REVITALIZING EUROPE'S PERIPHERAL REGIONS: A MULTIDISCIPLINARY FRAMEWORK FOR ECONOMIC RECOVERY AND SUSTAINABLE DEVELOPMENT

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Abstract

Purpose – The paper presents the conceptual framework of a multidisciplinary project aimed at the economic revitalization of peripheral regions experiencing significant population decline, particularly the loss of working-age individuals. The project seeks to develop a replicable model for socio-economic recovery, proposing multidisciplinary research for leveraging local resources and sustainable development, building on existing research addressing regional disparities.
Methodology – The project will focus on three areas: (1) Territorial Analysis, using methodologies from spatial econometrics and regional science; (2) Model Development, aimed at creating a framework maximising local resources; (3) Pilot Implementation of local businesses to validate the model in regions matching technological and logistical prerequisites.
Findings – As the project is currently in its conceptual phase, future findings will be contingent on the outcomes of the research. Preliminary insights are being gathered through active participation in conferences and workshops, where feedback from experts in regional development, economics, and social sciences is being solicited to identify potential challenges and opportunities. These interactions are instrumental in shaping the project's design and ensuring its alignment with the needs of peripheral regions. Additionally, the project aims to uncover replicable strategies for attracting and retaining working-age populations, which will be validated through pilot implementations in selected regions.
Contribution – Expected outcomes include a scalable and adaptable economic recovery model applicable across different European regions. The potential impact of this project is significant, promising to attract and retain working-age individuals while fostering long-term socio-economic stability in Europe's peripheral regions.
Keywords Economic revitalization, peripheral regions, demographic decline, aging regions, NFTs, Augmented Reality.

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INTRODUCTION

The paper presents the conceptual framework of a multidisciplinary project aimed at the economic revitalization of peripheral regions experiencing significant population decline, particularly the loss of working-age individuals. The project seeks to develop a replicable model for socio-economic recovery, proposing multidisciplinary research for leveraging local resources and sustainable development, building on existing research addressing regional disparities (Rodríguez-Pose, 2018). The project will involve universities and research institutions across Italy (Università degli Studi di Milano), Slovenia (University of Novo Mesto), Croatia (University of Rijeka) and the Netherlands (Utrecht University), integrating expertise in Economics, Econometrics, Technology, Law, Cognitive Psychology, reflecting the multidisciplinary approaches in regional development studies.

The framework emphasizes a holistic approach that focus on local assets represented by artisanal products, cultural heritage and natural landscapes, without forgetting environmental sustainability, resilience and ecological balance.
The design of the framework is guided by the following key research questions:

1. How can local resources, traditions and environmental assets be valorised to support economic revitalization?
2. In what measure can digital innovations, specifically Non-Fungible Tokens (NFTs) and Augmented Reality (AR), mitigate population decline and serve to stimulate economic growth in peripheral regions?

By addressing these questions, this paper aims to present the concept behind the development of a replicable model that aligns with the EU's 2021–2027 cohesion policy about strategies for policymakers, local governments and communities. The aim is to establish a theoretical framework for future applied research. Furthermore, the project also seeks to raise awareness about improved livelihood opportunities in rural areas and successful entrepreneurial initiatives, as well as to foster integration between the agricultural and tourism sectors, enhance community education, and promote funding programs (such as the Rural Development Programme of Croatia and initiatives by the Croatian Tourist Board).

The fundamental hypothesis leading the authors to design the conceptual framework is that revitalizing depressed areas and counteracting population aging requires economic development jointly with the creation of a social ecosystem, providing family support services, digital infrastructure for remote work as well as mobility solutions to attract and retain residents.

