The supporting role of business models in the promotion of sustainable innovations in the energy sector: an explorative study in the Italian SMEs

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Abstract

***Purpose of the paper**: This paper aims to analyze how small-medium enterprises (SMEs) contribute to the development of a sustainable innovations in the energy sector such as geothermal heat pumps (GHPs) by implementing effective sustainable business models.*

***Methodology**: The study carried out an exploratory multiple case study with 8 SMEs operating in the Italian GHP market on the role of sustainable business models in supporting the development of sustainable innovations.*

***Results**: The analysis shows that sustainable business models exert a supporting function between sustainable innovation and sustainable value creation thanks to their ability to overcome the existing barriers to adopt sustainable innovations (i.e. GHP systems). This supporting role thus results from the firms' capabilities and knowledge to assess and promote the peculiarities of selected sustainable innovation. Moreover, the analyzed business models foresee an ongoing support of customers before and after the adoption of sustainable innovation by communicating potential environmental benefits and providing additional services.*

***Research limits**: The main limitation is that the findings derive from a national case study with specific market conditions for GHPs which might influence the development of sustainable business models.*

***Practical implications:** The study supports firms aiming to develop and implement business models for boosting sustainable innovations through an effective assessment of selected sustainable innovation and dialogue with policy makers.*

***Originality of the paper:** The study opens the black box of unexplored relationships between sustainability innovations and business models by analyzing their main components (value proposition, supply chain and public institutions, customer interface and financial model).*

Key words: business model innovation; business model for sustainability; sustainable innovation; small medium enterprises; sustainable energy

1. Introduction

A growing body of literature characterizes challenging the role of companies for achieving the sustainable development. Companies are both the root cause and solution of many environmental and social problems

(Schaltegger *et al.,* 2016). Therefore, a fundamental shift in the purpose of business and related components is required. In this regard, business model innovation can support this change through redefining and rethinking the purpose of the company and the logic of value creation for delivering sustainability (Bocken *et al.*, 2014) and growth strategy (Chen *et al.*, 2020).

The integration of sustainability into business models thus requires a reconfiguration and/or creation of products, services, competencies, infrastructures, relationships with customers and other stakeholders (Boons and Ludeke-Freund, 2013). This process should be understood and shared with companies that want to embed sustainability. In particular, the investigation of business models for sustainability and their configurations becomes strategic in more polluting and responsible for greenhouse gas emissions sectors such as the energy sector (Latapí Agudelo *et al.*, 2020).

The energy sector, indeed, is facing a deep transformation through the development of renewable energy sources and consequently the increasing decentralization of energy supply whereby passive end-users become active market players. This dynamic is triggered by innovation such as smart meters and ICT tools and increasing environmental challenges in terms of reduction of CO2 emissions through the adoption of cleaner technologies (Kanellakis *et al.*, 2013). In this context, the traditional business solutions are not able to yield added value for suppliers, customers, and other stakeholders by taking advantage of innovative and sustainable technologies currently available in the energy sector (Burger and Luke, 2017).

This paper carries out an explorative multiple case study on the role of innovative sustainable business models in supporting the development of sustainable innovations such as geothermal heat pumps (GHPs), an attractive and sustainable technology for space heating and cooling. It analyzes how new ways of developing value proposition, supply chain, customer interface and financial models are the main strategic tool to contribute to the diffusion of decentralized and sustainable thermal energy supply at residential and commercial level and the company's growth.

The case-based research presented in this paper concerns a "substitute with renewables and natural processes" business model belonging to Bocken *et al.* (2014)'s sustainable business model archetypes for a better use of renewable energy resources in local thermal energy supply, henceforth a sustainable business model.

This sustainable business model is implemented in the promising but still juvenile Italian GHPs market (Rizzi *et al.*, 2011). GHPs are an interesting technology with a high potential of energy saving and renewable energy production that can be implemented almost everywhere (Saner *et al.*, 2010), but less known by consumers. Previous studies showed that GHPs determine a dynamic business environment characterized by pioneering small-medium enterprises (SMEs) providing sustainable e and decentralized solutions for space heating and cooling (Gasbarro *et al.*, 2017). Therefore, the current study aims to investigate how these SMEs contributes to the development of a sustainable innovation such as GHPs by implementing effective and innovative sustainable business models that might play a crucial role in the company's growth. Indeed,

the investigation of the role of sustainable business models in supporting sustainable innovation can provide evidence for helping SMEs to identify and implement growth strategies.

