasis on such company specifics, encouraging flexibility in the sampling frame. Second, it is

commonly the case that UK agri-food companies operate in more than one sub-sector and at more than one stage of the food chain. Thus, a study investigating the NRBV in a specific sub-sector or food chain stage would be of limited theoretical value and struggle to represent the UK agri-food sector. Rather, the sample, as defined in table 2 below, represents all 7 subsectors and all 8 stages of the food chain as taken from DEFRA's (2013) definition of UK agri-food. This said, given that the sample only includes companies with experience of the natural-resource-based view resources, it does not represent every UK agri-food company. Rather, it represents only those that have successfully exploited sustainability for competitive gain in line with the natural-resource-based view resources. Taking into consideration the heterogeneity and rarity that surrounds such competitive resources (Wernerfeldt, 1984; Barney, 2001; Lockett et al, 2009), this is an important distinction to make.

Table 2 Interview Respondents

	Sub-sector(s)	Stage(s) in food chain	Size**	Geographical Presence	Interviewee(s)
1	Fruit & Vegetables	Grower; Processor; Packer	Large	International	Environment & Energy Efficiency Officer
2	Fruit & Vegetables	Grower; Packer	Large	UK	Head of Agronomy
3	Fruit & Vegetables	Breeder	Small	International	Chief Executive
4	Dairy	Grower; Processor; Packer	Small	UK	Marketing Director; Finance Director
5	Seafood	Grower; Processor; Packer	Micro	UK	CEO; Marketing Executive; Collaborator
6	Fruit & Vegetables	Grower; Packer; Retailer	Small	UK	CEO; Health, Safety & Environmental Officer
7	Dairy	Wholesaler	Micro	UK	Director
8	Cereal	Processor; Packer; Retailer	Medium	International	CEO
9	Fruit & Vegetables	Breeder	Large	International	Executive Director
10	Baked Goods	Grower; Processor; Packer	Large	International	Agricultural & Sustainability Manager
11	Dairy; Fruit & Vegetables	Grower	Micro	UK	Farm Director
12	Baked Goods	Processor; Packer	Large	UK	Corporate Responsibility Director
13	Fruit & Vegetables	Grower; Packer	Medium	UK	Commercial Director
14	Fruit & Vegetables	Grower; Packer	Medium	UK	Commercial Manager
15	Animal Feeds	Wholesaler	Micro	UK	CEO
16	Meat	Processor; Packer	Large	UK	Environmental & Sustainability Manager
17	Seafood	Wholesaler; Retailer	Micro	UK	Co-founder
18	Fruit & Vegetables; Seafood	Grower; Wholesaler; Retailer	Micro	UK	Co-founder
19	Fruit & Vegetables	Grower	Large	UK	Farm Assurance Manager
20	Seafood; Meat; Fruit & Vegetables	Services	Large	International	Operations Manager
21	Fruit & Vegetables	Grower; Processor; Packer	Medium	International	Environmental Officer
22	Dairy	Grower; Processor; Packer; Retailer	Medium	International	Head of Corporate Communications
23	Meat	Grower	Medium	UK	Development Manager
24	Fruit & Vegetables; Dairy; Meat	Grower; Processor; Wholesaler	Large	UK	Senior Manager; Board Member
25	Fruit & Vegetables	Grower	Large	UK	Head of Agronomy; Marketing Executive
26	Meat	Grower; Processor; Packer	Large	UK	Sustainability Director
27	Baked Goods	Processor; Packer	Medium	UK	Environmental Director; Corporate Responsibility Director

These 27 in-depth interviews, each lasting between one hour and three hours, provided sufficient evidence and descriptions of NRBV resources to verify their existence, albeit to varying extents. The critical realist qualitative nature of this study is important here, in that in contrast to the positivists quantitative approach, the need for statistically relevant samples is diminished. Rather the 27 interviews produced 214 pages of rich discursive data surrounding competitive sustainable operations from which NRBV resources could be identified. Point of saturation was reached at 25 interviews, with a further two undertaken as a precautionary measure. The collected data was capable of answering the research question *how do NRBV resources manifest in practice?*

3.2 Conducting the Interviews

In-depth interviews are commonly initiated by a holistic question (Srivastava & Thomson, 2009). In this case, interviewees were asked to describe their experiences, knowledge and opinions of sustainable operations in UK agri-food. This was intended to facilitate open and detailed discussion of sustainable operations in which the tacit existence of NRBV could be identified thus explicated.

The researchers appreciate that even when the interviewer and the interviewee seem to be speaking the same language, there could be differences in understanding based on different experiences and world views. Effective planning can help to ensure that meaningful data is collected. Before embarking on the interviews, the researchers set out to gain as much expertise in relevant topic areas as possible in order that they can ask informed questions. A number of "friendly" local agri-food experts were used to test and refine the questions used.

Four key questions were designed based on depiction of NRBV resources in literature. Importantly, NRBV terminology was purposefully avoided to prevent leading. Rather, in consideration of contextualities and interviewer-interviewee

dialogue, terminology was inspired by practice. For example, review of company websites highlighted the use of '*waste management'* instead of pollution prevention, or *'food chain'* as opposed to lifecycle in product stewardship. According to Marshall et al (2015) such 'mismatch' between academic and practitioner language in sustainability is common. Similarly, interviewees were not questioned directly about competitive gain, but competitive inferences served as prompts to be enquired further. With the exception of key questions, interviewer questions differed from interview to interview dependent on organic topics of discussion and guided by prompts derived from the literature. As a result, interviewees often led the discussion, facilitating an open dialogue in which NRBV resources could be explicated without bias. This also supported the identification of two emergent findings. Key questions and prompts are provided in table 3 below.

