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Research paper

Startups versus incumbents in 'green' industry transformations: A comparative study of business model archetypes in the electrical power sector☆

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ABSTRACT

Scholars have recently argued that startups and incumbents play differential roles in the disruptive transformations of industries toward sustainability and that the transformations are only likely to succeed if both startups and incumbents contribute. To understand their respective contributions and, thus, to understand how industries make the transition toward sustainability, comparative studies of incumbents versus startups during this transformation have been identified as a central pursuit, but yet they are mostly lacking. Since business models have become a principal way of characterizing firms, the present study takes a business model perspective and derives business model archetypes in the electrical power sector from an analysis of 280 startups and incumbents in three different countries. The selected countries (USA, UK, and India) represent three different energy profiles and leading instances of disruption in the energy sector. The article, then, undertakes a comparative analysis of startups and incumbents based on the empirically distilled business model archetypes and develops propositions on startups, incumbents, and business models in industry transformations. This analysis produces several important insights. First, incumbents do not seem to engage in less business model experimentation than startups. Second, incumbents have adopted several new business models that are not pursued by startups. Third, startups have espoused some business models that are not pursued by incumbents. Fourth, foreign firms can also affect the 'green' transformation of an industry in a focal country. Finally, the identified business model archetypes are likely to be of interest to scholars and practitioners who are seeking an improved understanding of business models in the electrical power industry and the industry's competitive landscape.

1. Introduction

Innovation and entrepreneurship provide the foundation for the transition to greater sustainability, which has become a top priority for policy makers and societal stakeholders across the globe (Adams, Jeanrenaud, Bessant, Denyer, & Overy, 2016; Kraus, Burtscher,

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Niemand, Roig-Tierno, & Syrjä, 2017; Méndez-Picazo, Galindo-Martín, & Castaño-Martínez, 2021; Ranta, Keränen, & Aarikka-Stenroos, 2020; Rauter, Globocnik, Perl-Vorbach, & Baumgartner, 2019; Sharma, 2020). Ever since the foundational work of Schumpeter (1934), startups have been seen as a major driver of innovation and change. Consistent with this line of thought, many scholars have examined the role of startups in the transformation of industries toward sustainable development (Cohen & Winn, 2007; Ćorić, Lučić, Brečić, Šević, & Šević, 2020; Fellnhofer, Kraus, & Bouncken, 2014; Schaltegger & Wagner, 2011).[1] However, in his later work, Schumpeter (1942) acknowledged that incumbents can also make important contributions to the transition of industries. In line with this thinking, many other studies have researched corporate sustainability entrepreneurship in incumbents (Hockerts & Wüstenhagen, 2010; Palmié, Huerzeler, Grichnik, Keupp, & Gassmann, 2019; Smink, 2015).

Taken together, Schumpeter (1934) 'Mark I' and Schumpter (1942) 'Mark II' suggest that startups and incumbents offer specific advantages and disadvantages for innovation and change. Looking at their specific advantages and disadvantages, Hockerts and Wüstenhagen (2010) noted that startups and incumbents play "differential roles" (p. 489) in the sustainable transformation of industries and that "the sustainable transformation of industries is not going to be brought about by either Davids [startups] or Goliaths [incumbents] alone, but instead that their interaction is essential" (ibid.). Consequently, they concluded that we should conduct "comparative studies of sustainable entrepreneurial initiatives in both small and large firms" (ibid.).

One stream of literature has investigated differences between startups and incumbents in general – for example, with respect to modes of innovation (Freeman & Engel, 2007) and market entry dynamics (Markman & Waldron, 2014). But only very few studies have analyzed these differences in the context of sustainability (Diekhof, 2015). Furthermore, we are not aware of any studies that have taken a systematic comparative perspective on startups versus incumbents with respect to business models. This paucity of research is highly problematic because many scholars, political institutions, and societal stakeholders believe that business models provide a pivotal foundation for the transition toward more sustainable economies (Dabbous & Tarhini, 2021; Martín-de Castro, 2021; Pieroni, McAloone, & Pigosso, 2019; Ranta, Aarikka-Stenroos, & Mäkinen, 2018). They reason that companies will make critical contributions to this transition if they are able to find business models that make this move economically attractive (Geissdoerfer, Vladimirova, & Evans, 2018). Without such business models, the transition to a sustainable economy "will be an uphill battle" (Ranta et al., 2018, p. 988).

A business model, in a nutshell, describes how a focal firm creates and captures value for itself and its various stakeholders (Casadesus-Masanell & Ricart, 2010; Gavetti, Levinthal, & Rivkin, 2005; Martins, Rindova, & Greenbaum, 2015; Zott & Amit, 2010). Business models can be used to characterize individual companies in an industry as well as the competitive landscape and interactions within an industry (Spieth, Roeth, & Meissner, 2019; Teece, 2010; Zott & Amit, 2008). Previous research has established that firms innovating their business models rarely develop completely new business models but typically adopt business models already in existence in their own or another industry (Gassmann, Frankenberger, & Csik, 2014). Analysis of emerging and prevalent business models in an industry, therefore, increases our understanding of the industry's current status and potential future developments (Massa, Tucci, & Afuah, 2017).

The present study seeks to overcome the lack of comparative business model studies in the sustainability and entrepreneurship literature. And so, we have set out to investigate the business models of startups and incumbents in the energy sector. Sampling companies from two different databases (Thomson Reuters; Crunchbase), this project analyzes 280 startups and incumbents active in the electrical power sector in the UK, the USA, and India. After deriving business model archetypes for this sector in a first analytical step, the study systematically compares the business model archetypes adopted by startups to those adopted by incumbents and develops propositions on the role of startups, incumbents, and business models in 'green' industry transformations. The electrical power sector represents an intriguing setting for our purposes because this sector – like the energy industry in general – is currently undergoing fundamental technological and regulatory changes, thereby affording ample opportunity for entrepreneurial activity and a wide variety of business models (Bouncken, Kraus, & Roig-Tierno, 2019; Johnstone et al., 2020; Palmié et al., 2021; Pereira, Spect, Pereira Silva, & Madlener, 2018). Moreover, electricity and heat generation accounts for more than 40% of global CO_2 emissions, while the demand for electricity continues to grow (IEA, 2018, 2019). Therefore, a substantial transformation of the electrical power sector is key to combating climate change and minimizing its effects on the economy and society. More sustainable electricity production is, thus, a top priority on many political agendas (see e.g., Lund, 2007). The disruption literature calls an industry transformation 'disruptive' when it is driven by fundamental changes in the preferences and priorities of stakeholders (Christensen, McDonald, Altman, & Palmer, 2018; Palmié, Wincent, Parida, & Caglar, 2020). The industry transformation toward sustainability is, therefore, a disruptive transformation. While new business models are likely to emerge in disruptive industry transformations, old business models can be expected to persist to some extent and for some time.[2] We can, therefore, expect to encounter old and new business models in our analysis. Analyzing firms from three different countries representing three different regulatory, political, and economic contexts (World Energy Council, 2015) allows us to make sure that our findings are not idiosyncratic to a particular context. Using a multi-coder, iterative text-based qualitative analysis of archival data from the 280 firms, we identify 25 distinct business model archetypes currently adopted by firms in the electrical power sector.

Our analysis produces several important insights. First, incumbents do not seem to engage in less business model experimentation than startups. Second, incumbents have adopted several new business models that are not pursued by startups. Third, startups have espoused some business models that are not pursued by incumbents. Fourth, foreign firms can also affect the transformation of an industry in a focal country. Finally, the identified business model archetypes are of interest to scholars and practitioners who seek an improved understanding of business models in the electrical power industry and the industry's competitive landscape.

