

# **Structural changes and global dynamics and the effects on innovation capabilities for a transition to a circular economy**

## **Introduction**

The circular economy model requires a significant shift in our approach to producing and consuming goods and services. Its aim is to promote sustainability by maximizing resource utilization and minimizing waste generation. To ensure the successful implementation of a circular economy, it is essential to understand how businesses can adapt to the evolving landscape. This requires a comprehensive analysis of how structural changes and global dynamics affect their capacity to innovate and move towards a circular economy. By doing so, we can identify both challenges and opportunities, which will help ensure that the transition to this new model is both effective and sustainable.

## **The Role of Innovation in the Transition to a Circular Economy**

The transition to a circular economy requires significant structural changes, and innovation is essential to driving this transformation. This transition requires a fundamental shift in the way we design, manufacture, consume, and dispose of goods. It means reinventing the entire value chain, from sourcing raw materials to disposing of products at the end of their life cycle. The digital transformation of the production system is a crucial component of innovation. Industry 4.0 technologies, such as the Internet of Things, robotics, and artificial intelligence, are currently being utilized to optimize production processes, minimize waste, and enhance efficiency. The adoption of these technologies represents an opportunity for businesses to develop more sustainable and circular production systems, while abandoning traditional production methods.

## **Specific Research Themes**

### *1. Analysis of the Determinants of Eco-Innovation in Southern European Countries*

Existing studies analyzing the determinants and obstacles to implementing eco-innovation have primarily relied on data from the German economy. There are very few studies conducted in Southern European countries. It is crucial to address this gap in the literature because the national innovation system, environmental awareness among consumers, and the level of proactivity among businesses towards environmental strategies can vary significantly between Southern European countries and those in the North.

### *2. Exposure to International Trade and Eco-Innovation*

The literature presents conflicting results regarding the relationship between a company's engagement in international trade and its level of eco-innovation. Some studies suggest that eco-innovations may not effectively penetrate new markets, while others indicate that companies with a focus on exporting have a greater chance of developing environmental strategies and engaging in eco-innovation. Therefore, it is important to improve our understanding of this topic by utilizing company-level data from Italy. Compared to other European countries, Italy has a high number of small and medium-sized enterprises (SMEs) relative to its level of industrialization. These companies account for just under ninety percent of the Italian workforce. Despite making a significant contribution to the economy, SMEs tend to be underrepresented in international trade, accounting for a relatively small share of exports.

### *3. Global Value Chains, SMEs, and Green Technologies*

The rise of global value chains and the process of digitalization present new opportunities for SMEs to integrate into the global economy. A crucial question is to what extent SMEs and entrepreneurs, who are actively involved in the green economy, can capitalize on these opportunities. This topic is relevant because SMEs with environmental expertise can access new markets, in line with the European Union's international commitments in areas such as neighborhood policies and cooperation on climate change.

#### *4. Circular Economy as a Driver of Sourcing, Localization and Ownership Choices of International Firms*

A growing body of literature has emerged that addresses, both theoretically and empirically, how firms make critical decisions when participating in global value chains. These decisions include determining their level of forward and/or backward participation in the global value chains, expanding their supplier base, choosing the best location for each stage of production, and of the optimal organizational mode (e.g., outsourcing, or in-house production) for each task or stage of production. How does the transition towards a circular and environmentally sustainable economy impact firms' decision-making processes?

#### *5. Circular Economy and its Implications for Trade Policy and Regional Trade Agreements*

The political economy of international and regional trade agreements suggests that the motives behind the agreement inevitably influence and shape its design. What types of contractual provisions, norms, and clauses can better support the promotion of sustainability and circularity in the global economic system during international negotiations? What type of dispute settlement mechanism can be utilized to prevent and address issues and violations of these provisions during the implementation of the agreements?

#### *6. An Exploration of the “Gravity” of the Circular Economy*

Empirical studies in the international trade literature have shown that bilateral import and export flows tend to decrease as the geographic distance between the two trading partners increases. This pattern is similar to Isaac Newton's law of universal gravitation. Additionally, trade flows are influenced by various factors, including shared language, shared borders, and historical colonial ties. It would be interesting to analyze how bilateral trade in waste materials and recycled content among countries is affected by distance (and gravity, more generally). This analysis would determine whether waste materials and recycled content behave like any other type of product or intermediate good. If they do not, it would be useful to derive implications regarding the nature and composition of export costs for these materials, as well as their logistics and distribution channels.

#### *7. The “Economic Geography” and the Spatial Dimension of the Circular Economy*

The characteristics of production costs are often crucial in determining the optimal organization of a firm within a territory, e.g., the number of plants, their optimal size, and location. Although some research has been conducted on these aspects for utilities operating in the waste collection and disposal sector, there is limited knowledge about companies that specialize in waste recovery and recycling. How do these firms determine the optimal organization of their activities within a specific geographic area? How do companies participate in international trade markets? Specifically, how do their cross-border operations, such as importing and exporting, and the associated logistics, impact their spatial organization?