Table 3 Key questions

Objective	Literature Summary	Question	Prompts
Encourage discussion of pollution prevention	Preventing the initial occurrence of waste and emissions throughout operations	Can you tell me about waste management throughout the company/sector?	Minimisation of waste/emissions/pollution; prevention; disposal; costs; competitiveness; internal procedures/policy
Encourage discussion of product stewardship	Prioritisation of the natural-environment throughout each stage of the life-cycle	Can you tell me about sustainability throughout the food chain?	Prioritisation of natural environment; lifecycle; creation of wholly sustainable products; differentiation; scare resources; stakeholder integration; supply chain activities
Encourage discussion of clean technologies	Investing in the technologies of the future in pursuit of environmentally sustainable operations	How does technology play a role in sustainability?	Technological innovations; positive impacts; alternatives to non-renewables; external promotion of sustainability; patented sustainable technologies; waste; energy/transport/water/material technologies
Encourage discussion of base of the pyramid	The alleviation of social ills via simulation of development at the base of the economic pyramid	How can the company/sector play a role in social sustainability?	Emerging markets; social ills; global expansion; unsaturated markets; technologies; radical/disruptive innovations

3.3 Data Analysis

Qualitative content analysis, which supports the derivation of meaning from text (Burla et al, 2008; Elo et al, 2014) was undertaken to analyse the findings. This involved the coding and categorisation of interview data, which was recorded and transcribed throughout data collection, aligned to each NRBV resource. According to the critical realist, something is real if it has an effect or makes a difference (Sayer, 2004): in this case NRBV resources can be identified via the materialisation of sustainable and competitive benefits. Thus, descriptions of NRBV resources and their associated benefits taken from literature *(table 1)* served as a coding framework. Coded data can be considered observed resources, permitting empirical verification and explanation of the NRBV in industry.

Whilst this coding framework offers some reinforcement via theoretical underpinning, qualitative content analysis is questioned for its validity and rigor (Elo et al, 2014). To overcome this, qualitative software, such as NVivo, are often recommended to support data analysis (Bryman & Bell, 2011). However, this is somewhat conflictive of the significant role of the researcher in critical realist research. That is, it is via the researchers' deep engagement with data that final conclusions can be drawn and ideas conceptualized (Ackroyd, 2004; Edwards et al, 2012), encouraging a manual approach to analysis. In this study, data was coded by hand by each of the three researchers independently. This permitted inter-coder reliability to prevent bias in the coding of data (Burla et al, 200). More specifically, inter-coder reliability measures *'the extent to which independent coders evaluate a characteristic of a message or artefact and reach the same conclusion'* (Lombard et al, 2002, p589): in this case data representative of a NRBV resource. The presentation of NRBV resources as internal organisational capabilities and routines and exploitation of external issues of

environmental and social degradation (Hart, 1995; Hart & Dowell, 2011) was used to guide this, along with a coding framework based on the definition of NRBV resources in literature *(table 4)*. The researchers engaged in deep discussion and consultation of literature to verify identification of each resource.

Table 4 NRBV Resource Coding Framework

Pollution Prevention
➢ The minimisation of waste & emissions via prevention rather than disposal (Hart, 1995; Hart & Dowell, 2011; Shi et al, 2012) ➢ Reduced emissions & capital expenditure = competitive cost cutting (Hart, 1995; Russo & Fouts, 1997; Menguc & Ozanne, 2005) ➢ Assumes an internal focus that over times shifts towards external (Hart, 1995; Menguc & Ozanne, 2005)
Product Stewardship
➢ Prioritisation of natural environment throughout entire lifecycle (Hart, 1995; Hart & Dowell, 2011; Shi et al, 2012) ➢ Creation of wholly sustainable products offers opportunities for differentiation (Hart, 1995; Menguc & Ozanne, 2005; Ashby et al, 2012; Golicic & Smith, 2013; Miemczyk et al, 2016 ➢ Access to scarce resources via stakeholder integration (Hart, 1995; Hart & Dowell, 2011; Ashby et al, 2012) ➢ Supply chain/ lifecycle focus (Shi et al, 2012; Miemczyk et al, 2016)
Clean Technologies
➢ Positive impact operations (Hart & Christensen, 1997; Hart & Milstein, 1999; Song et al, 2015) ➢ Technological innovations as alternatives to non-renewables ((Hart & Christensen, 1997; Hart & Milstein, 1999Move away from traditional routines to re-create industry in a way which promotes sustainability with products, processes or services that create value or significantly reduce waste (Hart & Christensen, 1997; Hart & Milstein, 1999; Song et al, 2015) ➢ Energy technologies, transport technologies, water technologies and material technologies (Pernick & Wilder, 2007)
Base of the Pyramid
➢ Alleviation of social ills on a global scale (Prahalad & Hart, 2002; London & Hart, 2004; Hart et al, 2016) ➢ Stimulation of economic growth/ support of emerging markets at the base of the pyramid (Prahalad & Hart, 2002; London & Hart, 2004; Hart et al, 2016) ➢ Access to scarce/ unsaturated markets = new market entry (Prahalad & Hart, 2002; London & Hart, 2004; Hart et al, 2016) ➢ Relationship with clean technologies and innovation (Prahalad & Hart, 2002; Hart, 2011; Hart & Dowell, 2011)

Data out-with the scope of the coding framework, which is symptomatic of the open and exploratory nature of in-depth interviews, was considered irrelevant to the research question in that it did not correspond with any NRBV resource. However, such data was not discarded entirely, but rather, assuming an abductive approach common in critical realist studies (Ryan et al, 2012), was later revisited to explore new themes. This facilitated the identification of a fifth NRBV resource and the circular orchestration of

resources. This further stresses the significance of methodologies in a study of this nature.