This paper proceeds with an overview of the conceptual background on business models, cognitive strategic groups, and the role of startups and incumbents in sectoral sustainability transitions. It then goes on to

[1] We follow the common practice of calling a transformation toward sustainability a 'green' transformation (e.g., Hockerts & Wüstenhagen, 2010). The color 'green' may primarily evoke associations with the environment, and environmental sustainability is indeed the main driver behind the transformation of the power sector, so that 'green' motives are prominent (World Energy Council, 2015). However, sustainability has environmental, social, and economic components (Elkington, 2008). Since "energy equity" (the affordability of and access to energy) plays a central role in the power sector and since business models determine how much value is created for the various stakeholders of an organization (Gassmann, Böhm, & Palmié, 2019), the social and economic components are also covered in our study.

[2] Disruption "can take time and incumbents can get quite creative in the defense of their established franchises. For example, more than 50 years after the first discount department store was opened, mainstream retail companies still operate their traditional department-store formats. Complete substitution, if it comes at all, may take decades, because the incremental profit from staying with the old model for one more year trumps proposals to write off the assets in one stroke" (Christensen, Raynor, & McDonald, 2015, p. 6).

describe the data collection process and the methodological approach adopted, before presenting the findings and propositions derived from the analysis. It concludes with a discussion of the findings, the limitations of our study, and potential avenues for future research.

2. Conceptual background

2.1. Business models

Business models represent a relatively new concept employed in academia and practice (Zott, Amit, & Massa, 2011). The business model literature comprises research that uses business models (a) as a basis for enterprise classification, (b) as a means to explain heterogeneity in firm performance, and (c) as a potential unit of analysis for innovation (Foss & Saebi, 2017; Lambert & Davidson, 2013; Wirtz, Pistoia, Ullrich, & Göttel, 2016). Our study belongs to the first group. In this tradition, a business model reflects the mental models applied by managers to analyze their own companies and the firms in their environment featuring current and prospective competitors (Amit & Zott, 2001; Casadesus-Masanell & Ricart, 2010; Doz & Kosonen, 2010; Gavetti et al., 2005; Kaplan, 2011; Martins et al., 2015). Following this widespread understanding, the mental models carried by managers can be seen as a foundation for business models. Our study builds on this foundation in order to extract business model archetypes in the energy sector.

Conceptualizations that view the business model as an aggregation of specific components have become highly successful in research and practice and, thus, seem to be especially useful to scholars, managers, and stakeholders (Foss & Saebi, 2017). While practice-oriented treatments occasionally apply a finer-grained decomposition of business models and, hence, feature a larger number of components, research-oriented conceptualizations commonly depict a business model comprising three or four components (e.g., Boons & Lüdeke-Freund, 2013; Bouncken et al., 2019; Foss & Saebi, 2017; Frishammar & Parida, 2019; Gassmann et al., 2014; Geissdoerfer et al., 2018; Ranta et al., 2018). Apart from the fact that the three-component conceptualizations group the 'value proposition' and the 'customer' elements together, these conceptualizations converge on the constituent elements of a business model. Adhering to this emerging consensus, we distinguish the following components of a business model: (1) Customer: Every business model serves a certain customer group (Chesbrough & Rosenbloom, 2002; Hamel, 2000; Magretta, 2002). Morris, Schindehutte, and Allen (2005, p. 730) highlight the relevance of this dimension by noting that the "failure to adequately define the market is a key factor associated with venture failure." (2) Value Proposition: The value proposition describes what the firm offers to the target customer. It comprises products and services that are of value to the customer (Osterwalder, 2004). (3) Value Chain: To build and distribute the value proposition, a firm has to perform several processes and activities. The value chain dimension covers these processes and activities along with the resources, capabilities, and orchestration they involve (Hedman & Kalling, 2003; Morris et al., 2005). (4) Value Capture: This dimension explains why the business model is financially viable. It covers the firm's cost structure as well as the applied revenue mechanisms (Gassmann et al., 2014). Examples of different mechanisms for capturing value are charging customers per unit sold versus requesting a fixed fee over a certain period of time for providing access to a product or service. The value capture dimension addresses a very fundamental question for firms; namely, how they intend to earn money.

2.2. Cognitive strategic groups

The literature on (cognitive) strategic groups (DeSarbo, Grewal, & Wang, 2009; Kim, 2013; McNamara, Deephouse, & Luce, 2003) provides a conceptual background for our endeavor to identify business model archetypes in the energy sector (Porac, Thomas, & Baden-Fuller, 2011). Cognitive strategic group theory itself is rooted in strategic group theory (Cheng & Chang, 2009; Day, DeSarbo, & Oliva, 1987; Kim, 2013; Leask & Parker, 2006; Mascarenhas, 1989), which emerged when scholars observed performance differences between companies in the same industry and began to search for an explanation for these intra-industry performance differences (Hunt, 1972). Strategic group theory segments enterprises within the same industry into groups that adopt similar strategies along relevant strategic dimensions (Hunt, 1972; Porter, 1980). In turn, cognitive strategic groups are categorizations of competitors that are based on managers' mental models (Kim, 2013; Porac, Thomas, Wilson, Paton, & Kanfer, 1995; Reger & Huff, 1993). The cognitive strategic group approach argues that managers' mental models drive strategic decision processes and their firms' strategic actions (Thomas & Venkatraman, 1988). In this perspective, managers see strategic groups as reference points or archetypes (Panagiotou, 2007) and frequently try to conform with the group(s) with which they identify and which they consider most legitimate (Barreto & Baden-Fuller, 2006). This identification with a strategic group drives behavior and, therefore, organizational outcomes (Anand, Joshi, & O'Leary-Kelly, 2012). Exploring the archetypes that managers adopt helps to understand firm prosperity, competitive dynamics in an industry, and "ultimately industry evolution" (Reger & Palmer, 1996, p. 22).

The business model recently emerged as a dominant mental model among managers in numerous industries (Zott et al., 2011), including the energy sector, and the electrical power sector in particular (EY, 2015; KPMG, 2015). The business model literature emphasizes the usefulness of the concept in analyzing one's own company as well as the competition and interactions within an industry (Teece, 2010; Zott & Amit, 2008). Following this line of thought, we analyze business models in the electrical power sector to identify business model archetypes. Giving consideration to business model archetypes in the energy sector is not new. However, the existing literature focuses only on specific-use cases, technologies, or energy sources such as distributed energy (Wainstein & Bumpus, 2016), energy services (Burger & Luke, 2017; Hannon & Bolton, 2015; Hannon, Foxon, & Gale, 2015), small-scale heat (Suhonen & Okkonen, 2013), electric vehicles (Bohnsack, Pinkse, & Kolk, 2014; Lee, Shim, Kim, & Nam, 2021) smart grids (Shomali & Pinkse, 2016), microgrids (Hanna, Ghonima, Kleissl, Tynan, & Victor, 2017), and biofuel (Nair & Paulose, 2014). In addition, some scholars have examined business model archetypes in a specific country (Chaurey, Krithika, Palit, Rakesh, & Sovacool, 2012; Shrimali, Slaski, Thurber, & Zerriffi, 2011) or conducted a comparative study of Germany, the USA, and Japan for photovoltaic (PV) systems (Strupeit & Palm, 2016). Other authors have defined normative archetype elements for sustainable business models (Boons & Lüdeke-Freund, 2013). These prior studies, for the most part, looked at a small section of the electrical power or energy sector and did not engage in a comparison of business models. The present study, in contrast, takes a broader look at the electrical power sector in order to generate insights into the "differential roles" (Hockerts & Wüstenhagen, 2010, p. 489) that startups and incumbents play in this sector's transition to greater sustainability. This transition amounts to a disruptive transformation of the sector in many countries around the globe (Gielen et al., 2019; OECD, 2016; Verbong & Geels, 2007).

2.3. The role of startups and incumbents in sectoral transitions toward sustainability

Following Schumpeter's (1934) 'Mark I' and Schumpeter's (1942) 'Mark II' lines of reasoning, the specific advantages and disadvantages of startups versus incumbents for advancing innovation are widely discussed in the literature (Ferreira, Fernandes, & Kraus, 2019; Hockerts & Wüstenhagen, 2010; Kraus, Burtscher, Vallaster, & Angerer, 2018; Schaltegger & Wagner, 2011).

