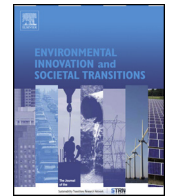




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## Mainstreaming solar: Stretching the regulatory regime through business model innovation

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### ABSTRACT

This paper explores how the regulatory regime for Solar PV, defined as a combination of niche shielding and mainstream regulations, affects niche business models, using the Dutch and Flemish regulatory regimes as examples. The regulatory regime does not influence all components of the business model: only one or two components are usually affected. The level of niche shielding influences the dominant niche empowerment strategy. We also identified substantial heterogeneity in fit-and-conform and stretch-and-transform empowerment strategies for dealing with the regulatory regime. These strategies are reflected in business models, and differ in terms of temporal focus, motivation and shielding characteristics targeted. Finally, we show that business model innovation, sometimes in combination with technological innovation, can be used for stretching the regulatory regime. Organizational components of the business model are usually redesigned for this purpose.

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## 1. Introduction

New, radically different technologies like solar PV require protected spaces or *niches* to shield them from mainstream selection pressures that are too strict to allow them to be competitive (Geels and Schot, 2010; Kemp et al., 1998; Smith and Raven, 2012). Within niches, the new technology can develop, scale-up, and eventually alter the status-quo. Driven by governmental R&D support, solar PV found its first niche application in space (Oliver and Jackson, 1999). Later, terrestrial applications substituting high-cost competitors followed, including remote industrial applications and telecommunications.

After the 1990s, governmental support shifted from R&D to market building, with governments implementing investment and generation-based subsidy schemes, and quota obligations (Haas et al., 2011; Mormann, 2012). This new wave of financial support provided opportunities for niche entrepreneurs, who started to develop new business models for PV, resulting in fast growing markets (Dewald and Truffer, 2011; Hinnells and O'Neil, 2012; Huijben and Verbong, 2013). Such business models can be considered as vehicles for bringing new technologies to the market and as a form of niche innovation (Bidmon and Knab, 2014; Björkdahl, 2009; Boons and Lüdeke-Freund, 2013; Chesbrough and Roosenbloom, 2002). Research-wise, a business model represents a separate unit of analysis (McGrath, 2010; Zott et al., 2011).

Researchers agree that the formal institutional context has a substantial impact on innovation in general and entrepreneurial activity and business models in the niche (Al-Saleh and Mahroum, 2014; Autio et al., 2014; Blind, 2012;

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Eckhardt and Shane, 2003; Hess, 2013; Hinnells and O'Neil, 2012; Huijben and Verbong, 2013; Palm, 2015; Provance et al., 2011). However, how business models are precisely affected by governmental policy is still to be investigated. We therefore follow the recent call by Greenwood et al. (2014) for a renewed appraisal of the effect of institutional settings on organizational forms. Additionally, we answer to a recent request from Strupeit and Palm (2015) for research on the influence of the political context on solar PV business models.

Formal institutions often have governmental origins and define the rules of the game (Scott, 2008). Just like regime incumbents, niche entrepreneurs have to deal with a set of mainstream regulations, including building, financial and electricity regulations. The level of niche shielding, i.e. the amount of financial support, determines the economic competitiveness of new technologies by protecting them from the above-mentioned mainstream pressures and creating space for business model to be developed (Geels and Schot, 2010; Kemp et al., 1998; Smith and Raven, 2012)<sup>1</sup>. Governments also set regulations regarding niche shielding instruments and as such they “shape the room for a niche to develop in” (Hermans et al., 2013, p. 622). It is this set of particular niche shielding instruments and their related regulations that is unique to the niche. Below, we refer to the set of mainstream regulations and niche shielding instruments as the *regulatory regime*, setting the boundaries of the *business model design space*, which encompasses all the legal business model design options available to niche entrepreneurs.

There is also a variation in strategies for dealing with the regulatory regime within the niches. Firstly, niche entrepreneurs can *fit and conform* with the opportunities the regulatory regime provides, while dealing with its limitations (Smith and Raven, 2012). Secondly, niche entrepreneurs also try to alter the regulatory regime in their favor (*stretch and transform*), either individually or collectively (Janssen and Moors, 2013; Hoogma, 2002; Pinkse and Groot, 2015; Smith and Raven, 2012; Thompson et al., 2014). Due to these profound differences, niche entrepreneurs are also likely to take a different approach to business models. In this paper we consider niche business models as a “reflection of the firms realized strategy” and a specific locus of scientific inquiry for theory building and empirical investigation (Baden-Fuller and Morgan, 2010; Casadesus-Masanell and Ricart, 2010, p. 195). By studying the different types of business models employed in the niche we can reveal different niche empowerment strategies for dealing with the regulatory regime. We thereby contribute to a recent call by Raven et al. (2015) for more research on the mechanisms behind niche empowerment. Our potential contributions to the transition studies and business model literature are as follows: First, we link niche-level empowerment strategy to business models by exploring the potential heterogeneity of the empowerment approaches within the same niche. Second, we challenge the assumption that governmental policies affect the entire business model, by showing how the regulatory regime affects business models differentially, at individual component level. Third, we explore the extent to which business model innovation can be used as a distinct means for stretching the niche business model design space.

In this study we employed embedded case study design by incorporating both the country (i.e., regulatory regime) and business model level of analysis (Eisenhardt, 1989). We researched cases of solar PV business models in two countries: the Netherlands and Belgium, focusing on the Flanders region in the latter to limit the variation in language and the associated cultural variations. Though geographically close, both countries differed highly in terms of niche shielding instruments in place over time, resulting in distinct market growth patterns (Audenaert et al., 2010; Beliën et al., 2013; Huijben and Verbong, 2013). The data collection is based on 16 semi-structured interviews with national experts and managers from PV companies in both countries, complemented by field observations during knowledge-sharing meetings, as well as extensive secondary data such as national sector reports, newspaper articles, and websites.

In the following section we first provide the theoretical framework for this paper consisting of insights from both transition studies and business model literature. We then discuss the effect of regulatory regimes on business models, at the business model type and the individual component level. We continue with an overview of entrepreneurial empowerment strategies for dealing with regulatory regimes, and their effect on business models. After a discussion section, we end with our main conclusions and managerial and policy recommendations.

## 2. Theoretical background

From the 1980s onward, company strategies for dealing with regulatory regimes have gained wide attention in both the scientific community as well as from practitioners (Beardsley et al., 2005; KPMG, 2012; Lichtenberg, 1991; Martin and Rice, 2014; Shaffer, 1995; Tan, 1996; Wesseling et al., 2014; Wilson et al., 2011). Innovative, breakthrough technologies are likely to change the mainstream environment, consisting of various dimensions such as existing infrastructures, user preferences or cultural meaning (Geels and Schot, 2010; Kemp et al., 1998; Smith and Raven, 2012). They start their development in niches, which represent protective spaces for development of such technologies and which operate within a unique set of regulations (Herman et al., 2013; Huijben and Verbong, 2013). Transition studies distinguish between the mainstream environment and niches as part of the regulatory regime affecting the niche innovations. Below we build on a recent discussion on the creation, development and up-scaling patterns of niches, focusing on the processes of niche shielding and empowerment of niches (see e.g., Smith and Raven 2012; Smith et al., 2014; Raven et al., 2015), and relate this to the interplay between the regulatory regime and the development of business models within the niche. Other broader processes in the niche, such as niche

<sup>1</sup> The economic competitiveness of renewable technologies also depends on governmental support for fossil technologies. For example, in the Netherlands, fossil energy received about four times as much financial support as renewable energy in 2010 (Delft and Ecofys, 2011).

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