4. Findings & Discussion

The 27 in-depth interviews offer the first empirical explanation of the NRBV. As depicted in table 3 below and discussed throughout this section, pollution prevention, product stewardship and clean technologies featured prominently in interviews, evidencing their existence in UK agri-food. Pertinently, resources were not referred to explicitly, but rather interviewee discussion of sustainable operations corresponded with literature's description of NRBV resources and associated sustainability and competitive benefits *(table 1)* and the coding framework *(table 4)*. The presence of such sustainability and competitive benefits in interviews demonstrates the effect of each resource, which the critical realist considers evidence of existence (Sayer, 2004). Adding further reinforcement is Hart's (1995) initial conceptualisation of the NRBV which contends that resources exist tacitly. Pertinently, this is not to say that the NRBV in practice exactly mirrors its conceptualisation, but that based on the results of qualitative content analysis and intercoder reliability assessments, pollution prevention, product stewardship and clean technologies play some role in competitive sustainable operations in UK agri-food.

Interestingly, the same cannot be said for base of the pyramid which did not feature in any of the 27 interviews. However, this does not warrant falsification of the resource. Rather, its absence can perhaps be considered a product of the contextual limitations of this study, inviting further investigation of the resource out-with the context of the UK agri-food sector. Reinforcing this is resource heterogeneity, scarcity, inimitability and

nonsubstitutability (Powell, 1992) which maximises scarcity and complexity of competitive resources (Lockett et al, 2009).

Moreover, analysis of interview data out-with the NRBV coding framework produces two emergent findings: a fifth resource, termed local philanthropy, featured in 20 of the 27 interviews (table 5); and the hierarchal presentation of the NRBV is challenged via implication of interconnected but not interdependent resources, encouraging proposition of the circular orchestration of the NRBV. Such findings, discussed throughout this section, offer empirical explanation and theoretical elaboration of the NRBV.

Table 5 Data capture

Pollution Prevention	- Featured in all 27 interviews - 24 interviewees offered detailed and lengthy discussion of pollution prevention - 3 interviewees demonstrated lesser but still identifiable experience of pollution prevention
Product Stewardship	- Featured in all 27 interviews - All 27 interviewees offered detailed and lengthy discussion of product stewardship
Clean Technologies	- Featured in all 27 interviews - 22 interviewees offered detailed and lengthy discussion of clean technologies - 5 interviewees demonstrated lesser but still identifiable experience of clean technologies
Base of the Pyramid	- Did not feature in any interviews
Local Philanthropy	- Featured in 20 of 27 interviews - 17 interviewees offered detailed and lengthy discussion of local philanthropy - 5 interviewees demonstrated lesser but still identifiable experience of local philanthropy

4.1 Pollution Prevention

In some correspondence with its dominance in literature (Hart & Dowell, 2011), pollution prevention featured in all 27 interviews. 24 of these interviews offered detailed and lengthy discussions of pollution prevention, whilst the latter three demonstrated lesser but still identifiable experience of the resource. Such discussions predominantly surrounded the prevention of waste, with particular reference to the prevention of internal wastes such as cardboards, plastics, metals, unusable or commercially unviable produce, water and soil. Prevention of pollution featured to a

lesser extent but were nonetheless notable in all 27 interviews via discussions of water pollution, soil pollution, carbon and emissions associated with machinery, pesticides and fertiliser. Thus, corresponding with literature, pollution prevention is concerned with the prevention of both wastes and emissions in internal operations (Hart, 1995; Russo & Fouts, 1997; Aragon-Correa & Sharma, 2003).

In line with resource heterogeneity (Powell, 1992; Christmann, 2000; Peteraf & Barney, 2003) the manifestation of pollution prevention differed in each interviewed company. However, the prevention focus remained consistent, evidenced in claims such as '*we want to remove waste wherever possible, or really prevent it'* (Interviewee 25). This was often associated with internal systems and processes. For example, Interviewee 24 stated *'for us it was important to have a system in place to support prevention',* whilst Interviewee 23 discussed *'key people from engineering, environment, sustainability, health and safety get together and look at their metrics from the previous month and discuss where the water is, where the waste is and discuss projects they have underway to try and meet new targets'*.

Sustainability benefits were heavily embedded in such discussions and corresponded with pollution prevention's advanced minimisation of waste and emissions (Russo & Fouts, 1997; Aragon-Correa & Sharma, 2003; Hart & Dowell, 2011; Shi et al, 2012). This in turn was intrinsically linked with efficiency and cost benefits, demonstrating the competitive benefits of the resource (Hart, 1995; 1997; Russo & Fouts, 1997; Christmann, 2000; Hart & Dowell, 2011). That is Interviewee 11 claimed '*people forget that being green is the most cost-conscious route, especially for efficiency'*. Additionally, Interviewee 27 stated *'waste is a big issue for us, we realise it costs us money and it impacts on the environment so of course we want to take measures to prevent it',* whilst Interviewee 6 stated '*I believe we are the most efficient in the*

business, certainly when it comes to minimising waste and energy use and making the most of reusables and recyclables [….] *that is how we keep our costs low and our environmentalism high'.* Interviewee 21 explained that by *'constantly optimising machinery to reduce waste and cut costs we'll gain environmentally just because they work better, and they are more efficient'.,*

Whilst such intrinsic links between environmentalism, efficiency and cost are typical of sustainable operations (Rothenberg, 2009), interviewees appeared to deliberately exploit environmental issues for financial reward with Interviewee 10 claiming prevention is undertaken *'principally to save money*'. Evidencing this, Interviewee 13 stated *'if your electricity bill is rising year on year, you think surely there must be something you can do*' and linking this with prevention. Offering further reinforcement, Interviewee 4 stated *'I'm going to be trying to reduce carbon because I want to cut my costs* [….] *'we see that as economics not sustainability',* whilst Interviewee 5 claimed *'farmers only use pesticides when we absolutely have to* [....] *and the most obvious way to prove that is that pesticides and fertilisers are really expensive, so sustainability really brings financial returns'*. Such discussions demonstrate the NRBV's exploitation of sustainability for firm gain (Hart, 1995; Russo & Fouts, 1997) and support links between pollution prevention and competitive cost cutting (Hart, 1997; Christmann, 2000; Hart & Dowell, 2011). Stressing the significance of this, Interviewee 8 claimed 80% of savings were made through internal processes in line with pollution prevention, whilst Interviewee 5 claimed their cost savings from prevention allowed them to '*compete with the big boys'.*