The comparative advantages of incumbents include a broader resource base, market power, and firm-specific capabilities developed over several years. The comparative advantages of startups include

greater flexibility, the absence of organizational inertia, and often the motivational force of an idealistic mission (Halberstadt et al., 2020). Building on this literature, Hockerts and Wüstenhagen (2010) have developed a conceptual account of the 'differential roles' that startups and incumbents play in the transformation of sectors toward sustainability. They argue that startups are "initially more likely to engage in sustainable entrepreneurship" (p. 487) than incumbents, thereby creating market disequilibria. Challenged by the sustainability innovations of startups, incumbents may respond by "mimic[king]" the startups (p. 489) and engaging in sustainability entrepreneurship themselves. Hockerts and Wüstenhagen (2010) further argue that their superior capability and resource endowments, along with their greater market power, allow incumbents to pursue sustainability initiatives that are broader in scope than the initiatives of the startups to which they react. Because they perceive this broadening of scope as pivotal to the transformation of mainstream markets, they conclude that neither the efforts of startups nor incumbents alone can bring about the sustainable transformation of industries, but that the efforts of both groups are required. The interplay between startups and incumbents "resembles a co-evolution, whereby each side moves the transformation further" (p. 488).

Apart from these conceptual arguments, the extant literature offers little insight into the 'differential roles' of and the interaction between startups and incumbents in the transformation of industries toward sustainability. Our comparative study of 280 firms seeks to close this crucial knowledge gap.

3. Data and methods

The purpose of this study is to identify currently employed business model archetypes in the electrical power sector and to analyze how these archetypes differ between startups and incumbents. The study applies a multi-coder, iterative, text-based qualitative analysis that follows Clark and Montgomery's (1999) approach to categorizing competitors. We first created a sample of firms from three different countries, extracted company information from databases and publicly available data and, in an iterative process, categorized the companies into business model archetypes. Since business models are complex and hard to quantify (Massa et al., 2017; Wirtz et al., 2016), a qualitative approach was considered most suitable (Gehman et al., 2018; Palmié et al., 2021). In addition, research stresses the value of qualitative methods (Panagiotou, 2007) for business model analysis (Tallman, Luo, & Buckley, 2017) and strategic group analysis (Leask & Parker, 2006). As a preventive measure against subjective biases, two researchers conducted the individual iterations of our approach independently of each other. Between iterations, we continuously compared the evolving business model archetypes of the two researchers.

3.1. Sample

Firm characteristics and environmental conditions (e.g., the regulatory framework in the focal location) affect which business model a firm can profitably pursue (Richter, 2013; Shefer & Frenkel, 2005). In order to present a more comprehensive picture of business models applied in the electric power sector on an international scale, we included firms from countries that represent distinct cases with respect to the regulatory framework and other local conditions (Eisenhardt & Graebner, 2007). This setup benefits our categorization of firms into business-model-based strategic groups (see Clark & Montgomery, 1999). In addition to examining different geographical locations, we sampled both incumbents and startups. Our sampling approach proceeded as follows.

First, in order to include cases from startups as well as incumbents, we chose two different sources of data. One source was the Thomson Reuters I/B/E/S database, which covers incumbents. As industry boundaries within the energy sector and adjacent industries have become increasingly blurred (e.g., Erlinghagen & Markard, 2012), we did not select firms based on industry codes. Instead, we selected all firms whose extended business description contained the words "electric*" and/or "energ*". Our second source was the Crunchbase database (www.Crunchbase.com), which provides information on startups. As of September 2017, Crunchbase sourced its data from a network of more than 3000 investment firms that submit monthly portfolio updates to Crunchbase, and from community contributors (Dalle, den Besten, & Menon, 2017). An overview of the use of the Crunchbase database published by the OECD concludes that "entrepreneurs have a strong incentive to register in the website and to keep their information updated" (Dalle et al., 2017, p. 6). Even though Crunchbase was established as a data source for investors and the venture capital industry in 2007, it has developed into a central data source for academics as well. More than 100 scientific publications have used Crunchbase so far, including top journal articles in the scholarly fields of Technology Management (Block, Fisch, Hahn, & Sandner, 2015), Marketing (Homburg, Hahn, Bornemann, & Sandner, 2014), General Management (Ter Wal et al., 2016), Entrepreneurship (Nuscheler, Engelen, & Zahra, 2019), and Sustainability (de Lange, 2016). We sampled companies from Crunchbase's 'energy' category. We combined the two data sources and excluded duplicate entries and firms that were not relevant to our purpose (e.g., holdings or oil, gas, and mining companies).

Second, we included cases from countries with distinct energy trilemma[3] profiles with respect to the countries' energy policies and other local conditions. To identify countries with such different profiles, we employed a study of the World Energy Council (2015), which grouped countries into five distinct energy profiles (World Energy Council, 2015, p. 32). The energy profiles and the associated country rankings informed our study's selection of countries. From each energy profile, we took the highest-ranked country for which we could locate at least 30 cases in both the Crunchbase and the Thomson Reuters databases. The lower limit of 30 observations per profile and database resulted from our targeted sample size of approximately 300 observations. The target of approximately 300 observations was, in turn, derived from previous research (Dolnicar, 2002). The United Kingdom, the United States of America, and India were the highest-ranked countries with sufficient data in their energy profiles. Furthermore, each of these countries represents one of the three global regions with the highest index score in the 'Power & Utilities Market Disruption Index' (PwC, 2015) – Europe, North America, and Asia Pacific. Our analysis, therefore, focuses on these three countries. Table 1 provides some background information on these countries. Table 2 describes our data sources.

For countries where the databases contained more than 50 companies, we drew a random sample of 50 companies from each data source. Thus, we obtained a total of 100 companies from the UK (50 companies from Thomson Reuters/50 companies from Crunchbase), 100 companies from the USA (50/50), and 80 companies from India (50/30). Accordingly, our final sample comprised 280 cases from incumbents and startups. So that only economically viable business models were included, we checked for bankruptcy and third-party funding (e.g., banks and venture capitalists).

3.2. Data collection

Drawing on secondary text data for organizational categorization is a well-established method in strategy and cognition research because the data function as a proxy for the views of organizations and their managers (Kaplan, 2011). Consequently, we gathered publicly available data on the firms that we had extracted from the Thomson Reuters and Crunchbase databases. In addition, we collected information from

[3] The expression 'energy trilemma' refers to three politically desirable goals of energy production – energy security, energy equity (affordability and access) and environmental sustainability – and the fact that it is often hard to pursue these three goals simultaneously (World Energy Council, 2015).

Table 1
Empirical Setting.

		India	UK	USA
Energy mix (% of total, 2017)	Coal	75.3	22.8	34.2
	Natural gas	4.9	29.7	31.9
	Oil	1.7	0.6	0.9
	Hydropower	10	1.9	5.8
	Renewable sources	5.4	23.0	7.4
	Nuclear power	2.8	21.0	19.3
Access to electricity (% of population, 2016)[1]		85 (98 urban; 78 rural)	100	100
CO_2 emissions (kg per PPP $ of GDP, 2014)[1]		0.3	0.16	0.3
Electric power consumption (kWh per capita, 2014)[1]		805	5130	12,984
Electric power transmission and distribution losses (% of output, 2014)[1]		19.4	8.3	5.9
Energy imports, net (% of energy use)[1]		34.3	40	9.2
Electricity production from renewable sources 2005–2015[1] (CAGR)		13.3%	22.4%	12.9%
Renewable electricity share (% of total electricity output) 2005–2015[1] (CAGR)		0.8	19.2	4.4
Renewable energy growth (% of total electricity output) forecasts 2018–2023[2] (CAGR)		10.5	7.2	4.2
Market design		- Unbundled[3] - Wholesale markets[3] - Generation and transmission are state owned[3]	- Unbundled[4] - Contracts-for-difference[4] - Capacity mechanism[4] - Emission performance standard[4] - Carbon floor price[4]	- Unbundled[5] - Mostly wholesale markets[5] - Ten different independent system operators or regional transmission organizations

Notes to Table 1: [1] (World Bank, 2018) [2] (IEA, 2018) [3] (Shukla & Thampy, 2011; Thakur, Deshmukh, Kaushik, & Kulshrestha, 2005) [4] (OFGEM, 2016; Waddams Price, 2005) [5] (Borenstein & Bushnell, 2015) .