The remainder of the paper is structured as follows: Section 2 presents the theoretical framework on sustainable business models, and their relationship with sustainable innovation as well as related archetypes of sustainable business model innovations. Section 3 describes and discusses the methods used for gathering and analyzing data. Section 4 describes and analyzes the sustainable business models under study. Section 5 discusses the findings regarding the role of sustainable business models in supporting sustainable innovations such as GHPs and provides conclusions concerning the usefulness and implications of this research, its limitations, and directions for future research.

2. Theoretical background

2.1 Business model for sustainability: a strategic means to change

Several scholars provide different perspectives of the business model concept moving from more holistic approaches of doing business (Magretta, 2002; Zott and Amit, 2010; Beattie and Smith, 2013) to organizational and financial dimensions of a business (Teece, 2010), and an overall description of business model components (Osterwalder and Pigneur, 2010).

Although above-mentioned various perspectives, a business model is a concept describing the rationale for how an organization creates, delivers, and captures value, and manages the realization of a firm's strategy (Osterwalder and Pigneur, 2010; Teece, 2010). Business models can thus be defined as a "set of interdependent organizational activities" (Zott and Amit, 2010) and their function is to create value and capture a portion of that value through a series of activities from supply of raw materials to the final consumers (Chesbrough, 2007).

In this context, business models have been considered as a remarkable contributor of sustainable development by creating superior customer value and positive impact on society (Lüdeke-Freund, 2010). Thus, the integration of sustainable dimension into business models can assume different configurations. Therefore, scholars and practitioners are exploring the role of sustainable business models in achieving both economic prosperity and positive effects for the natural environment and society (Boons *et al.*, 2013).

Early work on "sustainable business models" (alternatively defined as "business models for sustainability") dealt with organizational principles of corporate sustainability (Stubb and Cocklin, 2008) or with the identification of business models as means to re-think products, processes and organizations based on the life cycle approach (Hansen *et al.*, 2009; Wells and Nieuwenhuis, 2004). Other studies investigated the relationship between business models and business cases for sustainability (Schaltegger *et al.*, 2012).

All these approaches of investigation focus on organizational value creation with the integration of social and environmental values that can characterize sustainable business models together with related organizational, market and societal transformations. However, an unequivocally recognized definition of the sustainable business model has been debated. In this regard, Boons and Lüdeke-Freund (2013) described a set of requirements for each constituting element of sustainable business models: the value proposition provides ecological and/or social value associated with economic value through the bid of products and services, the supply chain must be regulated by sustainable principles, the customer interface must implement a strong relationship with customers and other stakeholders to assume responsibility for production and consumption paradigms, and the financial model should distribute equitably economic costs and benefits among all actors involved. Moreover, Lüdeke-Freund (2020) argued that the implementation of sustainable business models is a means to foster new business opportunities for sustainability and stimulate organizational development.

Thus, sustainable business models represent a mediating device for implementing a strategy aiming at the business case for sustainability and creating fit between different areas of a firm and its business environment as well as the social actors (Schaltegger *et al.*, 2012; Lüdeke-Freund, 2020). Therefore, the analysis of the constituting elements of sustainable business models might help understanding how companies react to changes in the business environment to tackle environmental and social issues through the implementation of sustainable innovation. In particular, the present study aims to answer to the following research question:

RQ1: How do SMEs operating in the GHPs market develop an effective business model for tackling sustainable challenges in the energy sector?

2.2 Interrelation between sustainability innovation and business model

The integration of economic, environmental, and social concerns at a company level requires new ways of thinking and the adoption of sustainable innovations to effectively pursue sustainable development (Longoni and Cagliano, 2018). In this regard, sustainable innovation is defined as "intentional changes to an organization's philosophy and values, as well as to its products, processes or practices, to serve the specific purpose of creating and realizing social and environmental values in addition to economic returns" (Adams *et al.*, 2016).