4.2 Product Stewardship

Whilst pollution prevention is the dominant resource in literature (Hart & Dowell, 2011), product stewardship emerged as dominant in interviews, rendering detailed discussion in all 27 interviews. As with pollution prevention, the term 'product stewardship' did not feature explicitly, but product stewardship's prioritisation of the natural environment throughout the lifecycle (Hart, 1995; Hart & Dowell, 2011) was identifiable. That is, in line with product stewardship's presentation of the natural environment as a key stakeholder (Hart, 1995), interviewees claimed '*sustainability is at the heart of the business model'* (Interviewee 25). Within this a reliance was placed on a lifecycle approach, with Interviewee 3 discussing the need for *'a holistic approach to resource management* [….] *from cradle-to-grave',* and Interviewee 6 stating *'we want to think about the performance of that product throughout production right up until it is cooked and eaten* [and] *sustainability plays a big part in this'.*

Again, the manifestation of product stewardship was heterogenous, but references to the supply chain featured prominently as a result of product stewardship's lifecycle focus. More specifically, Interviewee 24 stressed the need for a supply chain that is *'genuinely sustainable, not just in an environmental way but ensures sustainable living, a livelihood for our fishermen that is economically and socially sustainable',* whilst Interviewee 14 called for actors in the supply chain to '*do their best to make sure farms remain sustainable in the long term'.* Similarly, Interviewee 25 claimed to *'look to understand what the credentials are of a supplier that we're working with and we will always choose the most sustainable option available'.* Such discussion corresponds with existing links between product stewardship and supply chain management in literature (Shi et al, 2012; Miemczyk et al, 2016). In part this may be due to the common argument that wholly sustainable products and processes, such as those typical of product stewardship, are rarely achieved by a company on its own but rather dependent

upon a contribution from each actor in the supply chain (Prajogo & Sohal, 2013). Reinforcing this is Interviewee 15 claiming product stewardship '*can't be done in isolation on our farm'*.

Sustainability benefits corresponded with those in literature (Hart, 1995; Shi et al, 2012; Miemczyk et al, 2016), with explicit links to conservation and recyclability throughout interviewee discussions of product stewardship. Avoidance of harmful substances featured more implicitly, but was evidenced in statements such as *'to put it simply we don't want anything dirty at any point in the system* [….] *a lot of that is driven by water, which in being in short supply we don't want to pollute in any way'* (Interviewee 23).

Such sustainability benefits were again intrinsically linked with competitive benefits, albeit with some disparities to literature. Existing links between product stewardship and differentiation via the creation of wholly sustainable products (Hart, 1995; Menguc & Ozanne, 2005; Ashby et al, 2012; Golicic & Smith, 2013; Miemczyk et al, 2016) are verified in interviewee claims that product stewardship supports creation of a *'dream product for sustainability'* (Interviewee 12) or '*adds a positive light on the end product and what we do as a collective'* (Interviewee 14). Similarly, Interviewee 10 claimed stewardship allowed them to tell *'a good meat story'* that differentiates them from competitors. However, Hart's (1995) intended competitive benefit of access to scarce resources did not feature.

Moreover, in some contrast to existing literature, interviewees drew prominent links between product stewardship and financial reward. For example, Interviewee 14 claimed product stewardship *'works economically and from the point of conservation',* whilst Interviewee 17 claims to drive a product stewardship approach throughout their supply chain, showing partners that *'it's saving them money and helping long term*

sustainability by reducing environmental impact'. From this perspective, product stewardship *'is environmental and it also makes more sense business wise'* (Interviewee 24) and is *'to do with sustainable business as well as being good for the planet'* (Interviewee 17). However, the financial rewards of product stewardship lack clear discussion in literature. To some extent, this may be an extension of pollution prevention's competitive cost cutting due to proposed interconnectedness of resources (Penrose, 1959; Hart, 1995; Hughes et al, 2018). However, interviewee results show that product stewardship purposefully exploits sustainability issues in the lifecycle for financial gain.

4.3 Clean Technologies

Conflicting its negligence in literature (Hart & Dowell, 2011), interview results suggest that clean technologies assumes a prominent role in competitive sustainability. Clean technologies featured in all 27 interviews, and in 22 of those interviews was discussed in detail at length. Clean technologies' investment in the technologies of the future in pursuit of environmentally sustainable operations (Hart, 1997; Hart & Milstein, 1999) featured conspicuously in interviewee's involvement and interest in emerging environmental technologies. This adds strength to the presentation of technology as a new dimension of sustainability (Garetti & Taisch, 2012).

Due to resource heterogeneity (Powell, 1992; Christmann, 2000; Peteraf & Barney, 2003) and inimitability (Powell, 1992; Lockett et al, 2009), specific clean technologies differed significantly throughout interviewed companies. However, energy technologies assumed some dominance, with repeated discussion of solar panels, wind turbines, anaerobic digesters, bio-nuclear technologies, hydrogen fuel cells, biogas and biomass technologies, hydro power and combined heat and power technologies. Discussion of

water technologies and systems, transport technologies, closed-loop systems and innovative farming processes such as vertical farming, aquaponics and micropropagation. also featured prominently. Interestingly this corresponds with Pernick & Wilder (2007) categorization of clean technologies as energy technologies, transport technologies, water technologies and material technologies.