Table 2
Overview of data sources.

Data source	Number of firms covered by the database	Number of firms selected for analysis	
Thomson Reuters	UK: 3805	UK: 50	150
	USA: 20563	USA: 50	
	IND: 3250	IND: 50	
CrunchBase	UK: 602	UK: 50	130
	USA: 1544	USA: 50	
	IND: 30	IND: 30	

company homepages, reports, presentations, financial reports, newsletters, industry exhibitions, and published interviews. Altogether, approximately 650 distinct items were included in the analysis. Subsequently, we compiled a case database from the information we collected, giving a detailed overview of each individual firm.

3.3. Data analysis

The categorization of the 280 firms into distinct business model archetypes followed the iterative coding process of Clark and Montgomery (1999) and is depicted in Fig. 1. First, we coded the collected data according to a priori codes and emergent coding. The four previously defined components/dimensions of the business model served as the guiding framework for the data analysis and as a priori codes. However, due to the heterogeneity of our data, we specifically embraced emergent codes in the process (Andrade, 2009). This first step of coding of each business model component served as a basis for further categorization (Richards & Morse, 2012). We followed an iterative coding process until interchangeability of indicators was achieved (Holton & Walsh, 2016), and we used the first coding to produce initial categorizations for Clark and Montgomery's (1999) process.

For practical purposes, to avoid confounding the business-model categorization with effects rooted in traditional categorization criteria such as firm size, name, location and age, we blinded the information on these criteria for the analysis and used separate groups of researchers for

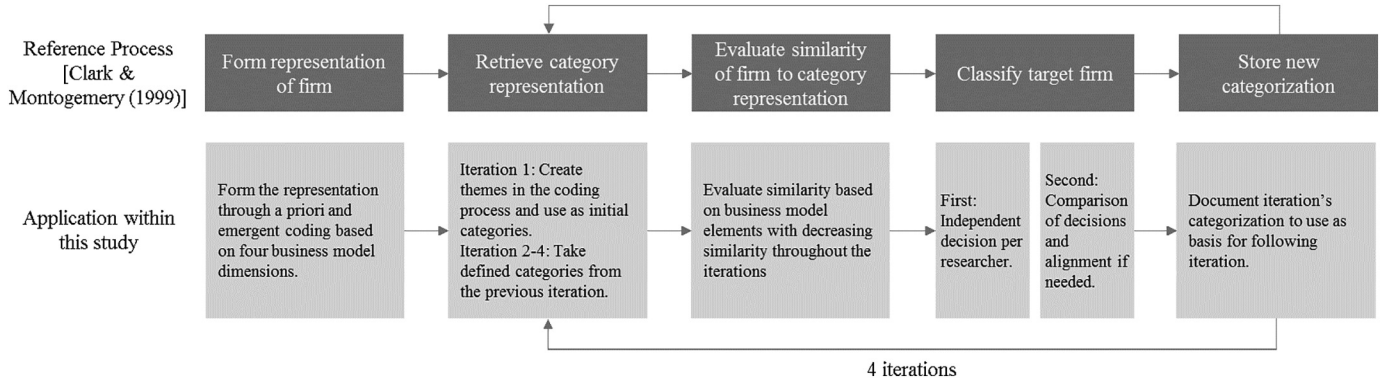

Fig. 1. Reference Process.

the data-collection and analysis phases. Following the coding, our post-coding analysis comprised four rounds of iteration. In each round, the similarity of each firm to the business model category was assessed. To minimize subjective bias and enhance validity, two researchers conducted each round independently of each other, prior to harmonizing the business model categorization after each round. Two industry experts who were not members of the co-author team provided their thoughts on the emergent categorization. After the respective iteration step was documented to avoid hindsight bias, the two researchers proceeded to the next iteration. Fig. 2 provides examples of the common categorization that resulted from each of the four iterations.

The iterations were carried out with decreasing requirements of similarity. The first iteration categorized the 280 firm case examples identified. If the case example was similar to an existing category (business model archetype) in *all four* business model dimensions, it was added to that category (archetype). If not, a new category (business model archetype) was introduced containing the case example at hand. Then, the next case example was compared to all existing categories (business model archetypes) and was either added to an existing category (business model archetype) or a new category (business model archetype) was created. We repeated this process for all 280 initial case examples, which generated 189 categories after the first iteration.

In the second and third iterations, we repeated the same process utilized in the first iteration but with minor modifications. We used the 189 categories derived from the first iteration as case examples. In contrast to the first iteration, we added the case example currently being examined to existing categories when it was similar in *at least three* business model dimensions instead of all four dimensions. We discussed the resulting 45 categories of this second iteration with independent experts in multiple rounds. Incorporating the expert feedback, the third iteration followed the process of the second iteration and resulted in 27 categories.

In the fourth and final iteration, we used the 27 categories as case examples, following the same process used in the other iterations. In the last iteration, however, we added the case example currently being examined to an existing category when it was similar in *at least two* business model dimensions. We ended the process after the fourth iteration since prior research has defined two business models as being distinct if they differ in at least two of the four dimensions (Gassmann et al., 2014). In the last iteration step, we arrived at 25 independent business model archetypes.

4. Findings and propositions

The analysis of the 280 companies from the three countries using the methodology described yielded 25 distinct business models. Table 3 provides a systematic description of the business model archetypes that were distilled for the electrical power sector. Table 3 also provides the frequency with which the business model archetypes occur among the sampled firms across the three countries. Fig. 3 indicates the frequency with which the business model archetypes were adopted by startups versus incumbents. A number of noteworthy findings emerge from the observed frequencies. Since the electrical power sector is a prototypical example of an industry undergoing a disruptive transformation toward sustainability (Johnstone et al., 2020; OECD, 2016; Pereira et al., 2018), we would expect these findings to have specific relevance not only for the electrical power sector but also for increased understanding of disruptive industry transitions in general. In consequence, our findings have allowed us to derive several propositions on such disruptive industry transformations and, in particular, on the "differential role" of startups versus incumbents in these transformations (Hockerts & Wüstenhagen, 2010, p. 489).

Fig. 2. Categorization Example.

Table 3
Identified Business Models (Strategic Groups) in the Electrical Power Sector.