1. LITERATURE REVIEW

Europe's peripheral regions often suffer lack of investments in infrastructure and in supporting business due to what is generally called a "double exclusion": declining working-age populations and limited integration into digital economies (Rodríguez-Pose, 2018). These regions experience a vicious circle where outmigration negatively impacts economic vitality, consequently accelerating depopulation. A further factor causing inequalities consists in the digital divide. In fact, peripheral regions usually lack in adopting technological infrastructures that are fundamental for an active economic participation (Graham & Marvin, 2001). The combination of demographic decline and economic stagnation causes an increasing gap between urban centres and rural peripheries, increasingly isolating these latter economically, as well as socially, undermining the EU's cohesion policy objectives.

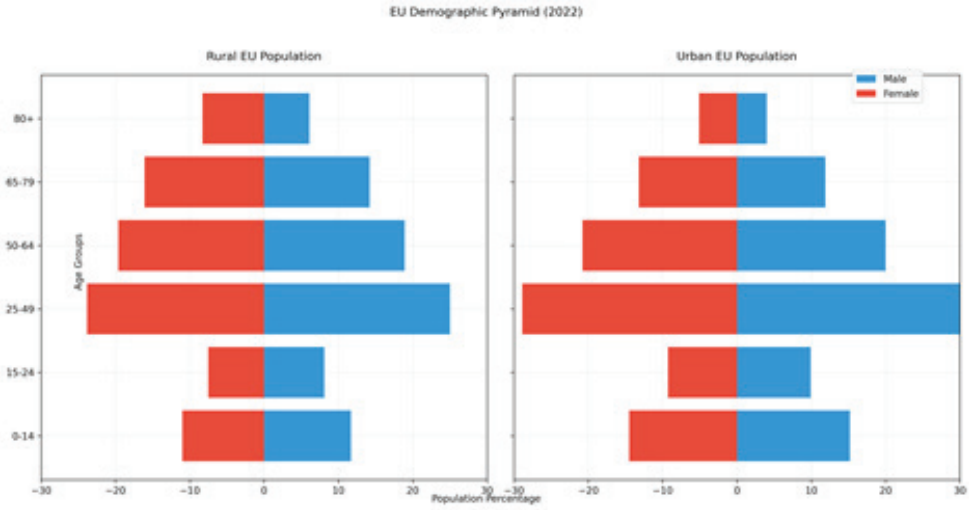
Following Eurostat data related to 2024, the urban population has a higher proportion of individuals (60%) in the Working-Age Population (20-64 years old) compared to rural areas (57%). This is evident in the broader bars for this age group in the urban demographic pyramid showed in figure 1, indicating a greater concentration of working-age individuals in cities.

Data related to Elderly Population (65-79 years old) indicate that rural areas have a higher percentage of elderly individuals (17%) than urban areas (14%). The trend aligns with the fact that younger people tend to migrate to urban areas for job opportunities, leaving an aging population in rural regions.

Both rural and urban regions show similar distributions for younger age groups (Children and Teenagers, 0-19 years old). At the EU level, 15% of the population is under 15, and 5% is aged 15-19, with minimal variation between regions.

Finally, although the 80+ population share is relatively small (6% at the EU level), rural regions in some countries, such as Spain, show a significantly higher proportion (10%) compared to urban areas (5%).

Figure 1: **The demographic pyramid illustrating the differences in age distribution between rural and urban regions in the EU**.



Source: Eurostat (2024). Demography of Europe – 2024 edition
(https://ec.europa.eu/eurostat/web/interactive-publications/demography-2024#rural-urban-regions, accessed online on 01/04/2025)

The conceptual phase also focuses on building a robust network of participants, including other universities, local enterprises, and policymakers, to ensure the project's feasibility and scalability across diverse European contexts.

