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Demographic Oases in Shrinking Rural Areas: Exploring Trends in Galicia (Spain) and Northern Portugal

Oasis demográficos en áreas rurales en declive: explorando tendencias en Galicia (España) y el Norte de Portugal

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Abstract

Despite their similar characteristics and shared challenges, Galicia and Northern Portugal are integrated into distinct national urban systems and have followed different territorial cohesion

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approaches. This study compares these regions to analyze their demographic dynamics and identify territories that exhibit resilience towards severe rural depopulation. Our findings reveal that both regions are intersected by the same Atlantic Urban Axis, where the highest population volumes and densities are concentrated. In contrast, the rural interior of the study area is experiencing strong and continuous demographic loss. However, upon examining demographic trends, alongside key socioeconomic indicators at a fine scale, we identify areas within predominantly rural regions that demonstrate resilience to decline. We termed them *demographic oases*. Our results indicate that the origins of these *demographic oases* are diverse —stemming from economic, administrative, and infrastructural factors— and, collectively, they play a crucial role in supporting their surrounding communities. Political approaches to territorial cohesion must acknowledge the significance of these *oases,* as their numbers are declining and they are essential for the sustainability of rural areas in both regions.

Key words: territorial inequalities; rural shrinking; urban systems; small towns.

Resumen

A pesar de sus características similares y desafíos compartidos, Galicia y el Norte de Portugal están integrados en distintos sistemas urbanos nacionales y han seguido diferentes enfoques de cohesión territorial. Este estudio compara estas regiones para analizar sus dinámicas demográficas e identificar territorios que muestren resiliencia frente a la severa despoblación rural. Nuestros hallazgos revelan que ambas regiones están atravesadas por el mismo Eje Urbano Atlántico que concentra los mayores volúmenes y densidades de población. En contraposición, el interior rural del área de estudio experimenta una fuerte y continua pérdida demográfica. Sin embargo, al examinar las tendencias demográficas, junto con indicadores socioeconómicos clave a una escala detallada, identificamos áreas dentro de las regiones predominantemente rurales que muestran resistencia al declive. Las denominamos *oasis demográficos*. Nuestros resultados indican que los orígenes de estos *oasis demográficos* son diversos –derivados de factores económicos, administrativos e infraestructurales– y, colectivamente, juegan un papel crucial en el apoyo a sus comunidades circundantes. Los enfoques políticos de cohesión territorial deben reconocer la importancia de estos *oasis*, ya que su número está disminuyendo y son esenciales para la sostenibilidad de las áreas rurales en ambas regiones.

Palabras clave: desigualdades territoriales; declive rural; sistemas urbanos; pequeñas ciudades.

1 Introduction

Many economic and social changes have contributed to make some territories more attractive for living than others. Across different European countries, well-connected urban areas offer more opportunities to work, study and socialize than less accessible towns and villages. A collateral effect of this phenomenon is the economic and social shrinkage of peripheral territories and the increase in urban-rural divide. Over the last decades, we have witnessed rising demographic and economic imbalances across space. Rural depopulation and economic deactivation have been persistent issues in Europe, and despite decades of varied policy approaches, it now appears to have reached an irreversible stage. Concurrently, the economic, environmental, political, and well-being ramifications of these growing imbalances are more evident than ever. In the context of the Iberian Peninsula, terms like *España vacía/vaciada* ("empty Spain") or *país sonolento* ("sleepy country") in Portugal have become part of narratives highlighting the peripheral status of territories marked by declining populations, aging demographics, low population densities, and diminishing economic vitality, along with reduced accessibility to essential services. However, within this landscape, there are enclaves of resilience that continue to thrive, serving as beacons of hope amidst a vast territory increasingly forsaken by both inhabitants and economic activity.

Spain and Portugal urban systems have experienced border blurring and the promotion of common development axes since their integration into the European Community in 1986, among which is the Atlantic Urban Axis. Since the 1980s, there has been a significant increase in the concentration of human population and economic activity along this longitudinal axis composed by cities and towns located along the Atlantic coastal line. This phenomenon has significantly impacted the demographic dynamics of Galicia and Northern Portugal. The areas within this axis have witnessed robust economic and social vitality, in stark contrast to the inland regions struggling with high depopulation rates, where only a few territories serve as dynamic poles.

While at first glance, Galicia and Northern Portugal may exhibit many demographic similarities, the fact that they are integrated into two states with distinct urban system development trajectories and different policy approaches to territorial cohesion has resulted in differing demographic evolutions (Lois-González, 2004). Despite their differences, both Portugal and Spain stand out as two of the most severely affected countries by demographic loss in shrinking regions in Europe (ESPON, 2020).

