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# Analysing the role of consumers within technological innovation systems: The case of alternative food networks

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ABSTRACT

In recent years, an increasing number of studies have stressed the relevance of the consumer experience in the research about new trajectories towards sustainability. These studies suggest that consumers should not be viewed solely as passive agents who select between different commercial options.

This paper argues for a broader application of Technological Innovation System (TIS) conceptual framework and proposes an analytical approach that explicitly considers consumers and producers as interacting and then co-evolving actors. We apply the TIS framework to the food industry, a low-medium technology sector where several "alternative" food networks (AFN) are emerging and acting as innovative systems in the transition towards sustainability. The analysis allows us to better understand the common structure and the functional patterns shared by the various models of AFNs. The paper points out how the interactive relation between consumers and producers may foster the transition into a more sustainable socio-technical regime.



## 1. Introduction

Environmental transition studies have gained increasing attention over the last twenty years. Their aim is twofold: to disclose the mechanisms that hinder or foster the transition towards sustainability, and to offer a response to the demands raised by policy makers, firms, and civil society. The transition towards sustainability requires radical changes that are not immediately accepted by all economic actors, and this delay is not due solely to the lack of green innovation or to the high price of environmentally friendly products and technologies. It follows that environmental policies based on market failure, which continue to be focused either on R&D support or market-based economic incentives, are not always successful in supporting a transition (Jacobsson and Bergek, 2011). In order to shed light on the (nonlinear) process of transition towards sustainability, we need a dynamic and complex approach that focuses on mechanisms and processes.

In the last few years, the Technological Innovation System (TIS) conceptual framework has received increasing attention in the social sciences. TIS research argues that the transition towards sustainability arises from an innovation system build-up process in which new and incumbent firms co-evolve along with supportive actor networks, policy activities, and institutional contexts (Bergek et al., 2008; Hekkert et al., 2007). It promises, therefore, "to inform policy makers of the problems that an intervention needs to solve in order to promote the growth of a particular system or to influence its direction" (Jacobsson and Bergek, 2011, p. 42). A TIS conceptual framework may be applied to a technology-specific (or product-specific)

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perspective, although "innovation does not necessarily have to be a technological innovation" (Markard and Truffer, 2008, p. 611). TIS studies usually focus on technology as the main driver of change and neglect the user-driven innovation and the pre-competitive market formation processes where consumers, together with entrepreneurs and institutions, also play an important role (Truffer and Coenen, 2012).

This is not due to a specific lack of the TIS framework, which considers consumers as a driver of change in the innovation process (e.g. in the function of market formation). Also Bergek et al. (2015) recognise that "some incumbent users might be competent enough to participate in the development of specific new technologies by defining their needs or even co-creating solutions to meet those needs" (p. 62). According to us, TIS studies underplay the role of consumers because the majority of studies apply the framework to the high-tech sectors in Northern European countries. Due to the context (i.e. geographical and sectoral) of research (Bergek et al., 2015) these studies stress the role of technology giving to consumers a back seat. In order to be clear, we do not suggest that innovation processes in Northern European countries do not allow for user involvement, rather that the choice of specific case studies has developed within TIS literature a large focus on the Science, Technology and Innovation (STI) mode of innovation (Jensen et al., 2007), which is based on the production and the use of codified scientific and technical knowledge.

Indeed, a recurring critique of the TIS approach is about a lack of attention to the context factors (Markard et al., 2015). According to Bergek et al. (2015) every TIS has different interactions with context structures such as other TISs, industrial sectors, geographical territories and political systems. It follows that scholars should be aware about the particularities of case studies and that technologies develop differently in different contexts. Focusing on the analysis of the system build-up processes within high tech industries in a specific geographical context (namely Northern European countries), TIS literature risks to overlook the doing-interacting-using (DIU) mode of innovation (Jensen et al., 2007), which is relevant in the low and medium technology sectors (e.g. tourism, fashion, food supply). Within these sectors are more relevant factors such as the interaction with suppliers and customers, other forms of "open innovation" and feedback mechanisms from the demand side (Arundel et al., 2007).

In recent years, an increasing number of studies have stressed the role of consumers in the research of innovative trajectories. These studies focused on end-user innovation (Baldwin et al., 2006; von Hippel, 2011), the so-called "grassroots innovations" (Seyfang, 2009; Seyfang and Smith, 2007), the process of domestication (Du Gay et al., 1997; Van Dijck, 1998), or the co-evolution of producers and consumers (Grabher et al., 2008; Jeannerat, 2012). Each of these bodies of literature claims for an active role of consumers in the innovation process and recognise that consumers cannot be conceived only as passive agents who select between different commercial options.

The main goal of this study is to shine a light on the role of consumers in an innovation system. We aim at contributing to the conceptual framework within which innovation processes are studied and innovation policy designed. The research questions that this paper follows to answer are then: which is the role of consumers in the early phase of path creation? How they can interact with producers in order to push for a change? Which policy lessons can be drawn from the inclusion of consumers among active players in innovation processes?

We fulfil our research task in two separate steps. First, we develop a preliminary meta-analysis of the literature on innovation processes to show how the TIS framework can be considered the most suitable one in answering to our research questions. Second, we apply the conceptual framework adopted in analysing the role of consumers in the dynamics of innovation.

This second step is accomplished in two ways. On the methodological side, we discuss in a systematic way how consumers can play an active and possibly central role in all the functional patterns driving the evolution of a TIS. On the empirical side, we apply such a methodological insight to a case study in the food industry, a low-medium technology sector where several "alternative" food networks (AFNs) are emerging and acting as innovation systems in the transition towards the sustainable consumption and production of food.

AFNs are widely recognised as examples of social innovations within the food supply chain, that is, social innovations that involve consumers and are stimulated by meso-level actors (municipalities, cities, and regions). For this reason, also the global production network (GPN) concept may offer positive insights and in the next section we will consider its application to the study of the role of consumers in fostering the emergence of AFNs., Consumers, however, are still considered as "end users" of the agricultural knowledge and innovation systems. In our view, the role of consumers is far more central in the innovation process reflected by the AFNs phenomenon. Not only the quest for alternative"sustainable" food has been recognized as the expression of ecological citizenship (Seyfang, 2006). Furthermore, the network interactions within AFNs can be interpreted as an "innovation process co-produced between all the actors involved" (Brunori et al., 2011: 31), including consumers.

The case study is carried out through a content analysis of the relevant literature. We started from the most authoritative and updated review studies (above all, the 2003 special issue dedicated to AFNs by the Journal of Rural Study: see Goodman, 2003; and the review study by Santini and Gomez y Paloma (2013) to define a set of papers on the topic to be analysed. We then looked for quotations where consumers were considered as actors in interaction with producers within the processes of innovation.

The paper is structured as follows: Section 2 introduces the theoretical framework, explaining why we chose the TIS framework to discuss the role of consumers in innovation processes; Section 3 develops such an approach analysing the potential role of consumers within the functional patterns of every TIS; Section 4 introduces the AFNs as an example of a TIS

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