In further correspondence with literature (Hart, 1997; Pernick & Wilder, 2007; Hart & Dowell, 2011) interviewees boasted positive environmental impacts and a long-term perspective throughout discussion of their clean technologies. Interviewees were motivated to invest in clean technologies due to *'a genuine desire to achieve sustainability in the long term'* (Interviewee 7), to realise '*global aspirations about being nice to the planet'* (Interviewee 10) and *'to reduce climate change* (Interviewee 11). Similarly, Interviewee 4 stated *'instead of asking how can we become more sustainable, maybe we need to be asking how can we protect the future* […] *at the end of the day it is the right thing to do',* whilst Interviewee 25 claimed clean technologies *'is about leaving the world in a state for our children that isn't completely impossible for them to manage, which is something that our species as a whole needs to start thinking about, and thinking about the way we interact with this planet in an entirely different way'*.

Whilst such discussions demonstrate some correspondence with the Bruntland report definition of sustainable development, interviews implied intentional exploitation of sustainability for firm rewards, corresponding with clean technologies. In particular, clean technologies competitive pre-emption (Hart & Milstein, 1999; Hart & Dowell, 2011) featured prominently, with Interviewee 9 crediting clean technologies with helping them to *'buck the trend',* Interviewee 20 stating *'we adopt tech quickly ahead of the curve because it gives us an advantage'* and Interviewee 23 claiming clean

technologies *'gives us more advantage in the market place because our competitors can't get into it'.* Offering greater explanation, Interviewee 6 claimed their investment in clean technologies puts them *'head and shoulders ahead of everyone else',* explaining *'we wanted to invest in that tech so we could become a self-sufficient stand-alone company that puts us in a very unique position, actually outweighing our CO2 emissions'.* Similarly, Interviewee 11 stated *'our vision for the future is to be a Scottish global brand from the greenest company in Britain',* adding '*we want to be 100% self-sufficient in renewable energy'.*

Further demonstrating exploitation for firm gain, discussions of competitive pre-emption featured prominent links with financial reward. This differed to those seen in pollution prevention and product stewardship, in that they were associated with profits from commercialisation of clean technologies. That is, Interviewee 8 claimed to make money from selling on energy produced from energy technologies and Interviewee 9 claimed their patented clean technologies were *'selling all over the world'.* Interviewee 20 described clean technologies as '*a long-term investment, although it does stack up commercially, you could think of it as another income stream',* whilst Interviewee 11 claim their commercialization of energy technologies has allowed them to become *'an energy producer'* alongside their agri-food operations. Whilst Hart & Dowell (2011) suggest companies require commercialization abilities in clean technologies, the competitive benefits of commercialisation lacks clear discussion in literature.

Moreover, financial rewards were not limited to competitive pre-emption and commercialisation, but rather clean technologies advanced manufacturing processes (Hart & Milstein, 1999; Hart & Dowell, 2011) rendered links with improved efficiency and thus reduced costs. That is, Interviewee 11 claimed clean technologies are *'energy efficient which of course reduces cost',* and later stressed *'it all needs to make sense for*

both the sustainable route and the financial route of the company'. Similarly, Interviewee 13 claimed clean technologies are *'morally the right thing to do for the environment, but of course that is not to say there aren't financial gains because there are, you get big reductions',* whilst Interviewee 9 stated *'when it comes to these technologies, it's a no-brainer when its £15,000 but with a two-year payback'*. This appears to go beyond embedded benefits due to resource interconnectedness (Penrose, 1959; Hart, 1995; Hughes et al, 2018) to suggest that clean technologies delivers financial benefits in its own rights.

4.4 Base of the Pyramid

In spite of references to global social sustainability on the interviewed company websites, none of the 27 interviewees spoke of base of the pyramid. This is not to say emerging markets or global sustainability was not discussed. For example, Interviewee 17 discussed working in Russia and the Middle East, demonstrating concern for *'climate change and severe weather conditions'* and the *'changing economic outlook and the volatile commodity prices* [that] *impact on the farmer'*. Interviewee 11 stated *'as a global company we have a responsibility to develop best practices and find the best solutions and put that into training all over the world, like we did with drip irrigation'*. However, Interviewee's operating in such markets did not demonstrate active alleviation of social ills or stimulation of economic growth. Moreover, such discussions, unlike that of the other three resources, were not explicitly linked with competitive gain. As such, the data collected does not correspond with Prahalad & Hart's (2002) base of the pyramid, adding to the negligence of the topic in existing literature (Hart & Dowell, 2011) and rendering the practical existence of the resource unsubstantiated.

Two things must be considered here. First is sampling and contextual limitations. It is notable that the two interviewed companies who demonstrated global sustainability and emerging markets interests were UK based micro companies, and as such their size and market scope may prevent them from realising base of the pyramid at present. Moreover, the sample is entirely sector specific. As such, the absence of base of the pyramid within this sample does not contest the argument that the resource may exist out-with the context of the UK agri-food sector. Reinforcing this is the growth of social sustainability efforts focused upon the development of emerging markets (Garetti & Taisch, 2012; Berger-Walliser & Shrivasta, 2015; Yusuf et al, 2017). Second, Hart et al (2016) argue that the heterogeneity, scarcity, inimitability and nonsubstitutability of competitive resources is maximised in base of the pyramid, further diminishing the probability of finding the resource in the sample.

Therefore, the absence of base of the pyramid in this study does not warrant falsification of the resource. To do so would return to the positivist tendencies of existing studies and conflict the non-contradictory synthesis (Sayer, 2004) of a critical realist perspective. Rather, the absence of base of the pyramid stresses the need for further investigation of the study. Reinforcing this are claims that competitiveness (Laosirihongthong et al, 2013) and sustainable operations (Yusuf et al, 2017) in such markets is a widely neglected area.

