

Technological, Organizational and Environmental Determinants of Sustainable Innovation in Spanish Firms

Abstract

This paper examines the determinants of eco-innovation and social innovation in Spanish firms, drawing on microdata from the 2022 *Encuesta sobre Estrategias Empresariales* (ESEE). While previous research has highlighted the relevance of technological capabilities and environmental regulation for eco-innovation, empirical evidence on the joint drivers of environmental and social innovation—and their organizational antecedents, remains limited. Building on the Technology–Organization–Environment (TOE) framework and the resource-based view, this study estimates a set of Probit models to analyse how strategic sustainability orientation, environmental financial effort, technological capabilities, and organizational barriers shape firms' propensity to innovate sustainably.

Results reveal a clear asymmetry between eco-innovation and social innovation. Eco-innovation is significantly influenced by specific organizational barriers, particularly coordination failures and resource needs, while social innovation appears less sensitive to internal obstacles. In both domains, environmental investment and environmental expenditure emerge as the most robust predictors of sustainable innovation, confirming strong complementarities between environmental commitment and broader sustainability outcomes. Technological capabilities, especially digitalization and R&D intensity, consistently increase the likelihood of innovating, whereas firms operating in high-technology sectors exhibit a lower propensity to adopt sustainable innovations. Organizational barriers related to knowledge and innovation capabilities show negative effects, particularly in models with aggregated indices.

Incremental TOE models confirm that technological and environmental factors dominate the explanation of sustainable innovation, while organizational factors display heterogeneous and often inhibitory effects. Overall, the findings underscore the importance of strengthening firms' technological capabilities and environmental investment efforts, while addressing internal organizational rigidities that hinder the transition toward more sustainable business models.

Keywords: Sustainable innovation, eco-innovation, social innovation, Technology–Organization–Environment (TOE), environmental investment