Considering that rural and remote areas across Europe exhibit significant diversity due to geographical, economic, and cultural factors, the framework aims at being a methodology to model peculiarities and patterns following an organised approach so that, in time, best practices can represent the guide for further developments of the framework itself. In fact, European remote regions can be classified into distinct categories, each facing unique challenges and opportunities for development:

1. Traditional Agricultural Rural Areas: regions primarily characterized by extensive farming and livestock activities. They include the Loire Valley and Normandy in France, the Po Valley in Italy and Bavaria in Germany, mainly characterised by small-scale farms and dairy production.
2. Mountainous Rural Areas: high-altitude regions such as the Swiss Alps, the Austrian Tyrol, the Pyrenees in Spain and the Dinaric Alps in Croatia, that often rely on livestock farming, forestry, and seasonal tourism.
3. Coastal Rural Areas: where economy is based on fishing and agriculture as well as on tourism. Examples include the Aegean Islands in Greece, the coastal Alentejo region in Portugal, and some rural coastal areas of France and Croatia.
4. Sparsely Populated Rural Areas: regions characterized by low population density, economy based on natural resources and ecotourism. They include Swedish Lapland, northern Finland, remote rural areas in Eastern Europe and rural Croatia.

5. Depopulating Rural Areas: these are regions facing severe demographic decline, outmigration and economic stagnation. Examples are represented by some areas in Central and Southern Italy, the so-called *España vaciada* in Spain, some rural regions in Croatia and post-industrial areas of Slovenia.
6. Touristic and Viticultural Rural Areas: regions leveraging cultural heritage and exclusive agricultural production, such as the wine industry. Key areas are represented by Burgundy and Champagne in France, Tuscany and Piedmont in Italy, La Rioja in Spain, Plešivica and Vallis Aurea in Croatia and Slovenia's wine-growing regions.

This paper proposes a multidisciplinary conceptual framework for the economic revitalization of peripheral regions, based on the assumption that traditional territorial development strategies need to be integrated with cutting-edge digital innovations. By combining expertise from Economics, Tourism, Technology, Law, and Cognitive psychology, the framework seeks to create sustainable economic opportunities, with the goal of attracting and retaining working-age populations, as well as enhancing the cultural, environmental, and touristic appeal of peripheral regions. The model also exploits digital tools like Non-Fungible Tokens (NFTs) and Augmented Reality (AR) as they can be introduced alongside local resources and traditions and territorial uniqueness to address the challenges of peripheral regions. It is worth it to recall some considerations coming from previous research on the subject. For example, blockchain-based NFTs can facilitate cultural and heritage monetization, providing local businesses and municipalities with new revenue streams (Malik et al, 2023). AR applications in tourism can enrich visitor experiences and promote local heritage (Prodinger & Neuhofer, 2023; Folgieri et al., 2022; Gričar et al., 2023) as well as advertising touristic and cultural areas through the Internet.