Since sustainable innovations pursue the spreading of clean technologies, the implementation of new organizational forms, or the resolution of social issues, business models assume different configurations (Boons and Lüdeke-Freund, 2013).

Lüdeke-Freund (2020) argued that business models related to clean technologies can be distinguished: "(a) new business models can employ given technologies; (b) given business models can take up new technologies; and (c) new business models can be triggered by new technologies and vice versa". However, business models can support the understanding of the logic of production and consumption systems (Wells, 2008) and assume

a role of mediator between how technologies are made and how they are used (Boons and Lüdeke-Freund, 2013).

Organizational innovations represent the change in the way of doing business toward sustainable development and related business models to promote organizational and cultural changes for answering increasing stakeholder demands but also alternative economic paradigms to integrate needs and aspirations of sustainability (Stubb and Cocklin, 2008; Boons and Lüdeke-Freund, 2013). Therefore, sustainable business models result in an aggregate of several organizational dimensions (Boons and Lüdeke-Freund, 2013).

Social innovations require business models able to support products and services with a social purpose or entrepreneurial and managerial activities aiming to develop social enterprises (Boons and Lüdeke-Freund, 2013). In this context, sustainable business models have the primary purpose of changing the focus of value creation. Seelos and Mair (2005) highlighted that earning money stems from the social value creation.

These three main categories of sustainable innovations highlight the strong relationship with business models. Lüdeke-Freund (2020) pointed out the need for an alignment between sustainability innovations and business models to increase the likelihood of business success of these innovations. Therefore, different degrees of business model innovations are required. Schaltegger *et al.* (2012) identified three typologies of business model innovations: defensive, accommodative, and proactive. Defensive strategies consist of business model adjustment to safeguard the existing business model through risk and cost reduction measures according to a compliance perspective. Accommodative strategies require the implementation of some improvements and integrations of the current business model by considering environmental and social issues. Proactive strategies pursue the redesign of the business model according to sustainability principles.

All these possible configurations of the business model innovation for sustainability can make "challenging for firms to understand how to innovate their business models" (Evans *et al.*, 2017). However, Evans *et al.* (2017) argued that the development of innovative sustainable business models cannot ignore some theoretical foundations related to the concept of creating sustainable value for multiple stakeholders including the natural environment and society, the change of value network of a firm in terms of new purpose, design and governance, systemic attention to stakeholder interests and the internalization of externalities through product-service system (PSS).

Bocken *et al.* (2014) thus categorized possible configurations of sustainable business models in eight archetypes to identify and promote mechanisms and solutions that might strengthen end enhance the embeddedness of sustainability into business purpose and processes. The archetypes aim to foster the development of innovation capacity and new development paths. The analysis stated the importance to investigate sustainable business models according to the level of innovation and technology, system perspective, innovative collaborative approaches as well as education and awareness.

Therefore, investigation on specific archetypes can support firms in the identification and design of strategies for implementing suitable and effective innovative sustainable business model. For this reason, the study focuses on the sustainable business model archetype "substitute with renewables and natural processes" that consists of the substitution of finite materials with renewable materials through renewable energy supply systems (Bocken *et al.*, 2014). This archetype is adopted to analyze how innovative sustainable business models support SMEs in the implementation of sustainable innovations, such as GHPs, in the energy sector, which leads to our second research question:

RQ2: How does the implemented business model support a sustainable innovation such as GHPs in the energy sector?

3. Methods and data

3.1 Sample definition

We carried out an exploratory multiple case study (Yin, 2009) on the role of innovative sustainable business models in supporting the development of sustainable innovations such as GHPs.

The criteria for the selection of case studies were the implementation of Bocken *et al.* (2014)'s sustainable business model archetype "substitute with renewables and natural processes" to promote and provide sustainable e and decentralized solutions for space heating and cooling through GHPs. The technology of GHPs represents an opportunity to trigger energy saving and renewable energy production in local thermal energy supply (Saner *et al.*, 2010). Moreover, GHPs are associated with a dynamic business environment consisting of SMEs (Gasbarro *et al.*, 2017). Therefore, the study selected SMEs operating in the Italian GHP market that has a high potential of development (Rizzi *et al.*, 2011). Thus, an investigation of sustainable business models implemented by SMEs representing most of firms in the Italian GHP market contributes to understand the strategic role of these business models in supporting a sustainable innovation such as GHPs.

