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Sustainable innovation, business models and economic performance: an overview

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1. Introduction

During the last five years there has been an upsurge of interest in sustainable innovation and economic performance (Aghion et al., 2009; EC, 2010; Montalvo et al., 2011). There are several forces of historical relevance that contribute to this interest. First, the world is facing a significant number of long term challenges including climate change, population ageing, desertification, water scarcity, pollution, and critical raw materials scarcities (see Montalvo et al., 2006). Second, the international economic context has moved to a new, multi-polar era in which the rules of the competitive game are being reset. The policies that have traditionally ruled international competitiveness are rapidly changing. Leading economies and newcomers into global markets (e.g. Brazil, Russia, India, China, South Korea, etc.) have mastered not only the know-how for cost-driven competition (Contractor et al., 2010) but they have also become innovative in traditional and in selected high-tech sectors (Montobbio et al., 2010). Firms and regions seek to differentiate

themselves to become leaders in international trade via innovation and smart specialization (Foray, 2009). Third, in several advanced economies, governments can no longer rely on the electorate's confidence and legitimacy in policy agendas to ensure the societal welfare and employment after the 2007–08 economic meltdown. Boosting employment and demand in the context of national austerity plans are the norm in 2012 in the US, Europe and Japan. The financial crisis that started in 2008 has made it abundantly clear how short term-profitability mindsets and related strategies, policies and actions of individuals and individual firms can cause global economic, ecological and ethical crises. These events have contributed to the judgement that most firms operate on business models that are not sustainable.

In the policy discourse, there is a consensus that to find solutions to these challenges, we need to do things differently and that, to a large extent, the preferred mechanisms are the generation of new knowledge and innovation (See for example; European Commission, 2009; European Commission, 2010; OECD, 2011). Future competitiveness is no longer defined as the struggle to remain competitive in current markets, but primarily as the creation of new markets, underpinned by innovation (Montalvo et al., 2011). In the case of sustainability challenges the notion of innovation – in particular, sustainable innovation connected to new

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business models – is often positioned to be a win–win situation (Porter and Kramer, 2011). Consequently, interest in sustainable innovation is rapidly increasing. This is in part a consequence of the number of un-sustainability issues being so large and pervasive across the world that the idea of transforming challenges into business opportunities and new markets has sparked fundamental interest in the business community. The interest is becoming clear from the large increase of capital flowing into sustainable innovations. For example, *Ethical Markets Media* (2011) reported \$2.4 trillion cumulative worldwide investment in eco-innovation during the period 2007–2011, while the expected cumulative investment by the year 2020 was estimated at \$10 trillion (Montalvo et al., 2011). Coincidentally, sustainable innovations are creating new global markets, allowing smart specialization of some regions and giving governments politically comfortable long-term horizons for policy action.

It is not necessary to fully agree with these assessments, and the underlying assumption that economic growth is a requirement, to agree that we currently lack sufficient theoretical and practical knowledge to move towards sustainable systems of production and consumption. While there is a considerable amount of knowledge on what drives sustainable innovation at the firm level,¹ we know less about how sustainable innovations can be realized and how win–win business situations can be created for those involved while actually enabling sustainability at the level of production and consumption systems. The concept of sustainable business models can provide a link between the firm and the system level. This insight is receiving increasing attention from researchers, policy-makers and business managers alike (OECD, 2012).

With this Special Issue (SI) of the *Journal of Cleaner Production* (JCLP) the editors have sought to further the understanding of sustainable business models beyond the aim of gaining a ‘license to operate’. In our view, sustainable business models provide the conceptual link between sustainable innovation and economic performance at higher system levels (Boons and Wagner, 2009). This starting point led to a varied range of papers of which early drafts were presented and discussed in a special track at the European Roundtable on Sustainable Consumption & Production in October 2010 in Delft (Wever et al., 2010). The selected papers are published in this SI.

In the remainder of this introduction to this SI we provide a conceptual framework for researching the link between sustainable business models, innovation, and competitiveness. We begin with definitional issues of sustainable innovations and business models (Section 2) and then outline how sustainable business models can be connected to innovation research (Section 3). We then present how the link between business models and sustainable innovation serves to bring the macro level of systemic innovation into focus (Section 4). This leads to a discussion on how sustainable innovation links to competitiveness at different systemic levels (Section 5). The SI is concluded with an overview of the individual contributions (Section 6) and conclusions and recommendations (section 7).