4.5 The Emergence of Local Philanthropy as the Fifth NRBV Resource

Whilst the empirical study did not confirm the existence of base of the pyramid, discussions of social sustainability within a competitive context did feature out-with the context of the resource. More specifically, in contrast to base of the pyramids focus on scarce, unsaturated markets and global expansion (Prahalad & Hart, 2002), 20 of the 27

interviews discussed competitive social sustainability on a local, philanthropic basis. Interestingly, this 'local' aspect was evidenced in both UK based and International companies and related to any operational market. In addition, the data was captured from companies of all sizes in the sample. This adds some strength to the findings, which can be considered significant given that social sustainability of this nature was not intentionally investigated. This facilitated the conceptualisation of a new resource, adding to the growing field of competitive social sustainability, which still lags behind that of environmental sustainability (Garetti & Taisch, 2012; Hoejmose et al, 2013; Eskandarpor et al, 2015; Koh et al, 2017; Yawar & Seuring, 2017) with particular reference to its practical implementation (Marshall et al, 2015).

Notably, existing literature has suggested that base of the pyramid over time has diverged from its global focus and profit intentions to become more locally-focused (Kolk et al, 2014). However, such radical realignment of base of the pyramid returns to falsification of the resource, and fails to consider its maximised heterogeneity, scarcity, inimitability and nonsubstitutability (Hart et al, 2016). Moreover, it disregards the growth of social sustainability efforts focused upon the development of emerging markets (Laosirihongthong et al, 2013; Berger-Walliser & Shrivasta, 2015) and the argument that base of the pyramid as it was initially conceived remains a feasible resource in modern business (Hart et al, 2016). It is for such reasons that base of the pyramid is not falsified in this study, and local philanthropy is not proposed as its alternative.

Rather, this paper conceptualises local philanthropy as its own competitive resource existing alongside the four other NRBV resources. This is not to say that links do not exist, as to do so would conflict the interconnectedness of resources (Penrose, 1959; Hart, 1995; Hughes et al, 2018). In particular, local philanthropy and base of the

pyramid share a focus on the alleviation of social ills. In fact, Echebarria et al (2017) argue that social sustainability in the domestic market may advance the realisation of globally focused social sustainability, implying that local philanthropy may support base of the pyramid. However, the distinction between the two resources is important and is evident in three key areas: first a local versus global perspective; second competitive benefits of expansion in existing markets versus new market entry; and third philanthropic versus innovative profit driven motivation. Stressing the significance of the latter distinction is Hart et al (2016) who argue that base of the pyramid strategies commonly fail on account of philanthropic intentions.

Thus, this paper conceptualises a fifth NRBV resource, termed *local philanthropy*, derived solely from interviewee discussions. 'Local' reflects the community focus, particularly small towns and villages in which interviewed companies were operational. 'Philanthropy' reflects support of social issues in such markets, namely fair treatment of farmers, animal welfare, food poverty, health, sponsorship and charities, employee rights and social rehabilitation. In large, interviewees invested in philanthropic activities '*that actually support the local community* [and are] *sustainable for our nation'* (Interviewee 24), acknowledging that *'food companies have a big responsibility when it comes to making a positive change'* (Interviewee 15).

Pertinently, alongside philanthropic intentions interviewees sought competitive benefits, drawing explicit links with commercial opportunities and differentiation. For example, discussing farmers rights, Interviewee 1 stated *'we treat our farmers fairly, we actually give them a price ahead of harvesting and that way if something goes wrong with that crop they still get paid that price and we just have to manage with what they give us',* claiming *'this is something we advertise'* to establish support of local suppliers and communities and appeal to consumers. Interviewee 13 claimed to promote that their

products are 100% Scottish because *'from a sustainability point of view that sends a bit of a message, people like the local aspect',* whilst Interviewee 11 claimed using local produce provides them with a *'provenance'* that sets them apart from their competitors. Interviewee 7 claimed to '*redistribute products that we realise we can't sell for community donations'* to alleviate local food poverty and promote themselves as a *'trusted brand'*. Demonstrating competitive exploitation of health, Interviewee 13 claimed their *'health at school talks'* resulted in increased attention on their social media sites and sales to local parents, whilst Interviewee 25 claimed engaging in children's health was a good opportunity because *'they are the consumers of the future'*. Stressing the significance of local causes and charities, Interviewee 13 discussed their sponsorship of the local firework display, refurbishment of the new village hall and victims of local flooding, stating *'we're certainly seen to be playing an active role in our local communities'*. Table 6 below offers further data evidencing links between philanthropic activities and competitive benefits.