The analysis used a purposeful sampling to identify SMEs which have implemented an effective and innovative sustainable business model for fostering GHPs. We selected SMEs listed in the database of the international project Repower , Lombardy Region database for GHPs and specialized websites to gather all relevant information for avoiding the risk of including unsuitable firms. Indeed, firms operating in Italian GHPs market usually are difficult to identify and list because there is not an official national register.

These firms cover more than one role along the Italian GHP supply chain confirming Gasbarro *et al.* (2018)'s evidence. Indeed, heating engineers are directly involved in the design, assembly, quality control and procurement of GHP installation. Due to the peculiarity of the multiple case study methodology, the statistical representativeness of the sample was considered less important than the opportunity of gathering detailed

information. Therefore, 8 out of 19 firms identified and contacted agreed to provide us with detailed information through interview.

Semi-structured phone calls and face-to-face interviews were carried out from May to September 2018. The interviews were based on a semi-structured protocol investigating the firm's competences in developing GHP systems, components of sustainable business model and related barriers. Given the explorative nature of the research, we asked the interviewees to narrate the path that induced the firm to develop a business model able to address sustainability challenges through GHPs and guarantee the company's growth, and the drivers and barriers of the adoption process. Given the small size of the firms, interviews were carried out with the firms' founder or the owner. Each interview lasted between 45 to 60 min. All interviews were recorded and subsequently transcribed. Table 1 shows the characteristics of the firms participating in the study.

Tab. 1: Overview of case characteristics

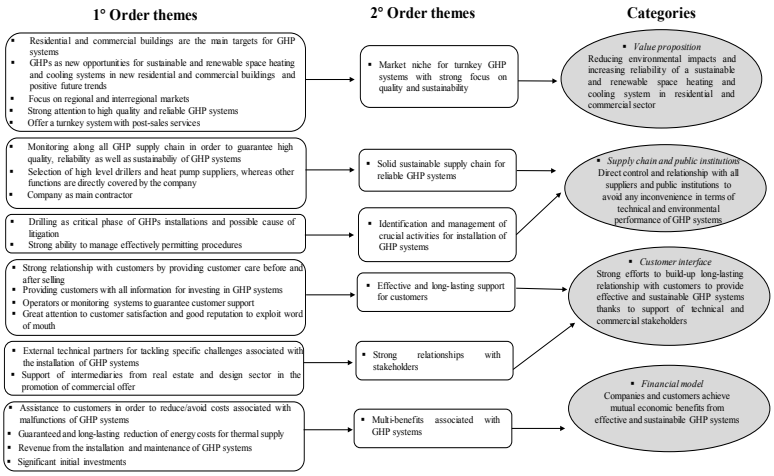
Company	Number of employees	Turnover € (2016)
SMEGeo1	2	448.481
SMEGeo2	2	830.399
SMEGeo3	n.a.	356.420
SMEGeo4	7	1.061.706
SMEGeo5	8	1.067.454
SMEGeo6	27	6.031.454
SMEGeo7	4	981.446
SMEGeo8	1	50.821

Source: our elaboration of Orbis database

Each interview was triangulated with documentation provided by the interviewed firm or collected via web research on the firm's website or using secondary data sources. We analyzed around 1,200 pages of relevant documents including financial reports, sustainability reports, firms' websites, press releases, and internal policies. The data saturation criterion was adopted to finish the data collection.

The data analysis was undertaken by classifying collected information into themes and then categories (Gioia *et al.*, 2013). The resulting themes were a combination of predefined codes based on our literature review and codes resulted from the data (see Figure 1). The entire coding process was done through an inductive and iterative mode aimed at attributing agreed codes to discourses and narratives emerging from our data (Corley and Gioia, 2004). Moreover, we alternated between independently coding data based on categorizations and then jointly appraising the fit of the current categorization scheme and making refinements to the scheme to minimize researcher biases during the data analysis.