Business Model (Strategic Group)	Value Proposition	Value Chain	Customer Segment	Revenue Mechanism	UK	USA	IND
Monolithic Producer	• Reliable and efficient provision of energy • Reliable and efficient operation of power plants	• High upfront investment and cost digression in the long run through economies of scale • Actively manages risk of high upfront investments • Develops and retains knowledge on production technology	• Key accounts (B2B) with PPAs • Retailers	• Money/ kWh • Long-term contracts	–	2	13
Generation Entity Manager	• Decreased risk for investors of generation entities	• Knowledge on production technology • Knowledge on regulatory aspects	• Investor/owner of generation entity	• Revenue sharing models with owner	8	4	4
Traditional (Local) Utility	• Reliable and efficient provision of energy to a defined geographical area	• Vertical integration allows for risk and complexity reduction and high bargaining power	• B2B and B2C Customers in a geographical region	• Combination of fixed pricing (e.g., grid access) and variable (per kWh)	–	5	3
Gentailer	• Provision of an energy mix based on customer needs • In a credible manner (e.g., ensuring 100% renewables)	• Controls with generation and retail all differentiating factors of the electric value chain (energy mix and price) • Anticipates B2B customers' needs and manages flexible production portfolio	• B2B customers with specific requirements for the energy mix	• Pay-per-use (money/ kWh)	0	0	1
Pro-Distributor	• Cost-efficient and reliable provision of energy based on long-term contracts	• Offers competitive prices by owning distribution but not production	• Solely B2B (e.g., Retailers)	• Purchase power agreements	–	1	2
Retailer	• Tailored and flexible energy tariffs	• Specialized in retail (customer facing) and buying from wholesale markets	• Focus on private end consumers	• Money/kWh • Flexibility charges	–	1	–
Green Producer	• Renewable energy for the lowest price in a reliable way	• Planning, building, operating, and maintaining of renewable decentralized energy production sites	• Retailers (B2B)	• Money/kWh	17	13	14
Green Gentailer	• Credible supplier of renewable energy as it controls the production	• Decentralized production sites with mostly one source (e.g., solar) • Retail (incl. Product management)	• B2B and B2C willing to pay a surplus for renewable energy	• Money/kWh	–	–	2
Green Retailer	• Be 'truly green' • Offering only renewable energy with flexible tariffs from all sources	• Energy sourcing from wholesale markets or through PPAs • Customer contact	• B2B and B2C willing to pay a surplus for renewable energy	• Margin on sold energy	1	–	1
Green Utility+	• Offers integrated energy solutions for a more sustainable way of living or operating a firm	• Orchestration of different partners to deliver ecosystems of 'green' energy solutions	• B2B and B2C willing to pay a surplus for renewable energy	• Combination of pay-per-use, service fees, and access fees	2	–	–
Smart Energy Solution Specialist	• Provides ICT-based products/ software solutions, which are necessary for value creation in smart energy ecosystems	• Focus on competencies that energy incumbents do not have • Focus on products that are easy to scale	• B2B (Business Model Energy Partner) • End consumer	• Mix of margins on sold products, service fees, profit sharing through contracting, white labeling	17	6	21
Energy Optimizer	• Lowering energy costs	• Knowledge on energy consumption patterns and saving mechanisms	• Focus on B2B	• Service charge • Contracting	13	11	–
Smart Energy Service Provider	• All-in-one solutions for analyzing and optimizing the energy consumption on different criteria	• Managing customer relations • Orchestration of different Smart Energy Solution specialists • Using the optimization of energy consumption as a 'door opener' to sell add-on services	• B2B/ B2C	• Service charge • Money/kWh • Contracting	4	4	3
Utility+	• Provides convenient access to different services, such as telecommunication, in addition to energy-related services	• Leveraging existing customer access, as well as existing knowledge and resources	• B2B/ B2C	• Predominantly service fees	3	3	–
Grid Developer and Operator	• Provides the technical infrastructure to distribute energy with high reliability at low cost	• Highly specialized personnel and knowledge on planning, building, operating, and maintaining grids • Anticipates future demands for grid infrastructure	• B2B/ B2C (microgrids)	• One-time fees • Access fees	–	8	4
			• Network Manager	• Arbitrage on prices	5	5	–

(continued on next page)

Table 3 (*continued*)

Business Model (Strategic Group)	Value Proposition	Value Chain	Customer Segment	Revenue Mechanism	UK	USA	IND
Flexible Energy Provider	• Offers ultra-flexible energy supply and demand	• Owns highly responsive production and storage infrastructure					
Local4Local	• Local optimization of energy supply and demand across several energy sources (e.g., waste, heat, electricity)	• Understanding of local imbalances in supply and demand across different energy sources • Connect different supply and demand entities	• Different supply and demand entities with geographical proximity	• Service fee • Contracting models	7	5	2
Turn-Key Living	• Offering security, communication, energy management as a general contractor for latest standard housing • Complexity reduction for real-estate owners	• Competencies on housing and newest housing technology • Orchestration of multiple service providers	• Real-estate owners	• Margin on built objects • Service and maintenance fees	5	2	–
Customer Empowerment	• Provides interested customers with tools to take control and optimize personal energy usage behavior	• Provision of analysis tools, detailed information on different tariffs and further opportunities to save costs and/or energy	• Private end consumers (B2C)	• Contracting • Service fees • Money/ kWh	4	5	–
Virtual Power Plant	• Levels volatility in local grids induced by new production technologies, such as wind and solar	• Aggregate a large number of decentralized producers • Build a virtual power plant with stable supply, by employing information and communication technology	• Owners of decentralized production (B2B) • Network Managers	• Service fees • Money/ kWh	1	–	–
Platform Player	• Creates interfaces and platforms for devices and players in a Smart Energy ecosystem • Enables all players to benefit from resulting network effects	• Provides interfaces and technical platforms • Maintains and manages platforms and ecosystems	• Private end consumers • B2B consumers that can benefit from the network effects the platform provides	• Access fees for B2B players • Usage fees for end consumers	5	5	–
Energy Consulting	• Solving energy specific problems for the customer with extended workforce or specialized expertise	• Service-oriented value chain with a focus on building up specialized knowledge and a well-educated workforce	• Predominantly B2C	• Service fees	13	11	–
Hybrid Model	• Energy production is an enabler or byproduct for another central value proposition	• Business unit that engages in energy-intensive activities	• Local energy consumers where excess energy is sold to B2B or B2C	• Money/ kWh	–	–	11
Integrated Solar Solutions	• Easy to implement solar solutions for single households (everywhere) • Attractive financing options for the solar system	• Highly standardized solar solutions • Central coordination of producers, customers, and finances	• B2C in remote areas with relatively high investment costs to get connected to the (national) grid	• Selling of energy (fixed tariffs, pay-as-you-go tariffs) • Margin on sold product	–	–	4
Off-Grid Solutions	• Electrifying remote clusters of energy demands (e.g., group of houses) as a 'mini utility'	• Procurement of products, building of the local energy system • Maintenance of the installed systems	• B2C: households/ villages in remote areas needing energy predominantly in the evening and night • B2B: stable and reliable energy needs (e.g., telecom tower)	• Margin on built objects (energy supply system) • Maintenance fees • Selling of energy (fixed or pay-as-you-go tariffs)	1	–	4

First, the number of business model archetypes that we identified in each country exceeds the number of archetypes that many prior studies identified in other industries (Bonetti & Schiavone, 2014; Kim, 2013; Leask & Parker, 2006; Porac et al., 1995). We reason that a high number of business models and strategic groups in an industry may indeed reflect the transitional nature of the industry (Mas-Ruiz & Ruiz-Moreno, 2011). A closer examination of the business models identified reveals that the number of firms adopting a given business model varies widely (see Table 3): While some business models are represented by 39 or 44 company examples (e.g., *Green Producer* or *Smart Energy Solution Specialist*), others are represented by only one (e.g., *Retailer*) or two (e.g., *Green Utility+*) companies in the sample. This, too, may be reflect the transitional nature of the electrical power sector where new opportunities emerge that are – at least initially – pursued by only a few companies while most of the firms tend to be spread over just a few strategic groups. Based on these observations, we make the first proposition on disruptive industry transformations toward sustainability, which future research can test systematically.

Proposition 1. Disruptive industry transformations toward sustainability are characterized by substantial business model experimentation, and the number of business model archetypes in the focal industry during the transformation exceeds the number of business model archetypes before and after the transformation.