2. Sustainable production and consumption through innovation

While the term sustainable innovation has been widely used during the last decade, the number of definitions in the academic literature is limited. The review by Carrillo-Hermosilla et al. (2010)

lists innovation definitions that focus on ecological sustainability, such as eco-innovation and environmental innovation. For instance, Carrillo-Hermosilla et al. (2010: 1075) introduced their own definition of eco-innovation: “... innovation that improves environmental performance”.

The European Commission (EC, 2008) defined eco-innovation as, “the production, assimilation or exploitation of a novelty in products, production processes, services or in management and business methods, which aims, throughout its lifecycle, to prevent or substantially reduce environmental risk, pollution and other negative impacts of resource use (including energy)”. Interestingly, elsewhere, the European Commission linked eco-innovation to sustainability and stated (EC, 2007): “Eco-innovation is any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy”.

Building on the concise definition of eco-innovation by Carrillo-Hermosilla et al. (2010), sustainable innovation could be defined as “innovation that improves sustainability performance”, where such performance includes ecological, economic, and social criteria. As such criteria differ as a result of spatial, temporal and cultural embeddedness, sustainable innovation will have different meanings and characteristics in different contexts. Thus, as a result of different sustainability challenges, a clear distinction can be made between developed consumerist economies, emerging economies (e.g. Brazil, China, India) and so-called Base-Of-the-Pyramid economies (many countries in Africa) (Tukker et al., 2008; Hart and Milstein, 1999).

The innovations required for sustainable development need to move beyond incremental adjustments. Sustainable development requires the transformation of larger parts of production and consumption systems (Boons, 2009). Incremental (product- and process-related) innovations in existing production and consumption systems may lead to further gradual improvements of sustainability performance, but in the end, incremental innovation frequently does not lead to a globally optimal system configuration in a multi-dimensional production and consumption system space (Wagner, 2012; Larson, 2000; Frenken et al., 2007; Schaltegger and Wagner, 2011).

Several typologies from the literature on innovation are relevant to characterize innovations beyond incremental improvements. Beyond the basic differences between radical and incremental innovation (Arrow, 1962; Henderson and Clark, 1990), we can distinguish types of innovations in terms of the object of change; this may be a product, process, or service (e.g. chemical substance). Innovations also involve the organization of production and consumption at the organizational, sectoral, and business systems level. This includes function-oriented innovation such as a shift from ownership to fee-based shared usage (Afuah, 1998; Truffer, 2003; Kirschten, 2005; Tukker and Tischner, 2006). Furthermore, the product innovation literature increasingly distinguishes so-called discrete and complex product architectures because the appropriation of profits from innovation differs between these two types with implications especially for business model choices (Hall and Vredenburg, 2003; Davies and Brady, 2000). In the literature on innovation, the label *architectural* refers to a change in the way in which sets of product components are inter-connected. Thus, an architectural innovation involves a changed linkage between unchanged components. This means that as larger parts of socio-technical systems are involved in the innovation, the ‘systemness’ of the effort will be larger: protagonists of the innovation will then have to engage with the larger system in order to be successful, which may eventually lead to system innovations or transitions (e.g. Elzen et al., 2004; Grin et al., 2010). We further develop this point in Section 4.

¹ For reviews on this issue, see Montalvo and Kemp (2008) Special Issue on Diffusion of Cleaner Technologies in the JCLP, Vol 16, Supplement 1, and OECD (2011).