Fig. 1: Data structure



Source: our elaboration

4. Results

In this section we describe the components of sustainable business models adopted by interviewed SMEs operating in the Italian GHP market. In this regard, respondents provide a clear framework of the configurations of their business models to support the development of GHPs by assuming a proactive strategy. As Schaltegger *et al.* (2012) argued that a proactive strategy pursues the redesign of the business model by integrating environmental objectives into the core business logic. Indeed, the interviewed firms implement innovative business models to promote GHP systems which allow the achievement of renewable and energy efficiency targets in the local thermal energy supply. Therefore, firms make a special effort to overcome the existing skepticism on GHPs by providing customers with useful information concerning economic and environmental benefits associated with these technologies. Moreover, firms aim to enhance the quality and typology of the offer. In doing so, their business models integrate some additional services that increase the reliability and sustainability of GHP systems such as monitoring activities during GHP systems' lifespan and ongoing assistance.

This proactive strategy was analyzed through the description of Boons and Lüdeke-Freund (2013)'s constituting elements of sustainable business models: value proposition, supply chain, customer interface, and financial model.

4.1 Value proposition

SMEs declared a value proposition that pursues the reduction of environmental impacts and the increase of the reliability of a sustainable and renewable space heating and cooling system in the residential and

commercial sector. Firms have developed this value proposition because they consider GHPs as a new opportunity for implementing sustainable and renewable space heating and cooling systems as declared SMEGeo8: "*GHPs can trigger the implementation of more sustainable space heating and cooling installations and can have a positive market trend in the future*".

Even though these firms operate in regional and interregional markets, they make a special effort to guarantee high quality and reliable GHPs systems as confirmed by SMEGeo4: "*[…] we work with a higher quality*". Moreover, the reliability of GHP systems is necessary to provide turnkey installations and real-time customer assistance. Indeed, SMEGeo5 has designed its offer to "*provide real-time support and register the performances of the plants on a cloud server, shared with the customer*".

The interviews show another crucial aspect associated with the great diffusion of GHP systems in residential and commercial/industrial buildings, whereas the public sector represents a less attractive and marginal market segment. According to some firms, "*the residential sector represents the majority of installed plants, but this is changing year after year: larger plants are constantly increasing*" (SMEGeo4). Therefore, commercial and industrial segments might have a further development in the future, although some firms argued that "*two thirds of the plants that we installed supply commercial or industrial users […]*" (SMEGeo2). Both segments require high quality standards and the achievement of environmental targets in terms of energy efficiency and reduction of CO2 emissions. Thus, firms understanding the need to guarantee their niche market by satisfying high demanding customers have designed value proposition focused on quality and sustainability principles.

4.2 Supply chain and public institutions

The analysis highlights the importance of building strong relationships with suppliers for the implementation of reliable, effective, and sustainable GHP systems. These relationships result from a trust between the interviewed firms and the suppliers. For instance, SMEGeo4 stated: "*[…] we have two suppliers which usually work with us, and we trust them*". In this regard, suppliers can support the implementation of GHP systems through asking "*the supplier for advice regarding possible doubts on the sizing and correct functionality of the plant*" (SMEGeo6). Moreover, firms want to develop long-lasting cooperation with suppliers able to cover specific activities and functions not belonging to their internal competences and expertise. Therefore, firms carry out the selection and supervision of specific functions such as drilling and the supply of heat pumps. Indeed, SMEGeo6 declared that they "*[…] involve external companies only for drilling, […]. We do not have further partnerships, except the one with the heat pump supplier; […]*".

The interviews confirm that SMEs very often "*[…] work as main contractors*" (SMEGeo5). Accordingly, they manage internal competences such as the design and the sale of GHP systems by integrating other external competences of suppliers. Their role thus guarantees the overview of the supply chain to avoid potential criticalities during the installation of

GHP systems. An example is represented by the drilling. SMEGeo8 stated that "*[…] during the construction, the drilling phase is problematic. We have always worked well, both in terms of design and sizing, and we have never undergone a litigation; other companies had this kind of problem*".

Another aspect that SMEs cannot overlook regards the permitting procedures. The achievement of permissions requires great effort and time. Firms should be able to dialogue with public institutions by "*[…] explaining their activities*" (SMEGeo8). Thus, a successful implementation of GHPs results from the ability to manage all the steps of permitting procedure. Indeed, SMEGeo1 recognized that it is important to "*[…] make each step according to the right procedure (considering permission and design)*".