Unlike other studies on strategic groups that have focused exclusively on incumbent firms, our sample includes startups as well as incumbents. The number of different business model archetypes adopted by startups is smaller than the number of different business model archetypes adopted by incumbents in all three countries we examined. Moreover, very few business model archetypes were exclusively adopted by startups in a country. Only three business model archetypes in India, two business model archetypes in the UK, and zero business model archetypes in the USA were adopted by startups without also being adopted by at least one incumbent in the said country (see Figs. 4 to 6). These findings challenge some conceptual arguments that Hockerts and Wüstenhagen (2010) used to illuminate the "differential roles" (p. 489)

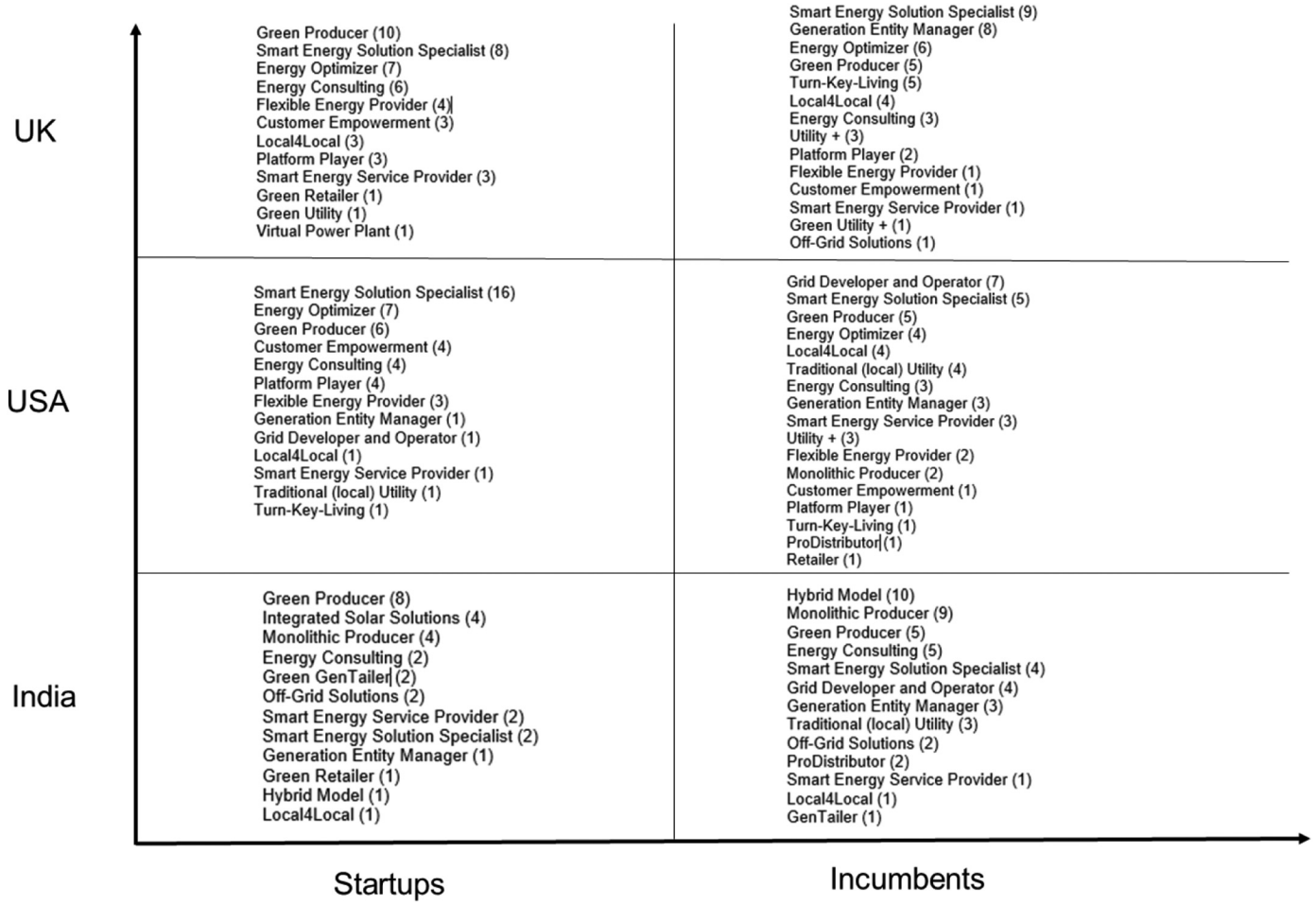

Fig. 3. Business Models of Startups and Incumbents across Countries.

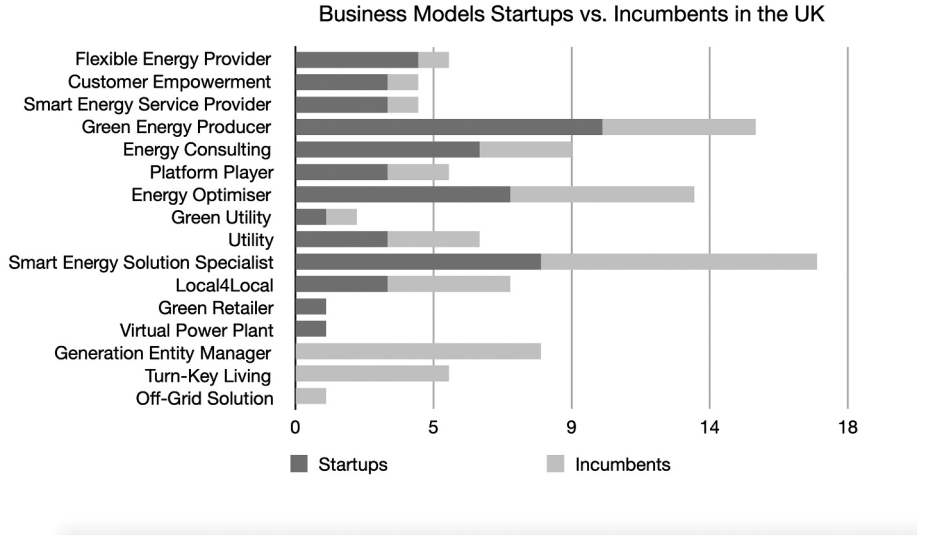

Fig. 4. Prevalence of Business Models in Startups vs. Incumbents in the UK.

of startups and incumbents in disruptive industry transformations toward sustainability. First, they argued that a "paradigm change is usually characterized by a high degree of variation, i.e. a large number of new entrants experimenting with new product designs" (p. 485). Second, they contended that incumbents "mimic some of the [… startup] initiatives" (p. 489). Our findings support the notion that industry transformations will be characterized by substantial business model experimentation (see Proposition 1 above). However, they indicate that incumbents are also quite active in this experimentation and that incumbents do not merely imitate the initiatives of startups but experiment with other ideas too. Thus,

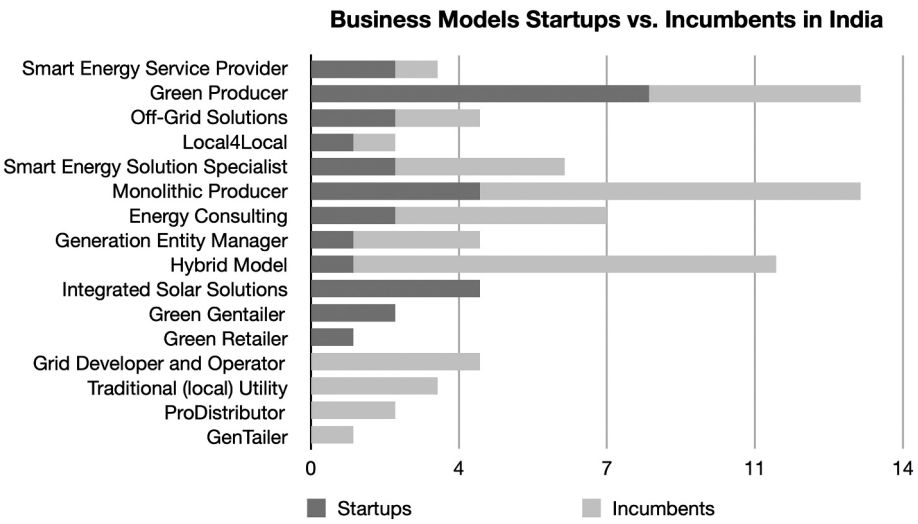

Fig. 5. Prevalence of Business Models in Startups vs. Incumbents in India.