The radicalness of an innovation is also important. Whereas Kleinknecht (1999) distinguished between novel to the firm, to the industry, to the country or to the world as a measure to map novelty and radicality, Markides and Geroski (2005) defined radical innovations as those that are characterized by creating new-to-the-world markets that are disruptive for both customers and manufacturers. They also argued that, because such innovations are commonly the result of an effort of a larger number of distributed R&D organizations and scientists, they are unlikely to have strong lead users or firm-internal champions to promote them. Because of this they often initially target small niche markets that are unattractive for larger firms. However, lead-users can be essential too, as can be learned from car-sharing (e.g. Truffer, 2003), organic foods and eco-housing (Smith, 2007) and from the work by Von Hippel (1994). In addition, when it concerns marketing or business model innovations like for instance the Bodyshop or Ben & Jerry's, these niche firms can be taken over by large firms that want to extend the range of customers they serve. Interestingly, niches of sustainable innovations can also trigger the adoption of more sustainable innovations and practices in mainstream markets like Smith (2007) has shown for organic foods and eco-housing in the UK. Radicalness has specific implications in terms of the actors involved (incumbent firms or new entrants), as well as the need to build up new markets. For example, Henderson and Clark (1990) have shown that larger incumbents do not perform well when innovation is architectural. In his seminal work, Christensen (2003) showed how, in the hard-disk industry, disruptive innovation often affects incumbents who are not open enough for more fundamental technological changes.

Given the challenges posed by sustainable development, sustainable innovation will often be characterized by systemness and radicalness. Generally, sustainable innovations go beyond regular product and process innovations and are future-oriented (Charter et al., 2008). Obviously, sustainable innovation goes beyond eco-innovation because it includes social objectives and is more clearly linked to the holistic and long-term process of sustainable development for the short- and long-term objectives of sustainability. The following definition captures the essence of sustainable innovation as we see it (Charter et al., 2008; Charter and Clark, 2007): "Sustainable innovation is a process where sustainability considerations (environmental, social, and financial) are integrated into company systems from idea generation through to research and development (R&D) and commercialization. This applies to products, services and technologies, as well as to new business and organizational models".

The inclusion of business models is crucial in this definition. Both radicalness and systemness raise important barriers for firms that envision sustainable innovations. Rather than dealing with the production process or product component over which they have full control, they engage with the larger system of which they are a part. As is argued in Section 3 of this paper, the business model concept provides a means for doing that.

3. Linking sustainable innovations to business models

Much of the literature on sustainable innovation deals with developing products and services with a considerably improved sustainability performance: intra-firm issues of design and motivational forces for engaging with sustainable innovation have been central. In addition, there is a large literature that deals with the analysis and management of system transitions. Here the focus is on changing whole systems, and the role of individual firms is not adequately addressed. Our proposition is that sustainable business models have the potential to bridge the gap between radical and systemic sustainable innovation and firm strategies, including the

issue of economic performance at several levels, which is elaborated upon in Section 5.

The concept of a business model captures the fact that for a firm to be successful, it needs to combine several elements into a coherent mix. At a minimum, these elements include (i) the value proposition, (ii) the configuration of value creation, which includes the way in which the firm links to suppliers and customers, and (iii) the revenue model, that is, how costs and benefits are divided over economic actors in the system (Boons and Leudeke-Freund, 2013).

The concept of business model became popular in the 1990s, largely because of the rise of internet-businesses that seemed to defy existing business logic, for instance through providing 'free' services to customers. At that time the business model concept was used to describe how new kinds of businesses, such as on-line content providers, or web services that provided a platform for market exchanges among autonomous buyers and sellers such as eBay, could survive and thrive.

Business models were related to sustainable innovation and sustainable development in two different ways in the late 1990s. First, as Boons and Leudeke-Freund (2013) review in a more detailed way in this SI, at a conceptual and foundational level the need to change existing business models was related to the concept of natural capitalism (Hawken et al., 1999) and to the mechanism of creative destruction of existing industries for sustainability (Hart and Milstein, 1999). Second, alternative business models were key to the so-called product to service switch that employs leasing and hiring as useful service concepts for dematerialization and energy services thinking (e.g. Okkonen and Suhonen, 2010; Tukker and Tischner, 2006). Recently, business models have become important in electric mobility (e.g. Kley et al., 2011), where different kinds of leasing have been proposed to reduce the battery cost to end-users. The product-to-service switch has been a focus in the attempts of the design community to move beyond ecodesign. Similarly, the switch to services has also become important in the energy sector, where awareness has grown that consumers seek energy services rather than energy as a product. A distinction can be made between use-oriented and result-oriented services (Tukker and Tischner, 2006). However, despite a focus on applying different business models by authors such as Tukker and Tischner (2006), Wüstenhagen and Boehnke (2008), Kley et al. (2011), and Okkonen and Suhonen (2010), a conceptual exploration of sustainable business models is relatively new.