4.3 Customer interface

The investigation shows that firms have developed a strong relationship with the customers by providing effective and sustainable GHP systems. The effectiveness and sustainability of these systems depends on the long-lasting support of the customers through the collaboration of the firm's technical and commercial stakeholders. Therefore, the firms interviewed want to "*[…] follow personally every phase, being available also to show up if needed, even years after the installation*" (SMEGeo4). They make every effort to provide customer care before but also after selling. Firms provide customers with all information to make a decision concerning the investments in GHP systems. Sometimes firms propose the opportunity of carrying out "*[…] visits of operating plants to convince the potential customer*" (SMEGeo8).

Moreover, some firms guarantee continuous costumer support through the availability of operators or the implementation of monitoring systems. SMEGeo5 declared that "*[…], every plant which we install is monitored from remote, and we provide real-time support and register the performances of the plants on a cloud server, shared with the customer*". This continuous support aims to achieve customer satisfaction so that firms have a good reputation and "*[…] have mainly worked through 'word of mouth'*" (SMEGeo5).

The supply of effective GHP systems is also based on the development of strong relationships with technical partners for tackling specific issues associated with the installation of GHPs. SMEGeo7 stated that: "*Drilling is assigned to some partners with which, in some cases, there are also agreements of corporate nature*". The relationship with stakeholders also includes the support of intermediaries "*with whom we successfully collaborate since some years. These intermediaries belong to the real estate sector or have commercial experience*" (SMEGeo2).

4.4 Financial model

Firms have developed a financial model able to provide multi-benefits associated with GHP systems. Indeed, firms and customers achieve mutual economic benefits resulting from the installation of GHPs.

Firms declared their attention to provide an effective system and help customers to reduce and avoid costs due to malfunctions of GHPs. Effective

GHP systems can guarantee a reduction of energy costs associated with thermal supply. Therefore, "*[…] customers should understand that there are potential advantages […]*" (SMEGeo4). The understanding of economic benefits associated with GHP systems overcomes potential oppositions to invest since this technical solution is less known and needs a significant investment.

Firms make revenues because they carry out the installation and maintenance activities of GHP systems. Concerning the installation, firms "*manage directly each part of the installation phase: design, assembly, quality control, procurement of technical components, etc.*" (SMEGeo1). Maintenance activities require a continuous effort during the lifespan of the plant by implementing a monitoring system and/or providing an operator.

5. Discussion and conclusions

The study, by carrying out an explorative multiple case study, contributes to the empirical analysis of the components of sustainable business models and their interplay with sustainable innovations such as GHPs, an attractive and sustainable technology for space heating and cooling. Analyzing the main components of these sustainable business models (value proposition, supply chain and public institutions, customer interface and financial model), the study opens the black box of unexplored relationships between sustainability innovations and business models without overlooking the identification of the type of implemented business model innovation.

The paper identifies the development of a proactive strategy within sustainable business models, as described by Schaltegger *et al.* (2012), able to redesign the business model by integrating sustainability objectives into the core business logic.

The analysis confirms the integration of Evans *et al.* (2017)' s theoretical foundations into developed sustainable business models. First, sustainable business models pursue mutual benefits for companies and customers without ignoring the positive effects for the natural environment and society. Indeed, customers installing GHP systems enjoy a decentralized and sustainable thermal energy supply at residential and commercial level associated with a reduction of energy costs, energy consumption and CO2 emissions. Second, the analyzed sustainable business models show an effective engagement of multiple stakeholders along the GHP's supply chain and institutional context (i.e. public authorities for permitting procedures) through stable and long-term relationships and beneficial results for all actors involved. Third, sustainable business models integrate a service-based business concept into their framework by providing not only a turnkey installation but also a real-time customer assistance and/or monitoring system to avoid malfunctions and associated environmental impact. Therefore, these business models promote a PSS able to fulfill customer needs through the combination of tangible products and intangible services according to sustainability principles. We thus argue that:

P1: The more innovative business models address mutual benefits for companies, customers, the natural environment, and society, the more likely they design and promote actions for integrating sustainability objectives in the companies' strategy.

