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Mapping strategic and net-zero emission technologies in Italy

Marco Cucculelli , Noemi Giampaoli  and Matteo Renghini 

Department of Economics and Social Sciences, Polytechnic University of Marche, Ancona, Italy

ABSTRACT

The European Union is pursuing a re-industrialisation strategy aimed at enhancing economic resilience and accelerating digital and green transitions. Accordingly, the Strategic Technologies for Europe Platform (STEP) and Net-Zero Industry Act (NZIA) initiatives are poised to reshape the European industrial landscape. However, there is no empirical evidence on where these technologies are located. This paper addresses this gap by systematically mapping STEP- and NZIA-related technology adoption among Italian firms. Using a web scraping analysis of over 6.5 million company webpages, we identify firms engaging with these two programmes and visualise their distribution at the municipal level. The results reveal 25,084 firms involved in the digital and net-zero transitions, with key hubs in Milan, Rome, Turin, Naples, Genoa and Bologna. We provide new insights into the geography of these transitions, highlight the distinctive traits of Italy's industrial dynamics, and underscore the need for differentiated, place-sensitive policies to support a convergent trajectory toward Europe's strategic development objectives.

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The EU is tackling geopolitical instability and climate change through re-industrialisation, with the Strategic Technologies for Europe Platform (STEP) and the Net-Zero Industry Act (NZIA), under the EU Green Deal, aiming to reduce strategic dependencies and foster a sustainable, innovation-led economy.

Although the twin transition is widely explored (Tabares et al., 2025; Cattani et al., 2025; Faggian et al., 2025; Fazio et al., 2025), identifying and mapping firms' engagement in strategic and net-zero shifts remain difficult. Narrowed empirical evidence on which firms adopt these technologies or where they are concentrated limits our understanding of the ecosystems shaping Europe's industrial transformation.


This study fills this gap by providing the first comprehensive geographical mapping of STEP and NZIA technology adoption across Italy. STEP and NZIA firms are early adopters of technological transformation, operating in sectors and regions with higher innovation capacity, stronger ecosystems and skilled human capital. Their geography reveals local innovation dynamics, regional disparities and 'innovation hotspots'.

We used a database of 366,440 firms from across Italy from the Aida database. This database was collected by extracting information from each company – including location, website and text from all links on their site discussing their business mission, products, etc. for a total of 6.5 million webpages. We applied a language algorithm to match semantics from these texts to corresponding keywords related to STEP and NZIA technologies (e.g., quantum computing, nuclear fuel) and identify those firms adopting such technologies (Nathan & Rosso, 2015). Finally, firms were geolocated at the municipal level (the smallest units of local government) to map the distribution of these technologies.

We identify 25,084 firms adopting STEP and NZIA technologies – 21,372 for STEP and 3712 for NZIA, 6% and 1% of the sample, respectively. These firms are concentrated in manufacturing, professional, scientific and technical activities, water and energy supply, and professional services. Figure 1 depicts the municipal-level distribution.

STEP technologies show broader national diffusion, while NZIA adoption remains spatially concentrated. Lombardy and Lazio emerge as key hubs, whereas Molise, Basilicata and Calabria and Sardinia

CONTACT Matteo Renghini  m.renghini@pm.univpm.it

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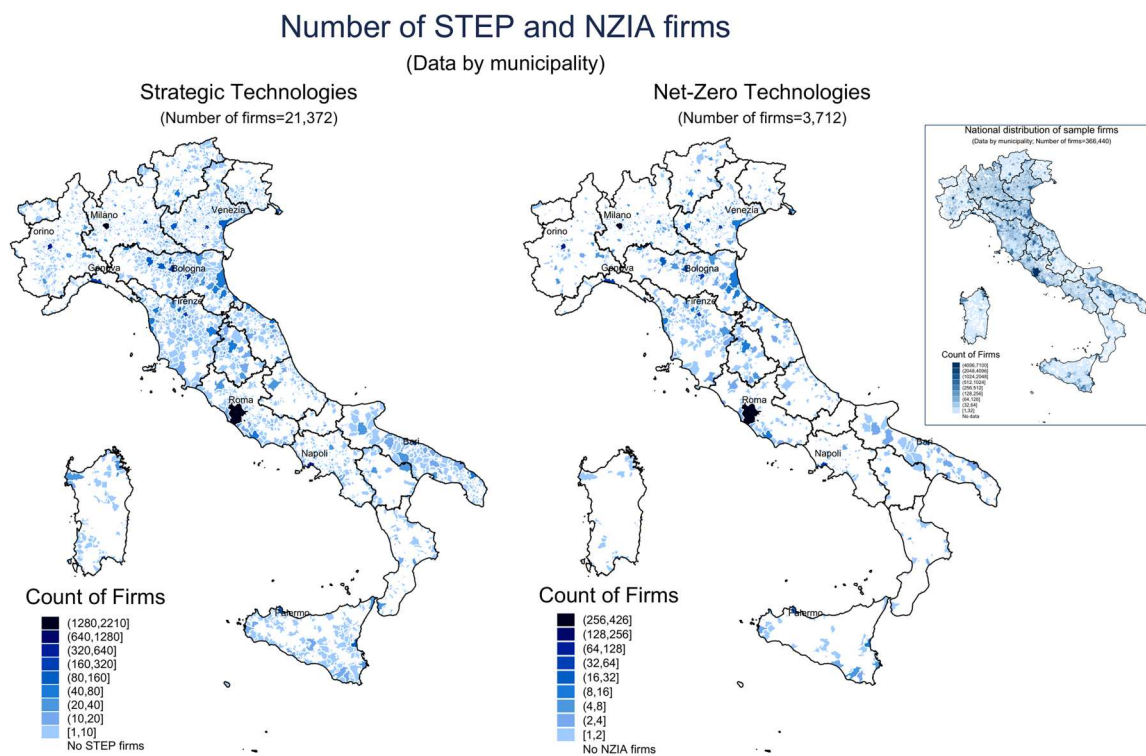


Figure 1. Spatial distribution of strategic (STEP) and net-zero (NZIA) firms in Italy.

show minimal engagement (see the Appendix in the online supplemental data). Findings partially diverge from the national industry concentration pattern. Of 6254 municipalities, only 21% report NZIA-related adoption, compared to 52% for STEP. Adoption is clustered in major innovation hubs – Milan, Rome, Turin, Naples, Genoa and Bologna – confirming patterns observed by Kriesch et al. (2025). These results highlight the marginalisation of peripheral and economically disadvantaged regions. However, unlike Kriesch et al. (2025) who found greater green technology diffusion in Germany, Italian firms appear more focused on strategic innovation than on net-zero-emission solutions. The limited diffusion of NZIA technologies suggests the green industrial transition remains in its early stages and marked by strong spatial disparities.

Two policy implications emerge. First, our mapping tracks the spatial spread of strategic and net-zero technologies. Second, the uneven regional distribution of NZIA firms highlights the need for targeted, place-based incentives to support the green transition. Without such measures, the EU's industrial strategy risks deepening territorial divides if regional technological gaps persist. Future research should investigate the drivers behind the adoption and development of these technologies.

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ORCID

Marco Cucculelli  <https://orcid.org/0000-0003-0035-9454>

Noemi Giampaoli  <https://orcid.org/0000-0002-6329-8436>

Matteo Renghini  <http://orcid.org/0000-0003-2960-3385>

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