Disentangling the antecedents of decarbonisation ambidexterity

Scholars have emphasised the importance of investigating climate-related corporate strategies and practices across industrial sectors. This is particularly relevant in the case of the manufacturing sector: the manufacturing industry accounts for almost a quarter of direct carbon emissions in the US and Europe. Yet, the climate strategies of manufacturing companies have been overlooked. Reviews on climate action show that literature has primarily focused on country-level targets, abatement efforts, and the impact of different policy instruments. In other words, the literature focuses on the standards that need to be achieved and less on how companies can meet those standards. Moving manufacturers closer to net zero requires much more than the simple adoption of new commitments and practices to reach clear-cut objectives; it is not a singular process that occurs and is then completed. Manufacturing companies must develop ambidextrous strategies to decarbonise their operations to respond to climate risks and opportunities.

The term 'ambidextrous organisation' is related to maintaining an appropriate balance between exploration and exploitation for the system's survival and prosperity. Exploration broadly refers to finding and pursuing new opportunities and ideas that are higher risk, involve long-term investments and commitments, experimentation and flexibility, and may lead to radical innovation (such as clean technologies). Exploitation builds on existing resources and knowledge that includes refinement, efficiency, and better execution for incremental innovations (such as reducing energy or water consumption). Companies must arguably pursue, reconcile, and align efforts for incremental and discontinuous innovations to remain competitive, and scholars have investigated over more than two decades the different shapes of ambidextrous organisations and the challenges and tensions that arise from ambidextrous attempts.

We argue that ambidexterity is critical to move companies "from here to there" in their efforts to decarbonise and move closer to net zero. Yet, despite recent calls in the literature for more studies on innovation for decarbonisation, no study that we are aware of has investigated decarbonisation ambidexterity, let alone patterns that arise from aggregate data. Thus, in this study, we ask: *how do manufacturing companies exploit and explore decarbonisation opportunities? How do they balance these efforts as they attempt to transition to net zero?* We develop a conceptual framework for understanding the contextual conditions to induce and balance exploitation and exploration in a climate change context. The framework is developed

by analysing a sample of European manufacturing companies committed to science-based carbon emissions reduction targets.

An inductive and qualitative analysis of climate disclosure reports of 870 manufacturing companies located in Europe was conducted to identify ambidextrous organisations and identify how companies organise for decarbonisation ambidexterity, i.e., pinpoint the contextual conditions shaping exploitation and exploration efforts. The data was sourced from a third-party non-profit organisation, the Carbon Disclosure Project (CDP), which operates a global disclosure system for companies, investors, and regions to manage risks and opportunities related to climate change, water security, and deforestation. Over 13,000 companies reported information on their firm policies towards climate change in 2021, and several studies have utilised CDP data previously in different contexts. Manufacturing firms were selected because the sector and its supply chains play a critical role in achieving the world's established science-based carbon emission reduction goals, and scholars have pointed out that the manufacturing industry's climate-related responses are understudied compared to other sectors. Manufacturing companies based in the EU were selected because the region has one of the most advanced regulatory environments regarding climate policy – in June 2021, the EU adopted a European Climate Law, aiming to reach net-zero greenhouse gas emissions in the EU by 2050.

The data analysis started with compiling data from all European manufacturing companies that submitted climate change reports to CDP in 2021. Firms' responses to the CDP's report question C3.3: "*Describe where and how climate-related risks and opportunities have influenced your strategy?"* were analysed to understand companies' products and services innovation approaches and identify the ambidextrous organisations. We coded the data on companies' product innovation initiatives to identify and categorise exploitation and exploration efforts. The software NVivo was employed in the coding process. Afterwards, we coded strategic changes in companies' R&D efforts, operations and supply chain management (still part of CDP's report question 3.3) to identify the structural conditions supporting exploration and exploitation initiatives. Additionally, we coded other questions in the CDP report (questions C1, C2, C5, C12) to identify other contextual characteristics (e.g. the systems, processes) that shape behaviour in organisations and understand the organisational design, including structures, practices, and culture that accommodate exploring and exploiting efforts. We then deployed the Gioia et al.'s (2013) data analysis approach to inductively interpret our coded data and synthesise them into more aggregate themes.

Two types of ambidexterity were identified in the sample: structural and contextual, which differ regarding the degree of structural separation between exploration and exploitation activities. The data revealed three core organisational design characteristics supporting decarbonisation ambidexterity: governance focused on climate-related issues, new carbon risks and opportunities management processes, and engagement with value chain partners on climate-related issues. A governance focused on climate-related issues includes various board members with complementary responsibilities and governance mechanisms into which climate-related issues are integrated. Providing incentives for managing climate-related concerns, including the attainment of targets, is another common practice in ambidextrous organisations. New processes for carbon risk management in ambidextrous organisations include consideration of a range of risk types. Ambidextrous companies also engage with a large proportion of their value chain partners, aiming to support carbon emissions reduction across the supply chain.

By conceptualising ambidexterity in a decarbonisation context and identifying the core organisational design characteristics supporting exploitation and exploration efforts, this study contributes to recent calls in the literature for more research on how to translate carbon emission reduction targets into organisational action (Wade and Rekker, 2020). The findings reveal the core characteristics of firms that explore and exploit to reach their carbon emissions reduction targets. The results contribute to a better understanding of how innovation management must evolve to adjust existing practices and support carbon neutrality (Jabbour et al., 2021; Wanke et al., 2021; Zhang et al., 2021).