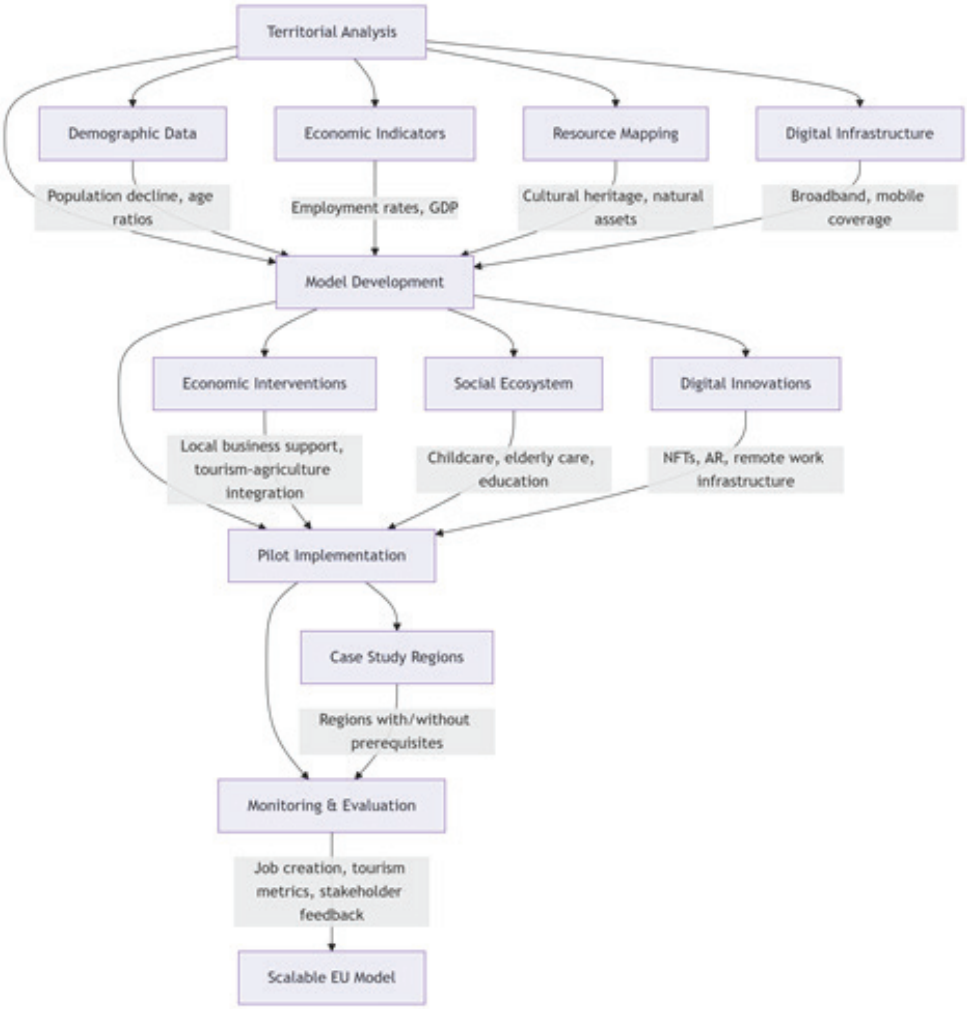
Another fundamental aspect is related to the need for the creation of a supportive environment for families and intergenerational solidarity, to ensure sustainable population growth. Comprehensive childcare services, educational opportunities, and recreational facilities are necessary to attract young families to these areas (Plantenga et al., 2009). Likewise, investing in elderly care, including telemedicine and active aging programs, ensures that older residents can continue to be integrated within the community while benefiting from essential services (Palozzi et al., 2020; Pravettoni et al., 2015).

2. THE CONCEPTUAL FRAMEWORK

The conceptual framework is based on a multidisciplinary approach suitable to address the complex challenges faced by Europe's peripheral regions despite their diversity. To identify and respect differences and to value local resources and peculiarities, the proposed model introduces and justifies the need to integrate territorial analysis, economic and policy interventions and digital strategies to create a replicable model for economic revitalization. Currently, the model is at its early stages where authors identified the three key phases of the plan aiming at developing the framework. Namely: Territorial Analysis, Model Development, and Pilot Implementation.

The following figure 2 illustrates the conceptual framework to provide a clearer visual representation.

Figure 2: **The conceptual framework**



2.1. Territorial Analysis

The first phase identified as the starting point of a possible design of the peripheral regions revitalising framework involves a comprehensive territorial analysis to identify high-potential uniqueness and assess local economic assets. Using methodologies from spatial econometrics and geographic information systems (GIS), this phase of the framework consists in mapping population trends, economic activity and resource distribution in the selected area. A focal point of this stage is to establish significant key indicators to be later able to measure the effectiveness of the model. Key indicators include demographic data, such as population decline rates, age dependency ratios, migration patterns; economic data, like employment rates, GDP per capita, sectoral contributions; resource mapping, such as cultural heritage sites, natural landscapes, artisanal traditions; as well as digital infrastructure, such as broadband connectivity, mobile network coverage, allowing remote working, e-commerce and more in general a stronger connection between rural communities and other regions. This analysis phase provides a foundation for identifying the best regions for pilot implementations, ensuring, at the same time, that interventions are tailored to the unique characteristics and needs of each area. In fact, the initial qualitative and quantitative analysis serves as a baseline to compare final achievements to the initial situation.

