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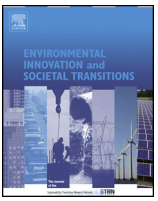

Informal institutions matter: Professional culture and the development of biogas technology

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ABSTRACT

Institutions play a crucial role for the development and diffusion of novel technologies. Many studies have analyzed the role of formal institutions such as support policies or specific R&D programs, while informal institutions have received less attention. With this paper, we contribute to the institutional analysis of emerging technological fields as we examine how the effects of formal institutions depend on informal institutional structures. We present findings from a comparative study of biogas technology in selected Austrian regions. Our findings suggest that the professional culture in which farmers are embedded modulates the effects of feed-in tariffs and investment subsidies to a considerable extent. This explains regional differences in the diffusion as well as variations in the design and operation of biogas plants. We argue that studies on emerging technologies benefit from a systematic analysis of the interplay of regulative, normative and cultural-cognitive institutions. We also argue that socio-technical variation is an important indicator to look at in addition to diffusion rates.

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1. Introduction

A sustainable and secure supply of energy is among the top political priorities in many countries. New renewable energy sources such as wind, solar or biomass play a key role in this regard. Since the early 2000s, biogas technology has made much progress in Europe (Wellinger, 2007) and is now one of the renewable energy technologies that is important for a transition in the energy sector. However, biogas is still more expensive than most established technologies for the provision of electricity and gas. Financial incentive schemes and regulatory support therefore play a key role in the development and diffusion of biogas (EUROBSERV'ER, 2012).

In innovation and transition studies (Markard et al., 2012), institutional structures such as technological standards, specific R&D programs, educational systems, local culture, or collective expectations have been assigned a key role in explaining the pace and direction of technological development (e.g. Coriat and Weinstein, 2002; Edquist and Johnson, 1997; Geels and Raven, 2006; Jacobsson and Johnson, 2000). More specifically, many studies on new energy technologies highlight the importance of formal institutions providing financial incentives or other regulatory support (Decker et al., 2007; Jacobsson, 2008; Jacobsson et al., 2004; Walz, 2007). However, regulatory support is only one of several institutional influences that affect emerging technologies in the field of energy supply and elsewhere.

Informal institutions affect emerging technologies as well: collective expectations about the future use and performance of an innovation, for example, can exert quite some pressure on innovating actors thus affecting the early stages of technology development (Borup et al., 2006; Geels and Raven, 2006; van Lente and Rip, 1998). In the case of fuel cell technology, hyped expectations motivated hesitant actors to enter the field thus creating a momentum, which carried on the development of the field even though the earlier expectations did not materialize (Konrad et al., 2012; Ruef and Markard, 2010).

Informal institutions and their effects are more difficult to study than formal institutions as they only become visible in the reasoning or decision making of actors. With this article, we want to contribute to the understanding of the interplay of different kinds of institutions and their effect on the development of new technologies. This interplay is particularly important in settings where new technologies have to be embedded into existing professional practices. Similar challenges can be expected at the intersection of established sectors.

As an empirical field of inquiry, we have chosen biogas technology, which emerges at the intersection of agriculture and the energy sector and has to be aligned with the established practices and beliefs of farmers. Contrary to other new energy technologies like solar cells, heat pumps or stationary fuel cells, biogas plants cannot be set up and left alone but must be filled, monitored and emptied constantly, i.e. they have to be integrated into the daily routines of farmers. We can therefore expect that the cultural and professional embeddedness of farmers – and the informal institutions it consists of – play a crucial role for which kinds of biogas plants are built and by whom they are operated.

Biogas technology has repeatedly been analyzed by scholars in the field of innovation studies (Decker et al., 2007; Geels and Raven, 2006, 2007; Markard et al., 2009; Negro et al., 2007; Negro and Hekkert, 2008; Raven, 2004; Raven and Geels, 2010; Raven and Gregersen, 2007). Most of these studies emphasize that formal institutions like feed-in tariffs, investment grants, R&D programs, or favorable regulations for co-digestion of organic waste represent key factors for explaining the successful diffusion of biogas technology. Some authors have also highlighted the role of specific cognitive institutions such as collective expectations for the development of biogas (Geels and Raven, 2006, 2007; Raven, 2004).

Despite this variety of studies at least two points have not been addressed explicitly enough. First, most studies focus on technology diffusion measured by the number of biogas plants or the installed capacity. Less attention has been paid to what kinds of biogas plants are built (size, substrate) and how they are operated. Second, most studies concentrate on the effects of regulatory support and pay little or no attention to how normative and cultural aspects modulate these effects.

In this article, we analyze how informal institutions interact with public support schemes and result in the diffusion of particular socio-technical configurations of biogas technology in agriculture. We will show that the effects of feed-in tariffs and investment subsidies are modulated by aspects of professional culture (e.g. identity of farmers). This ultimately affects both technology diffusion and the selection of specific socio-technical designs of biogas plants. In our study, we compare the