Table 6 Local Philanthropy Data

Themes	Philanthropic Activities	Competitive Benefits
Fair treatment of farmers	- *'We treat our farmers fairly, we actually give them a price ahead of harvesting and that way if something goes wrong with that crop they still get paid that price and we just have to manage with what they give us'* (Interviewee 1) - *'Our pay-on-the-day approach* [….] *puts a lot of money back into the local community'* (Interviewee 23)	'[our prioritisation of local farmers] *sends a bit of a message, people like the local aspect'* (Interviewee 13)
Animal Welfare	- *'We look at animal welfare and the way we deal with our animals and respect them whilst they are living with us'* (Interviewee 14) - *'99% of farmers really care about the treatment of animals'* (Interviewee 9)	*'Animal welfare is a big concern for us* [because] *our consumers are really looking for it'* (Interviewee 6)
Food Poverty	- *'A focus should fall on human consumption* [....] *to redistribute products that we realise we can't sell for community donations'* (Interviewee 7) - *'We give food to Harry Chrisnas and a local charity every week which in turn is donated to feed the homeless in and around Camden'* (Interviewee 15) -*'If we have usable food we donate it, normally to local causes and food banks'* (Interviewee 27)	*'I think* [our commitment to human consumption] *shows us as a trusted brand'* (Interviewee 7)
Health	- *'There's a big move towards healthier diets and tackling the obesity crisis and reducing junk food* [….] *we have a wonderful set of products that we know can help the country become more healthy'* (Interviewee 20) - *'The owner is renowned for trying to make people eat healthy and communicating that* [….] *that side of things came really easily because it was built into the company ethos and is a big part of our passion'* (Interviewee 27)	- *'We seen a lot of people going to our facebook, a lot of interest from the mums and dads who were wanting to know where they could buy our stuff* [because of our school talks about health]' (Interviewee 13)`
Sponsorship of local causes & charities	- *'Sustainability comes from the community* [….] *we are involved in our community and we support community events as much as possible through charities and donations'* (Interviewee 14) - *'We see* [charities] *as partners that we work with in order to help with health issues and awareness'* (Interviewee 19)	*'We have established a reputation for being a charitable company, we are known in the community'* (Interviewee 22)
Employee Rights	*'We offer a fair wage, fairness to the employee, looking after them from a health and safety point of view, looking after them in terms of health, looking after wellbeing across the sites, making sure they aren't overworked or involved in slavery'* (Interviewee 23). - *'For us social sustainability is all about job creation, anywhere we build a farm we are eager to create jobs'* (Interviewee 25)	- *'if our employees are happy our customers are happy'* (Interviewee 23)
Social Rehabilitation	*'We're also very interested in societal rehabilitation* [….] *we hire unemployed young people, or people with convictions and we train them and give them opportunities to work* [….] *and a chance for a better future'* (Interviewee 27)	*'I think, I hope, people know we focus on the disadvantaged side'* (Interviewee 19)

Pertinently, whilst links between philanthropy and competitiveness may appear paradoxical, they are not exclusive to local philanthropy. In fact, links between philanthropy and competitiveness in business have long been debated in corporate social responsibility literature (Galbreath, 2009; Li & Lui, 2014) and feature more prominently in triple-bottom line literature (Norman & MacDonald, 2004; Wilson, 2015; Koh et al, 2017), highlighting a business case for social sustainability (Hoejmose et al, 2013; Yawar & Seuring, 2017). However, whilst competitiveness is largely considered an 'outcome' of social sustainability (Yawar & Seuring, 2017), local philanthropy's involvement in social sustainability is purposefully driven by firm gain. In corresponding with the competitive underpinnings of resource-based theory (Wernerfeldt, 1984), particularly the NRBV's exploitation of sustainability for firm gain (Hart, 1995; Russo & Fouts, 1997) and the depiction of resources in operations (Hughes et al, 2017), it is this which warrant's local philanthropy's distinction as a competitive resource. Adding further reinforcement is the increasing complexity of realising socially sustainable operations (Hoejmose et al, 2013; Berger-Walliser & Srivastava, 2015; Yawar & Seuring, 2017), particularly in UK agri-food (The Guardian, 2016, Gould, 2016), which renders connotations of heterogeneity, scarcity, inimitability and nonsubstitutability. Local philanthropy as a NRBV resource is summarised in table 7 below.

Table 7 Depiction of Local Philanthropy in UK Agri-Food

Resource	Description	Sustainability Benefit	Competitive Benefit
Local Philanthropy	Philanthropic support of social issues in local community	Alleviation of domestic social ills	Opportunities for commercial gain and differentiation via promotion of philanthropic activities

4.6 From Hierarchal to Circular Orchestration of the NRBV

As discussed, literature implies that the NRBV is a hierarchal structure in which each resource is dependent on its forerunner (e.g. Menguc & Ozanne, 2005; Shi et al, 2012). This is more explicit in Hart's (1997) paper's explanation of pollution prevention as stage 1, product stewardship as stage 2 and clean technologies as stage 3. Adding to this are inferences of base of the pyramid's dependencies on clean technologies (Prahalad & Hart, 2002; Hart, 2007; Hart & Dowell, 2011).

However, this is challenged by this study's empirical investigation of the NRBV. For one, the reliance on pollution prevention is undermined by the dominant presentation of product stewardship throughout the interviews and prioritisation of clean technologies in some companies. Second, the realisation of local philanthropy ahead of the other resources along with claims that social sustainability may support environmental sustainability reverses the NRBV hierarchy. For example, Interviewee 19 claimed that once their social sustainability was *'quite mature'* they moved towards *'a wider sustainability role'* in which environmental initiatives were prioritised. Similarly, Interviewee 15 described themselves as a *'social enterprise focused on food sustainability',* whilst Interviewee 25 stated *'being a social enterprise is really important because it is one of the main reasons we set the business up'.* Such companies implied that social sustainability was of greater value than environmental sustainability, with Interviewee 14 stating '*if I was trying to get a contract with Sainsbury's, I would certainly be promoting our free-range milk over our recycling policies, I think we are just more interested in social sustainability than environmental responsibility, which is maybe wrong but it is our belief and it really is what our business has become about'.*

Thus, this study argues that that the hierarchal orchestration of NRBV resources offers a naïve construal of competitive sustainability in operations.

Building on this, this paper argues that NRBV resources may be realised in any order. Pertinently, this does not oppose the orchestration of resources from pollution prevention to product stewardship to clean technologies and then to local philanthropy or base of the pyramid, nor does it contest resource interconnectedness (Penrose, 1959) or combinative value (Hart, 1995; Teece et al, 1997; Lockett et al, 2009; Hughes et al, 2018). In fact, interview results in some cases depict linear orchestration of resources, whilst the interviewed companies' exploitation of multiple NRBV resources suggests that one resource's assets may support another. However, interview results also demonstrate that this is not a prerequisite, and rather present the NRBV as a virtuous circle of resources that can be exploited in any order to suit the sustainability and competitive goals of the firm.