2.2. Model Development

Based on the findings from the territorial analysis, the subsequent stage of the model consists in developing a multidisciplinary - driven map of the area aimed at maximizing local resources and integrating digital tools to create sustainable economic opportunities. The map serves within the conceptual framework to target services for demographics, to identify support needed for local businesses, to evaluate the possibility of introducing digital innovations (NFTs, AR) and establish, when suitable, cross-border collaboration.

This framework is proposed based on the hypothesis that revitalizing a declining area and counteracting population aging requires not only the creation of commercial activities but, more importantly, the establishment of conditions for “family sustainability.” This implies the development of comprehensive childcare services and young educational as well as entertainment structures,

to provide long-term prospects for young family members who choose to relocate or return to the area, as well as services for the elderly to support an intergenerational aid system. By ensuring a socially comprehensive environment, the community can become self-sustaining and resilient. Such multigenerational approaches have been shown to enhance community vibrancy and cohesion (Warner & Zhang, 2019; Moliterni et al., 2025).

Furthermore, the integration of up-to-date digital infrastructure, if not already present, would enable remote work opportunities in technology, finance and various service sectors, attracting new residents. Studies have highlighted the potential of remote work in rural areas to attract and retain skilled workers, contributing to regional development (Bogason et al., 2024). It is important to stress that technological infrastructure also represents the key to leverage local products, culture and traditions, helping to mitigate youth migration to urban centres. The model will be informed by existing research on regional development, such as the role of entrepreneurship in revitalization (Stam, 2015) and the importance of digital infrastructure in economic recovery (Sarangi & Pradhan, 2020; Moliterni et al., 2025).

Another aspect to be considered is related to the need of a carefully designed mobility infrastructure, that would surely facilitate both daily commuting and occasional travel for work and leisure. Tailoring these elements to the specific socio-economic and geographical context, this approach could provide a reference pathway for the regeneration of considered areas. Also, planning age-friendly mobility could provide support for residents of all ages (Adlagha & Sallis, 2020).

Finally, cutting edge technologies should be considered. In this context, NFTs can be used to tokenize local art and cultural heritage, creating new revenue streams, whilst AR can enhance tourism experiences.

2.3. Pilot Implementation

The final phase of the framework implies a test through a case study, consisting in the pilot implementation of the proposed framework in selected regions that meet specific technological and logistical prerequisites (such as, for example, fibre connectivity and proximity to urban centres) to maximise the impact of the model, as well as regions very far from satisfying the prerequisites, to have examples of partial versus broad application of the plan. The pilot programs serve as proof of concept, validating the effectiveness of the model and providing indications for further optimisations. Key components of the pilot phase also include digital literacy programs, also targeting local population (Romer-Paakkanen & Suonpaa, 2023) to ensure the possibility to implement also technological solutions such as NFTs or AR. The pilot implementations include close monitoring and evaluating activities using both quantitative and qualitative metrics, such as numerosity of job creation, tourist footfall, digital tool adoption rates, and stakeholder feedback.

The proof of concept necessitates both short- and medium-term research efforts to ensure sustainable and positive effects in the long run. In further developments, it is necessary to continuously improve the management of sustainable development of rural areas following community-based tourism (Candeloro & Tartari, 2025) also considering that tourism becomes an inherent element of rurality in peripheral areas of Europe (Ruiz-Ballesteros and Gonzalles- Portillo, 2025).

More in general, a phased approach allows for the continuous evaluation of implemented strategies, facilitating necessary adaptations and optimizations to maximize long-term regional development outcomes. In fact, the framework is not aimed at analysing the current situation but rather a proposal for an EU-funded project designing a development path. For this reason, long-term monitoring is essential for assessing its impact and effectiveness as well as revisions of the model to ensure continuous improvement and optimization of the framework in achieving competitive advantages of multiplying results.

