

# Regional differences in the generation of green technologies: The role of local recombinant capabilities and academic inventors

by Gianluca Orsatti | Francesco Quatraro | Alessandra Scandura | Università degli studi di Torino |  
Università degli studi di Torino | Università degli studi di Torino

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This paper investigates the association between region-level recombinant capabilities and the generation of green technologies in Italy, together with their interplay with the local intensity of academic involvement in innovation dynamics.

We elaborate on the notion of recombinant capabilities (Carnabuci and Operti, 2013) to extend it to the regional domain and introduce the concept of regional recombinant capabilities. We develop a theoretical framework combining this approach with the recent literature on the inherent complexity of GTs, to spell out the main hypothesis that the capacity of regional agents to manage infrequent and unprecedented combination of knowledge inputs is associated with better performances in the production of GTs (Barbieri et al., 2020; Orsatti et al., 2020). Our second hypothesis concerns the impact of the involvement of academic inventors in view of their documented capacity to conduct research spanning technological boundaries, and the possible substitution effect in areas characterized by a low degree of recombinant novelty (Quatraro and Scandura, 2019).

The empirical analysis implements a knowledge production function (KPF) framework at the Italian provincial level. Precisely, it focuses on a balanced panel of 103 Italian NUTS 3 regions (Italian provinces) observed over the period 1998–2009. Our results support the hypothesis according to which regional recombinant novelty is positively associated with better performances in terms of GT generation. Moreover, consistent with previous empirical evidence, we also confirm the positive correlation between the local presence of academic inventors and the generation of GTs. Most importantly, the involvement of academic inventors in patenting activities seems to mitigate underperformances in GTs associated with scarce local capacity to engage in recombinant novelty.

Our results bear interesting policy implications for the elaboration of successful regional strategies to promote research and innovation in the green domain, in view of the increasing commitment at the European level to cope with climate change and achieve decarbonized societies. Green technologies represent a key lever that will allow to comply with the objectives of the European Green Deal, as well as their articulation at the regional level in EU Cohesion Policies. Regions characterized by a well-established innovation system

specialized in research and innovation activities dealing with complex technologies and based on exploration dynamics will be better off in this respect. However, strengthening the institutional framework conducive to successful collaborations between industry and universities might be an alternative strategy for regions that features innovation dynamics mostly focused on incremental improvements of known technologies, with scarce impact on the advancement of the knowledge frontier.