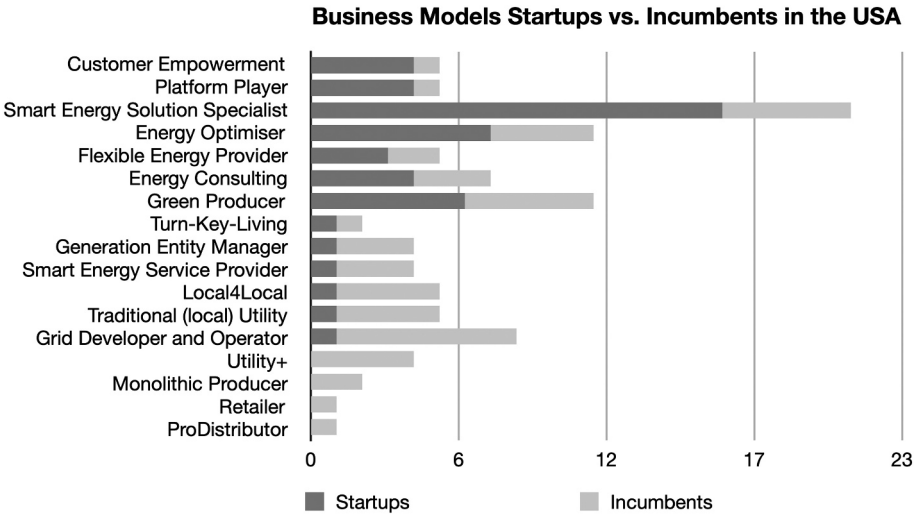

Fig. 6. Prevalence of Business Models in Startups vs. Incumbents in the USA.

Proposition 2a. In disruptive industry transformations toward sustainability, both startups and incumbents engage heavily in business model experimentation.

Proposition 2b. In disruptive industry transformations toward sustainability, incumbents experiment with some business models that are not pursued by startups.

Thus, it seems that incumbents and startups differ in the content of their business model experimentation. Probably most importantly for an industry transformation toward sustainability, startups tend to dominate the adoption of decidedly 'green' business models. While both startups and incumbents have adopted the business model archetype *Green Producer* quite frequently across the three countries, startups have done so in greater numbers (see Figs. 4 to 6). The archetypes *Green Gentailer*, *Green Retailer*, and *Integrated Solar Solutions* are adopted exclusively by startups in our sample. Thus:

Proposition 3a. In disruptive industry transformations toward sustainability, startups and incumbents differ systematically in the content of their business model experiments and in the adoption of business model archetypes.

Proposition 3b. Even though incumbents may experiment with 'green' and other new business models, industry transformations toward sustainability will progress relatively slowly and will not achieve the same degree of change if they are not supported emphatically by startups.

Moreover, the business model archetypes *Smart Energy Service Provider*, *Smart Energy Solution Specialist*, and *Virtual Power Plant* are more frequently adopted by startups than incumbents across the three countries we examined (see Figs. 4 to 6). This observation indicates that startups place greater emphasis on digitization than do incumbents. Moreover, startups tend to adopt the archetype *Customer Empowerment* more frequently than incumbents, specifically in the UK and the USA. This business model enables customers to control and optimize their energy usage behavior mostly through apps and online coordination. The incumbents in our sample rarely adopt this business model archetype, which could reflect the fact that customer satisfaction was often less relevant for energy companies that exercised strong market power in the past (Hartmann & Ibáñez, 2007). Thus, energy companies often did not develop particularly strong capabilities for customer relationship management, whereas a strong customer orientation is the hallmark of many startups (Teece, 2000). In contrast, incumbents tend to dominate in the adoption of business models with highly complex value creation and delivery structures (e.g., *Turn-Key Living*, which involves offering

state-of-the-art housing in terms of security, communication, and energy management) and in the adoption of very capital intensive business models (e.g., *Monolithic Producer* or the *Hybrid Model*, where firms sell excess energy that they have produced for their own energy-intensive production processes to external customers). Therefore:

Proposition 3c. In disruptive industry transformations toward sustainability, startups lead the development of business model archetypes based on digitization and customer orientation, whereas incumbents lead the development of business model archetypes based on complex value creation and delivery structures, and high capital intensity.

From a cross-country perspective, it is noteworthy that the mere number of archetypes per region shows little variety (UK: 16; USA: 17; India: 16), while the specific business model archetypes that make up each number vary widely across the three countries. Thus, there are some business model archetypes that are applied in only one or two countries and not in all. For instance, the *Gentailer* and *Green Gentailer* business models, which are characterized by the fact that they do not own transmission or distribution assets, are exclusively featured in our sample of Indian firms. This may be due to prevailing governance structures and planning processes of the transmission and distribution lines in India, which means that many of the corresponding assets remain under state ownership (Thakur et al., 2005). However, this regional cluster does not contain such business models as *Turn-Key Living*, *Customer Empowerment*, or *Energy Optimizer*. To take another example, we observe the business model *Green Utility* + only in the UK. This may be a consequence of the quest of European utilities for new sources of income to compensate for shrinking margins in their core businesses and of their status as central players in the politically enforced decarbonization of energy production (Richter, 2012). The same reasoning seems to apply to the *Virtual Power Plant*, which is a model that helps to integrate small renewable production sites into the energy market (Aghaei & Alizadeh, 2013; Palmié et al., 2021). Thus,

Proposition 4a. Because of institutional differences (e.g., in policies and regulations), different business model archetypes will account for a given industry's disruptive transformation toward sustainability across different countries.

Proposition 4b. Even if two or more countries display similar varieties of business model archetypes in a given industry undergoing a disruptive transformation toward sustainability, the varieties are likely to result from different business model archetypes so that the transformation is still likely to differ substantially across countries.

Finally, our study reveals that business model archetypes that contribute to the disruptive transformation of an industry toward sustainability can spread internationally. For instance, Cambridge Clean Energy, which is headquartered in the UK and serves emerging countries with an *Off-Grid Solutions* business model, has entered the corresponding strategic group in India. This example underscores the usefulness of the business model perspective in identifying competition as it shows that companies from another location can turn into competitors if they pursue a business model suited to the focal market. Thus,

Proposition 5. Business model archetypes originating in a foreign market can make critical contributions to disruptive industry transformations toward sustainability in a focal country.

5. Discussion and conclusion

Many scholars and practitioners have assumed that disruptive industry transformations toward sustainability are predominantly driven by startups, while others have concentrated attention on sustainability efforts in incumbents (e.g., Diekhof, 2015; Fellnhofer et al., 2014; Hockerts & Wüstenhagen, 2010; Kraus et al., 2018; Palmié et al., 2019; Smink, 2015). In contrast, sustainable entrepreneurship research has rarely looked at "the interplay between these two players" (Hockerts & Wüstenhagen, 2010, p. 486) and, consequently, has "neglected the differential roles of large and small firms in transforming industries towards sustainable development" (p. 489). To overcome this knowledge gap, we analyzed and compared the business models of 280 startups and incumbents in the electrical power sector across three countries – the UK, the USA, and India – and found 25 distinct business model archetypes. The three countries under investigation represent three different energy profiles (World Energy Council, 2015). While they exhibit various strengths and challenges in responding to the energy trilemma, they are all undergoing a disruptive transformation toward sustainability (OECD, 2016; PwC, 2015). Our analysis yields several important findings.

5.1. Contributions to theory and practice

First, we observed that incumbents pursue a greater number of business model archetypes than startups in each of the sampled countries. This observation challenges the assumption that startups are inherently more inclined to experiment with new business models. Rather, changing regulations and customer preferences in favor of sustainability can put the business models of incumbents under so much pressure that they feel an enormous urgency to act (PwC, 2015).