CONCLUSION

This paper outlines the conceptual framework of a multidisciplinary research initiative designed to address the economic revitalization of peripheral regions undergoing severe demographic decline, particularly the outmigration of working-age populations, economic stagnation and decline. Building upon established theories of regional disparities (Rodríguez-Pose, 2018), the project aims to formulate a replicable model for socio-economic recovery by strategically leveraging endogenous resources and promoting sustainable development pathways. The research consortium brings together academic institutions across Europe. By integrating methodological approaches from Economics, Econometrics, Tourism, Agriculture, Entrepreneurship, Technology, Law, and Cognitive Psychology, the project embodies the interdisciplinary nature of contemporary regional development studies, ensuring a holistic analysis of territorial resilience and growth potential.

The revitalization of peripheral regions requires an integrated approach that balances economic incentives, infrastructure development, and demographic policies. The authors argue that by following a framework that indicates how to proceed to value local resources the most and detect pitfalls in services, infrastructure, digital needs and mobility, it is possible to create a self-reinforcing ecosystem that attracts and retains residents.

The hypothesis is that addressing the demographic and economic decline of peripheral regions requires a comprehensive and multi-dimensional approach that integrates economic, social, and digital strategies.

The suggested strategy states that, by reinforcing the extremes of the demographic curve, that is targeting both the elderly and children, peripheral regions can create a balanced ecosystem that fosters long-term stability. Supporting the claim, this approach has already been successfully implemented in case studies such as Lika-Senj County in Croatia, where policies promoting intergenerational solidarity have been central to regional revitalization efforts (Tonković, 2019), see Lika Quality[1] (a regional quality system of food, drinks and souvenirs) and the project of integral economic development INTEGRA LIKA 2020.

Also, by integrating digital innovation with traditional economic practices, the framework provides a scalable and adaptable model for economic recovery in peripheral regions.

The proposed framework has significant policy implications at both single-nations and pan-European levels. Beyond regional applications, this framework contributes to broader European economic cohesion by addressing disparities between urban and rural areas, consequently enhancing resilience, fostering inclusive growth and reducing regional inequalities (McKay et al., 2023).

Further investigations will test the developed model through pilot implementations in selected peripheral regions, employing a mixed-methods approach to evaluate its effectiveness. Quantitative metrics—such as job creation rates, demographic shifts, and digital tool adoption—will be paired with qualitative stakeholder feedback to assess socio-economic impact. However, the integration of innovative technologies like NFTs and AR (highlighted in the framework) may face significant constraints, including insufficient digital literacy among rural populations, inadequate broadband infrastructure (linked to the 'digital divide' discussed in the Literature Review), and resistance to change in traditional sectors. The paper further underscores the need for tailored digital literacy programs (e.g., training local artisans to tokenize cultural assets) and phased technological rollouts to address these gaps. Additional limitations could stem from external factors such as EU funding dependencies, policy fragmentation across regions, or mismatches between technological solutions and local cultural practices (e.g., NFTs for non-commercial heritage). Rigorous monitoring and iterative co-design with communities will be essential to mitigate these challenges and ensure the model's long-term viability.

Concluding, this paper serves as a preliminary presentation of the proposed conceptual framework for revitalizing peripheral and rural areas. It aims primarily to underscore the necessity of coordinated and multidisciplinary research efforts to address the complex challenges of demographic decline, economic stagnation, and infrastructural deficiencies. By outlining key strategies and leveraging digital innovations, the framework establishes a foundation for further investigations.

Future research will focus on the structured implementation of the proposed framework, providing a proof of concept for its practical applicability. This will serve as a foundation for subsequent empirical evaluations of the adopted strategies, allowing for rigorous comparative analyses across different regional contexts. Furthermore, it will facilitate a deeper investigation into the role of digital innovations in fostering rural development. By strategically integrating technological advancements, structural interventions, improved mobility solutions, and the valorisation of local resources with community-centred policies, this approach aims to effectively mitigate demographic decline and support the long-term sustainability and prosperity of rural regions.

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