P2: The more innovative business models establish long-term relationships and benefits for stakeholders along the supply chain and institutional context, the more likely they identify and address sustainability objectives in the companies' strategy.

P3: The more innovative business models assume a service-based business approach, the more likely they design and promote actions for integrating sustainability objectives in the companies' strategy.

Moreover, the analyzed business models promote the firms' great effort to support customers before and after the selling of GHP systems representing a sustainable innovation that might be difficult to communicate to customers even though it has several advantages in terms of enhancement of environmental performance and reduction of energy costs during its lifespan. Therefore, these business models communicate potential environmental benefits of GHP systems together with their technical effectiveness.

Sustainable business models are also characterized by their commitment to overcome the customers' potential resistance to GHP in terms of the management of technical-regulatory issues and relationship with all actors involved in the supply chain.

P4: The more sustainable business models can communicate environmental benefits of promoted sustainable innovations, the more likely sustainable innovations are promoted.

P5: The more sustainable business models tackle potential resistance to sustainable innovations, the more likely sustainable innovations are promoted.

As stated by Lüdeke-Freund (2020), these sustainable business models exert a supporting function between sustainable innovation and sustainable value creation thanks to their ability to overcome the existing barriers to adopt GHPs. The supporting role of the sustainable business model thus results from the firms' capabilities and knowledge to assess and analyze the peculiarities of a specific sustainable innovation (i.e. GHP systems). The presence of specific capabilities and knowledge associated with a selected sustainable innovation represents a competitive advantage for the analyzed firms and guarantees the business success of their own sustainable innovation through the development of a suitable business model. Moreover, these firms can design and implement specific growth strategies associated with sustainability principles. However, these firms as SMEs facing resource constraints prefer to operate in regional and interregional markets where they have a full control of the institutional

context and their supply chain (e.g. suppliers, partners, public authorities, etc.) and can avoid or reduce potential risks by guaranteeing a high quality installations and services. The choice of developing sustainable business models that operate in a niche market currently supports the success of selected sustainable innovation but can be a potential risk for its future growth and sustainable value creation. Therefore, business models should be transformed or renewed to trigger a long-term transition towards sustainable mass markets by taking into account the institutional context (Schaltegger *et al.*, 2016; Gasbarro *et al.*, 2017). In this regard, sustainable business models can benefit from a specific policy support. This leads to the following propositions:

P6: The more companies have capabilities and knowledge to analyze the peculiarities of sustainable innovation, the more likely sustainable business models play a supporting role between sustainable innovations and sustainable value creation.

P7: The more companies face resource constraints, the more likely sustainable business models support sustainable innovations in a niche market.

The study also provides some managerial implications. The empirical results suggest that companies who want to develop business models for boosting sustainable innovations should identify the peculiarities of selected sustainable innovations and tackle potential issues that can produce opposition to their adoption. Furthermore, companies should identify and potentially acquire internal and external capabilities to support an effective implementation of sustainable innovations without ignoring the availability of their resources. Thus, the findings of this study can support the implementation of promotion and communication actions in sectors characterized by unknown or less diffused technologies which require detailed information for persuading potential customers. Therefore, these above-mentioned activities provide companies with all the necessary components for designing and implementing effective strategies which strengthen competitive and growth opportunities associated with sustainable innovations. However, this process can be influenced by the size of companies. Indeed, SMEs should assess the external acquisition or internal development of capabilities by considering potential resource constraints. Another managerial implication regards the ability of companies to dialogue with policy makers to foster the implementation of effective policies to remove non-technical barriers to the implementation of sustainable measures and opportunities (i.e. renewable energy and energy efficient solutions).

There are some limitations to this study. First, the research is limited by the selection of Italian SMEs for analysis. The selected SMEs have implemented an effective and innovative sustainable business model in the juvenile market that has a high potential of development. Further studies might investigate the development of sustainable business models for fostering sustainable innovations in mature markets. Second, the study

investigates the development and implementation of innovative sustainable business model in SMEs. Future studies might focus on large companies to understand if sustainable business models assume a different configuration compared to SMEs. Third, the analysis focuses on the development of business models to exploit sustainable innovations but does not compare the development of business models to sustain traditional innovations. Further investigation might examine the dynamics between the development of business models for sustainable innovation and traditional ones.

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