Boons and Leudeke-Freund (2013) provide an extensive survey of the business model literature and connect it to sustainable innovation.

Through its core components, the business model concept highlights three aspects that are vital for sustainable innovation:

- a) The value proposition makes it explicit that the relationship between the firm and its customers is not built around a specific product or even a specific service, but rather by the exchange of value. What is deemed valuable is often taken for granted, but it can be questioned and redefined. Taking stock of, or developing, a business model requires that the value that is exchanged should be critically assessed. For sustainability, this has the advantage that the balance between economic, social and ecological value comes into focus. Also, it calls for a look at the needs that are articulated by consumers, i.e. the function that is fulfilled by the products and services offered by producers. Both needs and functions can be seen as fundamental categories to assess in an analysis of sustainability.
- b) The configuration of value creation directly points towards the larger system of which the firm is part, both technically and socially. It makes it clear that the activities of the firm are

embedded in the larger system. Essential parts of this larger system are the customer interface and the supply chain.

- c) The distribution of costs and benefits points towards the requirement that all actors involved need to have a sound balance of costs and rewards. It therefore provides concreteness to the value definition mentioned under a), especially in terms of distribution across involved actors and communities.

4. Including the macro level: innovations system, socio-technical systems and transition management

As indicated above, conceptualizing sustainable innovation in terms of business models links the activities of firms to the larger systems of which they are part. For this, we can build on a rich literature in the analysis and management of innovation, more specifically, contributions dealing with: (i) innovation systems, and (ii) socio-technical systems and transition management. The analysis builds partially on the comparative analysis of innovation systems and socio-technical systems (Coenen and Díaz López, 2010; Jacobsson and Bergek, 2011) and on the discussion by Van den Bergh et al. (2011) who relate environmental innovation to societal transitions.

A systemic approach to innovation emphasizes the role of actors, networks and institutions; innovation systems are seen as knowledge or technology producing systems. In the innovation system approach, firms are key actors that use knowledge and technologies to develop competitive products and services, and introduce them to the market (e.g. Malerba, 2002; Coenen and Díaz López, 2010; Hekkert et al., 2007). However, the approach also acknowledges the way in which firms are connected through networks to other actors like research actors, the government, actors providing funding, and intermediaries that transfer knowledge and connect actors. Different varieties of the innovation system concept have been proposed of which the sectoral innovation system (Malerba, 2002) and the technological innovation system (Hekkert et al., 2007; Bergek et al., 2008) are the most relevant for this SI. In the sectoral innovation systems approach, the emphasis is on innovation as a source of competitiveness to firms and industries (Malerba, 2002). The contribution of research actors is to provide knowledge for incremental innovation, as well as for next generation of radical and architectural innovations. In many industries this includes R&D on 'green(er)' technologies (for an example, see Iles and Martin, 2013). However, establishing sustainable innovation as the standard and the normal way of doing innovation in specific industries requires greening knowledge production and greening sectoral innovation systems, and could, in a more fruitfully way, be approached as a transition as discussed in the following paragraph.

In the technological innovation system approach, the emphasis has been on constraints and enablers of successfully developing sustainable technologies, in particular renewable energy technologies, and diffusing them into society. This kind of innovation system research has pointed to the relevance of consistent government support. For instance, in the Netherlands, inconsistency in policies and policy making have strongly constrained the development of renewable energy industries, whereas in Germany the feed-in tariff has strongly stimulated the emergence and growth of a range of renewable energy technology industries. Comparative analyses of innovation systems in different countries can reveal good practices. For instance, Kamp (2008) showed that the development of the wind energy innovation systems in Denmark was more successful than in the Netherlands because of better firm facilitation of the Danish government and better interaction and learning among a larger range of relevant actors in the innovation system.