Second, we observed that incumbents have adopted several new business models that are not pursued by startups. This observation qualifies the assumption that startups commonly pioneer innovative solutions that are subsequently "mimic[ked]" (Hockerts & Wüstenhagen, 2010, p. 489) by incumbents. While this assumption may hold true for product or process technologies that are at the heart of Hockerts and Wüstenhagen's (2010) conceptual account, it seems to be less accurate for business models. A potential explanation for this discrepancy is that a new product or process technology leads to a concrete response strategy – imitation. In contrast, pressure on the current business models of incumbents provides a much more diffuse stimulus to which incumbents can react in various ways. As the first comparative assessment of business models of startups versus incumbents, our study suggests that the role of startups and incumbents in innovation and change depends to a certain degree on what is innovated – technology or the business model. Generally speaking, our study cautions managers against prematurely extending findings on the role of startups versus incumbents from one innovation context to another (cf. Keupp, Palmié, & Gassmann, 2012).

Third, we observed that startups have adopted some business models that are not pursued by incumbents. While the first two findings could call into question the relevance of startups in the transformation of industries toward sustainability, this third observation reinforces their relevance. Our comparative study of startups versus incumbents reveals systematic differences in their business models. Whereas incumbents lead the development of business models with a complex value creation and delivery structure and of those with a high capital intensity, startups lead the development of business models with a high customer orientation, a strong digital component, or a decidedly 'green' character (e.g., *Green Gentailer*, *Green Retailer*, and *Integrated Solar Solutions*). Overall, both startups and incumbents make specific contributions to the transformation of industries. This finding both corroborates and extends Hockerts and Wüstenhagen's (2010) conclusion, "In isolation, none of these two developments [initiated by startups and by incumbents, respectively] would necessarily lead to sustainable transformation of mainstream markets" (p. 489). First, this study's finding corroborates Hockerts and Wüstenhagen's (2010) conclusion by confirming that a comprehensive industry transformation toward sustainability depends on the involvement of both startups and incumbents. And second, our finding extends Hockerts and Wüstenhagen's (2010) work by identifying additional mechanisms that lead to their conclusion. Hockerts and Wüstenhagen (2010) base their position on the argument that, one the one hand, idealistic startups are in a good position to initiate the industry transformation but in a poor position to scale their sustainability initiatives successfully. As newly established firms, they face the liability

of newness and the liability of smallness. On the other hand, incumbents as mature firms with large resource endowments are seen to be in a good position to scale sustainability initiatives but in a poor position to overcome inertia and invent fundamentally new ways of doing business. Consequently, Hockerts and Wüstenhagen (2010) conclude that startups and incumbents complement each other because incumbents can imitate and scale the sustainability initiatives advanced by startups. Our study identifies another reason why both startups and incumbents matter for a successful 'green' industry transformation: they pursue different business models and, without the involvement of both groups, some relevant business models would probably be missing or be developed much more slowly.

Fourth, we observed that foreign firms can also affect the transformation of an industry in a focal country by replicating their business models internationally. Depending on the organizational characteristics and preferences of these foreign firms, they may partially assume the role traditionally played by either local incumbents or local startups. Thus, the presence of foreign firms can alter the relative importance of local incumbents and startups in the transformation of industries toward sustainability. Foreign firms may also act as a substitute if local incumbents or local startups cannot advance certain business models desired by local stakeholders.

Fifth, this paper is one of the first attempts to use business models as a categorization criterion for creating strategic groups. Using business models for this purpose represents an extension of previous approaches, which relied on other categorization criteria such as R&D spending (Leask & Parker, 2006) and firm size (Mas-Ruiz & Ruiz-Moreno, 2011). This extension is timely given the increasing dominance of business models as a unit of analysis (Zott et al., 2011) and the high relevance of strategic groups and cognitive models in explaining competitive dynamics in structurally highly uncertain and disrupted industries (Porac et al., 2011), for which the electrical power sector is a prime example.

Sixth, energy scholars and practitioners may find our study useful because it offers an important overview of business model archetypes in the electrical power sector across different countries. Categorizing the firms in the industry into business model archetypes and strategic groups that serve as reference points (Fiegenbaum & Thomas, 1995) makes understanding the competitive landscape easier than when managers were required to consider each firm in the industry individually (Reger & Huff, 1993). The increasingly dynamic and uncertain nature of the electrical power sector renders this effect especially beneficial because complexity reduction is particularly valuable when managers suffer from information overload (Livengood & Reger, 2010; Reger & Huff, 1993). Since business models are relevant cognitive models that managers use to think about their own firm as well as their competition, this study helps to provide an overview of the current developments in the energy sector and to offer insights into the disruptive transformation toward sustainability (EY, 2015; KPMG, 2015). Our study does not only identify and describe the business model archetypes in the electrical power sector, but it also suggests poignant labels for these archetypes (see Table 3). We hope that these labels stimulate discussion on the development of the sector and the opportunities it provides.[4]

In addition to supporting managers in effectively understanding the current transitional dynamics in the electrical power sector, our overview of existing business models, which differentiates between startups and incumbents, can boost their efforts to innovate their business models toward green ends and customer orientation. Business model innovation often draws heavily on inspiration gained from examining the business models of other companies (Frishammar & Parida, 2019; Gassmann et al., 2014). As industry transitions typically stimulate firms' willingness to rethink their business models (Martins et al., 2015), managers need to understand how relevant business models work.

5.2. Limitations and future research

As with all research endeavors, our study is not without limitations. First, while this paper provides a general overview of the business models adopted by firms in the electrical power sector across three countries, it is likely that not all emerging business models in the electrical power sector of these countries have been covered. However, by employing globally renowned data sources, a broad sampling strategy that goes beyond industry code definitions of the electrical power sector, and a random selection of observations, and by differentiating incumbents as well as startups in our data set, we have tried to be comprehensive in our coverage of the most important business models. Further research using different data sources may detect additional business models, particularly in the two regional energy profiles that were excluded from our analysis because of limited coverage in the data sources used.

Second, publicly available text sources may not always accurately represent the actual business model of firms. While we used a variety of text sources to minimize this problem, a degree of inaccuracy may persist. The data also do not explain why the managers of firm A adopt a particular business model and the managers of firm B adopt a different model. Future research could examine the extent to which the different business models in incumbents are influenced by different intrapreneurial practices.[5]

Third, our approach is cross-sectional and cannot depict the temporal dynamics of industry transformations. Future research could periodically repeat our analysis to arrive at a longitudinal account of the business models in the electrical power sector and, therefore, describe how the transformation of the sector unfolds and the way in which the roles of startups and incumbents evolve. Given the current dynamics in the sector and the substantial role business models play in its transition, an examination of the evolution of business model archetypes over time seems a very promising avenue to explore. We hope that our study, by providing a first step in this direction, can serve as a reference point for future accounts.

5.3. Conclusion

Business models play a major role in 'green' industry transformations. By describing what firms offer to their clients, how they create and deliver this value proposition, and how the created value is distributed across actors, they determine how much economic, social, and environmental value is created (or possibly destroyed) by the firms in an industry. If an industry is undergoing a transition toward greater sustainability, the business model landscape of this industry changes considerably and new business models emerge. This article has served two interrelated purposes. First, it provides an overview of the changing business model landscape of the electrical power sector in three different regulatory, political, and economic contexts. Such an overview can stimulate the industry's further transformation since it points to viable business model options that firms may consider in their business model innovation efforts. Second, the article illuminates the respective contributions of incumbents and startups to the changing business model landscape and, thus, to the transformation of the sector. Our findings suggest that their respective contributions to a changing business model landscape can differ significantly from their respective contributions to a changing product or technology landscape. Given the relevance of business models for industry transformations, further research along these lines is highly desirable.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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