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The institutional evolution process of the global solar industry: The role of public and private actors in creating institutional shifts

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ABSTRACT

This study takes an institutional perspective on industry creation, which argues that an industry's maturation relies on a process of building legitimacy and establishing rules for competition. It addresses the institutional evolution process that an industry experiences, in which existing rules for competition are disrupted and replaced by new regulatory frameworks, technological standards, and business models. These interruptions are referred to as institutional shifts. The study seeks to understand the role of specific actors in creating institutional shifts that drive an industry's institutional evolution process. Based on a study of the global solar industry over the period of 1982–2012, the findings suggest that the industry's institutional evolution was driven by an interplay of different public and private actors that influenced one another over time and across national borders. To create institutional shifts, companies employed a mechanism based on knowledge diffusion, while governments used a stimuli-based mechanism instead.

1. Introduction

The creation of an industry around a new technology is a non-linear and unpredictable process. A common explanation of industry creation is that technological change determines how an industry develops over time (Utterback and Suarez, 1993). Due to technological discontinuities, for example, industries can witness unexpected turns in their development (Tushman and Anderson, 1986). This study, however, focuses on the influence of institutional change on an industry's maturation by drawing attention to the ways in which different actors build legitimacy for a technology and establish the rules for competition (Aldrich and Fiol, 1994). In such an institutional evolution process, changes in regulatory frameworks, technological standards, and business models lead to new rules for competition in an industry. The process involves various public and private actors with diverging interests. While the actors involved will have a collective interest to build legitimacy for novel activities; they will be in a competitive struggle as well in an attempt to shape the rules for competition to their own advantage (Pinkse and Groot, 2015).

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This competitive struggle results in an institutional evolution process that either enhances or destroys the position of companies that emerged as key actors in previous stages of the process. We seek to capture the interruptions in an industry's institutional evolution with the concept of *institutional shift* (cf. Hoffman, 1999), which we define as the moment when an industry's existing rules for competition are changed as a consequence of new regulatory frameworks, technological standards, and business models (Battilana et al., 2009; Garud et al., 2002). In contrast to the more common focus in the innovation literature on the role of technological change in industry creation (Tushman and Anderson, 1986), we focus on the associated changes in an industry's institutional foundation instead. A key attribute of an institutional shift is that it can at the same time enhance the development of the industry as a whole, but destroy the competitive position of a specific sub-set of the industry. We are particularly interested in the impact different actors have as institutional entrepreneurs (DiMaggio, 1988), who have been defined as 'change agents who, whether or not they initially intended to change their institutional environment, initiate, and actively participate in the implementation of changes that diverge from existing institutions" (Battilana et al., 2009: 70). In creating change, institutional entrepreneurs might enhance the maturity of an industry, but destroy the position of specific other actors within it. Moreover, since actors driving the creation of a global industry tend to be dispersed geographically, the industry's institutional evolution has a spatial dimension to it; a dimension this study pays specific attention to.

To empirically investigate the role of specific actors in creating shifts that drive an industry's institutional evolution process, the study focuses on the emerging global solar industry. We chose this industry because it has seen the involvement of both public and private actors over time and has gone through several different stages of institutional change (Jacobsson and Lauber, 2006). In each stage the rules for competition changed considerably by instigation of different actors (Jones and Bouamane, 2012). Government policy has been an important driver, increasing the scale of solar PV production as well as making it more cost competitive (Lund, 2009). Concomitantly, companies from various different industries have affected the industry's creation (Jones and Bouamane, 2012). Institutional entrepreneurship has been of particular importance for the solar industry, because it developed within the context of a larger energy industry of established actors with firmly institutionalized patterns with regard to energy production and consumption (Garud et al., 2002; Jacobsson and Bergek, 2004). What has made the evolution of the industry also complex is its international character; not only has it involved multinational corporations from different countries (Oliver and Jackson, 1999), but various governments have also tried to create 'national champions' (Algieri et al., 2011). The evolution of the solar industry has therefore depended greatly on the ways in which the institutional foundation of the industry—as contained in regulatory frameworks, technological standards, and business models—has been created and changed globally.

The study's main contribution is in revealing that the development of the solar industry can be portrayed as a relay run, in which different actors, at different times, created the momentum for the industry's evolution due to institutional shifts. We analyse this institutional evolution process by questioning which actors were responsible for the most significant institutional shifts that have moved the solar industry forward. Based on a study of the global solar industry, over the period of 1982–2012, the findings suggest that the main institutional shifts were the result of the interplay between different public and private actors that used various entrepreneurial mechanisms to drive the institutional evolution process. Besides, the findings show that the transition of the solar industry can only be understood from an international viewpoint; it has been a process of competition between companies as well as between countries that operate in a globalized space (Raven et al., 2012). Through a process of cross-border emulation of government policies and business practices, the centre of gravity of the global solar industry has moved from one country to the other and from one company to the other. Before we explain the methods, findings and conclusions of the study, the next section first starts with a review of the literature on industry creation and institutional entrepreneurship, which forms the main theoretical foundation of this study.

2. The institutional dimension of industry creation

This study extends current theory linking literature on industry creation (Aldrich and Fiol, 1994; Spencer et al., 2005), processes of (de) institutionalization (Maguire and Hardy, 2009; Oliver, 1992; Tolbert and Zucker, 1996), and institutional entrepreneurship (Battilana et al., 2009; Lawrence and Suddaby, 2006). Industry creation involves many institutional aspects such as the development of regulatory frameworks, technological standards, and business models (Aldrich and Fiol, 1994). Similar to the technological foundation of an industry, its institutional foundation is also likely to undergo an evolution process that reflects a process of creative destruction (Schumpeter, 1942/2013); that is, whilst new institutions are created, existing ones are disrupted (Lawrence and Suddaby, 2006). As long as an industry has not yet reached maturity, the rules for competition will be in a state of flux (Henisz and Zelner, 2005), whereby processes of institutionalization to establish new rules will be interspersed by processes of deinstitutionalization to disrupt established rules (Maguire and Hardy, 2009; Oliver, 1992; Tolbert and Zucker, 1996).

The institutional dimension is particularly pertinent when governments are actively involved in the industry creation process (Spencer et al., 2005), which tends to be the case for technologies that relate to societal problems such as environmental impact or energy security (Schot and Geels, 2008). Industry creation is then characterized by the interplay of governments which change regulations and market conditions and companies that bring new technologies to the market (Geels, 2014). Government involvement opens up the debate which actor's behaviour forms the main driver of the direction an industry is taking by no longer just considering new entrants or incumbents (Bergek et al., 2013). Industry creation will then be the outcome of competition between different companies as well as between different governments that pursue political