Conceived of as the guided change of socio-technical systems towards sustainability, sustainability transitions and system innovations is a rapidly growing field having both an analytical and an action-oriented branch (e.g. Rotmans et al., 2001; Grin et al., 2010; Geels, 2005; Foxon and Pearson, 2008; Van den Bergh et al., 2011). It focuses on (i) making societal domains like mobility, industrial sectors or regions sustainable in the long run and (ii) on the study of past transitions (e.g. Geels, 2005; Grin et al., 2010). Transition research assumes that system innovations and transitions start in niches or innovation systems and that under preferable conditions, niche actors are capable of becoming mainstream suppliers serving mainstream markets (e.g. Van den Bergh et al., 2011). Whereas, originally the focus was on technically radical innovations in demonstration or market niches, the focus is being broadened to consumer niches (e.g. vegetarians) and niches employing new business models (e.g. car sharing and other services). While research of past transitions has shown that innovative firms have been crucial, the issue of how firms can contribute significantly to bringing about these transitions has received too little attention, especially in relation to business models (see Loorbach and Wijsman, 2013). One way of making the connection to firm's strategies is through long-term foresight and visioning exercises not only at the level of firms (e.g. The Natural Step methodology (Holmberg, 1998; Nattras and Altomare, 1999)) or the methodology by Gaziulusoy et al. (2013), but also at the level of a certain societal domain, socio-technical system or industry by means of transition management (e.g. Rotmans et al., 2001; Loorbach and Wijsman, 2013) or backcasting (e.g. Vergragt and Quist, 2011; Quist et al., 2011; Weaver et al., 2000). For instance, Giurco et al. (2011) show possible futures for the Latrobe region in Australia for the incumbent coal mining industry, distinguishing between coal-driven and sustainable biomass-based futures and envision possible implications and challenges for the current coal-dominated industries.

5. The link of competitiveness to sustainable innovation at different levels

As indicated in the introduction, the policy discourse is focused on using sustainable innovation in seeking to arrive at 'win-win' situations where economic performance and sustainable development are advanced simultaneously. This formulation assumes that sustainability, which includes an economic component, must be confronted with ecologically and socially sustainable performance. In our view, this is problematic as sustainability is about balancing all three sets of criteria, not two against one. In doing so, it is important to consider the level at which the balance is struck. Much of the literature on this topic fails to do so, and conflates economic/financial performance and competitiveness at the firm, sector, or country level (Boons and Wagner, 2009).

Competitiveness is an attractive term, as it provides an assessment of the success of firms relative to competing firms. The link between sustainable innovation and competitiveness dates back to the early work on environmental regulation and competitiveness whereby it was hypothesized that regulation negatively affected the cost structure of firms, making them less competitive (for a comprehensive review see SQW, 2006). However, in an early phase the counter hypothesis was advanced that green and environment could also be a source of competitiveness to firms (Porter and Van der Linde, 1995a, 1995b). By now the majority of empirical research has shown that the role of regulation on innovation and competitiveness at the firm level is positive (Wagner, 2006; Wagner and Llerena, 2011; Montalvo, 2012). The literature dealing with issues of (mainly ecological) sustainability reports effects at the firm level but has largely neglected the spillover effects that environmental policies and

regulations have had in national economies through the creation of new economic sectors. For instance, Lund (2009) showed positive effects of renewable energy policy and regulation on industry expansion in several European countries. As stated in the introduction, the eco-innovation market is forecasted to reach ten trillion Euros by 2020. Currently, the attention and debate have shifted towards how firms can create and add value (environmental and monetary) to their products and services through innovation (EC, 2010; Porter and Kramer, 2011). Countries are promoting policies that enable their firms to compete for leadership in these new markets where sustainable innovation plays a key role as a strong enabler and multiplier of sustainable economic development.

The competitiveness of nations is generally assessed in terms of the capability to maintain a position of surplus in the international trade balance (Ezeala-Harrison, 2005). For decades it was known that innovation plays a role in the international competitiveness of nations (Freeman, 1987, 2004). Other factors have been found to be important for industrial organizations that deal with international competitiveness. For example, the now classic work of Porter (1990) argued that conditions (skilled labour, infrastructure, and raw materials), domestic market demand, industrial organization and structure, and firm strategy, structure and level of competition were determinants of the performance of nations, though he later also emphasized the relevance of clusters and sectors. Zanakis and Becerra-Fernandez (2005) and Ezeala-Harrison (2005) maintain that competitiveness is related to R&D investment levels, productivity trends, trade balance, level of education of the labour force, etc., while Hämäläinen (2003) empirically tested for national competitiveness based on seven interrelated factors. These factors were resources, technologies, organizational efficiency, product market characteristics, external business activities, institutional framework and government activities. Several of the characteristics enabling competitiveness are the same or have great resemblance with the factors that drive systems of innovation as stated in the previous section.