This assumes some logic, as the drivers for attaining one resource ahead of another may be firm or context specific as is demonstrated in this study. For example, interviewees often discussed pollution prevention in the context of accreditation and policy, presenting context specificities which may support realisation of the resource in the UK agri-food sector. Similarly, the interrelated and often vertical nature of the UK agri-food chain may drive the lifecycle approach required of product stewardship, perhaps offering some justification for its dominance in this study. As discussed, clean technologies can be linked with firm specificities such as long-term vision, company mission or technological capacities, whilst context specificities such as high levels of funding and innovation in the sector may also play a role in enabling the resource. However, hierarchal presentation of the NRBV does not permit contextual consideration of drivers of each resource, which can perhaps be linked to the positivist dominance of

existing literature (Acedo et al, 2006). In contrast, the critical realist stance underpinning this study encourages examination of the resources as their own entities in real-life business environments, recognising that orchestration of resources may differ due to a number of factors. This further highlights the need to explore NRBV resources in practice and pertinently, this returns to the seminal resource-based theory contention that resources cannot be separated from their own context (Barney, 1991).

Moreover, such circular orchestration of NRBV resources may in fact maximise heterogeneity, scarcity, inimitability and nonsubstitutability, and correspond with initial conceptualisation of the NRBV (Hart, 1995) which suggests resources should be interconnected but does not imply any interdependencies. Thus as highlighted by this study, the distinction between *interconnected* and *interdependent* NRBV resources is important and has been neglected in existing literature. Adding further significance is the emerging topic of resource orchestration which stresses the need for unique and heterogenous bundles of resources if competitiveness is to be maximised (Hughes et al, 2018).

5. Conclusion

The purpose of this paper was to undertake empirical research of the existence of each NRBV resources in practice: pollution prevention, product stewardship, clean technologies and base of the pyramid. Assuming a critical realist qualitative approach this involved 27 in-depth interviews with sustainability experts in UK agri-food. This resolves the research question *how are NRBV resources manifest in practice* and renders five contributions.

First, theoretical contributions arise from empirical explanation of NRBV resources in practice, contesting existing criticisms of infeasibility (Teece et al, 1997; Christmann,

2000; Fiol, 2001; Barney, 2003; Lockett et al, 2009; Li & Lui, 2015) and inexistence (Andersson & Batemann, 2000; Mencug & Ozanne, 2005; Hart & Dowell, 2011; Ashby, 2012; Golicic & Smith, 2013). This also offers additional support of the value of NRBV resources in competitive sustainable operations.

Whilst the same cannot be said for base of the pyramid, its absence in this study is not considered a limitation, but rather the second theoretical contribution of this study. That is, this paper contests the falsification or re-alignment of base of the pyramid to support its value in operations. Moreover, its absence in part facilitated the emergence of local philanthropy as a new social sustainability NRBV resource. As well as offering theoretical elaborations of the NRBV, this adds to the growing field of competitive social sustainability, which still lags behind that of environmental sustainability (Garetti & Taisch, 2012; Hoejmose et al, 2013; Eskandarpor et al, 2015; Marshall et al, 2015; Koh et al, 2017; Yawar & Seuring, 2017).

The circular orchestration of the NRBV emerge as the third theoretical contribution. This study highlights disparities between the hierarchal presentation of the NRBV in literature (e.g. Hart, 1997; Mencug & Ozanne, 2003; Shi et al, 2012) and its manifestation in UK agri-food. In doing so, attention is returned to seminal resource-based theory and NRBV literature to propose a more realistic depiction of competitive sustainability in operations. This adds to growing interest surrounding the orchestration of competitive resources (Hughes et al, 2018) which has been widely neglected.

The fourth contribution is practical, in that this paper responds to Hart & Dowell's (2011) calls to embed NRBV resources in practice to provide effective and competitive solutions to social and environmental problems. That is, this paper offers empirical explanation of NRBV resources in practice and verifies their value in terms of competitive sustainable operations. In doing so, this paper bridges the gap between the

NRBV in academia and in practice, and supports its continued application in industry. Moreover, it responds to calls for the need for practical insights into the implementation of sustainability operations (Garetti & Taisch, 2012). This is particularly significant for those operating in UK agri-food who may benefit from the practical insights of sustainability experts in this study.

The fifth and final contribution of this study is methodological. It is this study's critical realist qualitative approach which permits access to and explanation of the NRBV's tacit and heterogenous resources. Therefore, this paper departs from the positivist dominance of existing resource-based theory research (Acedo et al, 2006), allowing it to overcome methodological limitations. Thus, the critical realist methodology supports study of competitive resources beyond the NRBV of which empirical explanation is long overdue (Lockett et al, 2009, Rashidirad et al, 2015).

5.1 Limitations & Future Research

It is important to acknowledge the contextual limitations of this study. That is, whilst the existence of the NRBV has been evidenced and explained, this is solely within the context of the UK agri-food sector. As discussed throughout this paper, this raises query to key findings such as the prominence and manifestation of pollution prevention, product stewardship and clean technologies, the absence of base of the pyramid, the emergence of local philanthropy and the circular orchestration of the NRBV in other sectors or geographical regions. This returns to the argument that resource cannot be separated from its own context (Barney, 1991).

Thus, a need for further empirical investigation of NRBV resources in practice is highlighted. The presentation of sustainability as one of the greatest opportunities to 21st

century business is not context specific (Ashby et al, 2012; Pagel & Shevchenko, 2014) and as such the existence and manifestation of NRBV resources in other contexts is of great interest. In particular, investigation of base of the pyramid within an emerging market context should be prioritised as an area for future research. Independent study of local philanthropy should also be undertaken, either to further support conceptualisation or to refute its existence outside UK agri-food. The same can be said for the orchestration of NRBV resources, which to date has not been purposefully investigated empirically. Moreover, empirical investigation of competitive resources out with the context of the NRBV should also be considered, which exists as a significant gap in existing literature (Hitt et al, 2015). The critical realist qualitative approach offered in this study is recommended as a methodological template for such future studies of competitive resources in practice.

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