Environmental Innovation and Societal Transitions 40 (2021) 207–221

Contents lists available at ScienceDirect

Environmental Innovation and Societal Transitions

journal homepage: www.elsevier.com/locate/eist

Unleashing the industrial transformative capacity of innovations

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ARTICLE INFO

Keywords:
Transformative innovation
Context
Complementarity
Competition
Technology policy

ABSTRACT

This paper investigates the conditions in which the development of new technologies induce structural change in the economy. A literature review reveals three factors that influence the industrial transformative capacity of a technology: context; complementarities; competition. We explore the dynamics of these factors, focusing on the extent and nature of induced activities in adjacent sectors. We apply this framework to study marine renewable energy technologies (MRET) in Portugal. Adjacent sector firms active in several MRET exhibited diversified activity, innovation and internal change. Comparing with Norway, where an offshore sector (oil & gas) supports the emergence of offshore wind, the absence of such sector in Portugal raises challenges but also creates opportunities for the transformation of several other sectors. We develop a new indicator to identify and compare the industrial transformative capacity of innovations. Finally, we discuss the extent to which context, complementarities and competition contribute to accelerate or hinder transformative change.

1. Introduction

To accelerate the energy transition, several technological paths are possible, with distinct performances and socio-economic costs and benefits. Benefits could include a greater use of competencies from existing economic activities or the revitalization of declining sectors by creatingnew direct and indirect jobs (Arthur, 2009; Pahle et al., 2016). To achieve a combination of environmental and economic goals, 'tweaking' existing innovation trajectories is arguably insufficient. Instead 'transformative change' (i.e. structural change) is needed (Grubler et al, 2018). At the same time, aligning environmental and socio-economic goals, such as jobs and value creation, is a key concern to the wider public (Foxon, 2018). The legitimacy of energy transition policies would thus be significantly strengthened if combined with creation of new economic opportunities (Vona, 2019). It is, therefore, important to understand how sustainable energy transitions interact with industrial transformation (Andersen et al., 2020).

The impact of a new technology on existing industrial sectors has been addressed in the literature, via the concept of the transformative capacity of technology. This concept refers to the process of structural change and adjustment in sectors that adopt and use the new technology (Dolata, 2009, 2018). This view of transformation contributes to an understanding of the disruptive effects of transitions on sectors (such as electricity or transport) that increasingly adopt sustainable technologies (Köhler et al., 2019). But it only offers a partial approach, since it does not consider the dynamics of the sectors developing, producing and upscaling these new technologies. This is nevertheless an important point, if the goal is to combine sustainability with industrial development. In fact, most

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https://doi.org/10.1016/j.eist.2021.07.004
Received 5 November 2020; Received in revised form 22 June 2021; Accepted 16 July 2021
Available online 7 August 2021