The link of international competitiveness to sustainable business models resides in two key actors in the innovation system that drives many of the competitiveness factors. These two actors are entrepreneurs and governments seeking to establish markets for sustainable innovations that start at the national level but seek diffusion to the global level. Thus, competitiveness is dependent on the ability of governments to design and implement appropriate policies and framework conditions to support entrepreneurs to implement new sustainable business models with new technologies and services.

Recent studies indicate that a few leading countries/regions (US, Europe, Japan) are currently well positioned in the world markets, and these countries are responsible for a large proportion of the global environmental technologies market (Henzelmann et al., 2007; OECD, 2011; Montalvo et al., 2011). Given the realities of technological accumulation and path dependencies, countries that invested earlier in sustainable innovations are likely to remain strong in the medium term. It is uncertain what will be the evolution of international competitiveness in the long term. This is because other regions of the world already have policies in place to further develop their own long-term innovation strategies to underpin what is called new green growth (in many cases the green economy) (see OECD, 2010).²

What is common to all the strategies in OECD countries is that they are underpinned by the belief that innovation implies

improved competitiveness and growth and that sustainable innovation will play a major role. There is agreement that without innovation there will be no sustainability (Aghion et al., 2009; EC, 2010). As stated in the previous section, there is much literature on the necessary conditions for transitions towards sustainability to occur but less on analyses that bring the debate to the areas of policy that have significant influence on technical change (e.g. industrial and innovation policies).

6. Papers in the special issue

This special issue starts with two conceptual papers. The paper by Boons and Lüdeke-Freund (2013) builds on a literature review of the concepts of business models and sustainable innovation to provide a conceptual framework and a research agenda. They propose to use the concept of business models as a framework to focus the research on sustainable innovation. The analysis of business models involves assessing the way in which a firm combines a value proposition with supply chain management, the interface with customers, and a revenue model. Based on that definition, successful sustainable innovations can be analyzed in terms of how they succeed in linking these elements. Also, they define a sustainable business model in terms of specific characteristics of each of these elements. As a result, research on sustainable innovation becomes more focused on the coevolutionary process in which technologies, social practices and institutions change towards sustainability. The paper by Loorbach and Wijsman (2013) develops a firm-oriented conceptual framework that built on the transition perspective on system-wide sustainable innovations. As the latter perspective has been criticized for its lack of attention towards individual firms and corporate strategies, this paper covers new ground in showing how firms can connect their business models to a process of transition within a larger system.

Subsequently, there are three papers that provide insight into the process by which firms develop sustainable business models. The paper by Karadzic et al. (2013) analyzes fishing cooperative in a process of change due to a crisis in the social-ecological system of which it is a part. By approaching the business model concept from the perspective of resilience and organizational adaptivity, this study provides insight into the way in which an organization may develop the ability to be more adaptive to the ecological system on which it depends. Framed in such a way, this leads the researchers to question the way in which adaptability is a necessary quality of a sustainable business model. The paper by Iles and Martin (2013) shows how a new product such as *bioplastics*, requires the building of new markets, even if their product promises reduced costs, increased yields, and better feedstock supplies. Business models serve to provide a linkage between producer and customer, and for a new range of products with a claim for sustainability, firms need to have dynamic capabilities to make their business model function effectively. A critical aspect is that of developing a shared definition of what the sustainability value of the new model is comprised. This definition of value (Boons and Mendoza, 2010) needs to be embedded into wider systems of accountability to make *bioplastics* a success. Their paper makes it clear that a business model needs to be actively constructed by the firm, and also indicates that in order to be successful, it is essential that various stakeholders are actively included in its shaping. Their paper also shows that major chemical companies consider *bioplastics* as a niche market that needs to mature and may remain in a niche market; it is not yet seen as creative destruction of their main business of fossil fuel-based plastics. As a consequence the case also shows that green chemistry and *bioplastics* only receive a minor share of the R&D budget. Their paper is complemented by that of Keskin et al. (2013), who

² For example, China currently is the largest producer of solar panels in the world (Clark and Cook, 2011).

analyze the process through which a number of new ventures sought to establish themselves on the market, each of which was specifically aimed to provide a sustainable product or service. While the former paper analyze the way in which incumbent firms give shape to a more sustainable business model, this paper provides insight into the way in which this process unfolds for new entrepreneurs.

One of the recurring issues in these papers is the importance of involving stakeholders in developing a new business model. The paper by [Matos and Silvestre \(2013\)](#) turns that relationship around by analyzing the way in which conflicting stakeholder interests provide an incentive for developing new business models in the Brazilian energy sector. They analyze two cases from the energy sector, the national oil company Petrobras and their attempts to develop biodiesel, and the national electrical utility Eletrobras and their attempts to provide electricity to impoverished communities. They show not only that new business models are needed, but also that it required the companies to shift stakeholders from single objectives to multiple objectives in order to make each of the cases successful. Moreover, the two cases also document the essentiality of government funding and point to the issue of making cases economically viable, due to poor bill payment discipline in impoverished communities.

The two papers that follow deal specifically with a business model that has, for several years, been heralded as a sustainable alternative to the sale of products, namely product service systems (PSS). The paper by [Ceschin \(2013\)](#) analyze the process through which six firms introduced such business models into the market. The analysis of these cases uncovers four relevant factors that are then translated into recommendations for making a successful market introduction: implementation of socio-technical experiments; establishment of a broad network of actors, building up of a shared project vision; creation of room for broad and reflexive learning processes. The researcher finds that the introduction of a sustainable business model requires a systemic perspective on marketing, which includes other parties in the learning process. The paper by [Anttonen et al. \(2013\)](#), empirically examines the reasons of the limited diffusion of innovative eco-efficient services in the Finnish market. While this is partially a matter of limited offering of such business models, the authors choose to focus on the demand side. More specifically, they analyze cross-sectoral data on potential customers in B2B relations about their reasons for (not) using specific eco-efficient services. Their results point to a partial mismatch between the firms offering such services and the hoped-for customers. The mismatch has to do with the service itself as well as with the information that is necessary for the potential customers to make an informed choice. Additionally, their findings reveal that the market for eco efficient services, even though it is geared towards sustainability, is characterized by phenomena that are universal for economic transactions, including the need for competitive pricing and considerations of dependency.

This SI is concluded with a paper by [Gaziulusoy et al. \(2013\)](#) who propose a scenario method through which firms can develop the more transformative strategies that are required for bringing about the transitions in our production and consumption systems required on the long-term. The method enables firms to combine long-term vision development with product development strategies on the short term, which has relevance for both product and business model development of firms that are involved in transitions like the ones to renewable energy or electrical mobility.

7. Conclusions

In this introductory paper the editorial team of this SI explored the relationships of sustainable innovation, sustainable business

models, strategy and competitiveness. We emphasized that the research topic of sustainable innovation necessarily builds on accepted, but evolving, distinctions made in the general study of innovation. The typology of radical and incremental innovation remains important, just as the work on system innovations and innovation systems highlights the embeddedness of the innovation processes of firms in their wider socio-economic context. This is especially relevant if the link between sustainable innovation and economic performance is addressed. In that respect, it is important to be sensitive to the fact that sustainable innovation has different meanings in different contexts like consumer economies, emerging economies, and base-of-the pyramid economies. We view the concept of business models as an important tool for researchers as well as for practitioners to understand and to make progress on sustainable innovation. Several papers in this SI document this potential. We believe that together, they provide a valuable stepping-stone towards deeper understanding and practice of the development and marketing of sustainable products and services.

The papers and the scope of this SI do not directly challenge the current economic logic, which remains focused on growth and at its best green growth. Rather, the papers take the current situation as the starting point and see how things evolve from there. However, the material provided can be fruitfully connected to the current debate on degrowth ([Schneider et al., 2010](#)). Any significant alteration of the dominant economic logic involves, or maybe even necessarily starts from, the application of new business models by social actors seeking to promote more sustainable ideas, which may also lead to different types of sustainable innovations and different innovation practices, like for instance argued by [Jackson \(2009\)](#) in his book entitled 'Prosperity Without Growth'. If our wellbeing is served by leaving the path of economic growth, then each of the dimensions of business models as identified above need to be altered: value propositions need to reflect the true needs of citizens, and the distribution of revenues needs to be defined in categories other than purely economic ones. This will also require that the way through which firms connect to each other and wider society require a fundamental change.

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