Galicia and Northern Portugal are recognized for their strong and long-standing cross-border relationship, marked by ongoing cooperation (Trillo-Santamaría, 2014). Together they form a

Euroregion where cooperation is used as a strategy for the vitalization of territories. As in many other European contexts (ESPON, 2021), the lack of harmonized indicators and comparable information between states presents significant obstacles to the promotion of these cross-border cooperation dynamics, particularly in data collection and evidence-based policymaking. Given the shared demographic challenges faced by Galicia and Northern Portugal and the influence of the Atlantic Urban Axis that links both regions, this study aims to identify areas of demographic resilience within the predominantly rural NUTS 3 (European Nomenclature of Territorial Units for Statistics level 3) regions of this Euroregion. By analyzing demographic trends and key socioeconomic indicators, we aim to locate and classify *demographic oases* —territories that exhibit resilience to rural depopulation and socioeconomic decline. Identifying these resilient areas is essential for sustaining the vitality of economically depressed regions, as they foster unique socioeconomic dynamics that contribute to regional stability. To achieve this, a comprehensive study is conducted, examining a range of demographic and economic variables at a fine spatial scale, derived from census data from both Portugal and Spain for the period 2001 to 2021. This approach involves constructing specific indicators and applying cartographic techniques to map and visualize evolving spatial patterns, offering both visual and analytical insights into these dynamic trends.

This paper is structured as follows: it commences with a literature review aimed at examining diverse definitions of rural spaces and associated concepts. Subsequently, case studies centred on Galicia and Northern Portugal are introduced, accompanied by a detailed description of the methodological approach employed in the study. Following this, the analysis presents and interprets the research findings. Finally, the paper concludes by contextualizing the results within the existing body of research, debating their implications, and presenting the key findings.

2 Literature review

2.1 Delimitation of rural areas

Understanding demographic change trajectories of our societies necessitates grasping a fundamental concept: rural areas. In Europe, until the second half of the 20th century, a marked difference between rural and urban areas could be observed (Kayser, 1990). The former was almost perfectly associated with agricultural activity, while the latter was characterized by high artificialization of the land and high population densities. In recent decades, the delineation of rural and urban areas has become increasingly intricate, with blurred boundaries challenging clear identification and resulting in confusion (Hoggart & Paniagua, 2001; Halfacree, 2011).

In the absence of a universally recognized definition for rural areas, national governments adopt diverse criteria for their classification (Esparcia et al., 2017). Usually, this classification relies on demographic factors like lower populations and densities within local administrative units (Molinero & Alario, 2019). However, the considered intervals vary greatly depending on each country. This leads to considering very different areas as "rural", ranging from 30,000 inhabitants in Japan to 300 in Sweden per municipal area (Instituto Geográfico Nacional, 2023). In the case of Spain, the INE.es[1] considers municipalities with fewer than 2,000 inhabitants as "rural", those with more than 10,000 as "urban", and those between 2,000 and 10,000 as "intermediate". In Portugal, the INE.pt distinguishes between "predominantly urban areas" (APU), which are defined by factors such as having more than 5,000 inhabitants or a majority urban space, "moderately urban areas" (AMU), which include locations with 2,000 to 5,000 inhabitants, and "predominantly rural areas" (APR), which register values below 2,000 inhabitants.

Regarding the demographic density criterion, the most recognized and used classification method at the international level is defined by the Organisation for Economic Cooperation and Development (OECD) (2006), which considers rural areas to be those with low densities, that is, those that do not exceed 150 inhabitants/km^2. At the regional scale, EUROSTAT, the statistical office of the European Union, considers a region as "predominantly rural" when over 50% of its inhabitants reside outside urban clusters, defined as contiguous groups of 1 km^2 grid cells hosting a population density exceeding 300 inhabitants per km^2 and encompassing a minimum of 5,000 individuals. Regions exhibiting rural demographics ranging from 20% to 50% are categorized as "intermediate", and those registering less than 20% of the population living in rural areas are classified as "predominantly urban" (EUROSTAT, 2019).

The diverse range of indicators employed reflects the challenge in establishing a definitive threshold to demarcate rural areas. Scholars like Sancho & Reinoso (2012) indicate that demographic criteria face two other main problems. On one hand, establishing the administrative area of reference, which depending on the territories can vary greatly in scale. They argue that the representativeness of population density is highly conditioned by the extent of the political-administrative unit used. And on the other hand, considering the location, in the sense that two nuclei with the same number of inhabitants do not necessarily have the same rural character. In the

1 INE.es is the National Statistics Institute of Spain (Instituto Nacional de Estadística). The other two major statistical agencies used in this study are the National Statistics Institute of Portugal (INE.pt, Instituto Nacional de Estatística) and the Galician Institute of Statistics (IGE, Instituto Galego de Estatística).

context of the Iberian Peninsula, Esparcia et al. (2017) articulate some issues derived from the singularity of the municipal map itself, such as regional diversity in relation to its settlement structure.

Another criterion commonly considered in the definition of rural areas relates to the main economic activity of the population (Reig et al., 2016). Traditionally, it was considered significant for rural territories that the population was mostly employed in the agricultural sector. Currently, although this criterion has lost its original importance as an indicator of the rurality of the territory, its relatively high presence remains a characteristic and quite defining aspect of rural areas. However, the number of indicators used to define rural areas can be very diverse: demographic dynamism, age groups, indices of childhood and old age, migratory movements, income level, level of education, accessibility to urban centres, land use, political-administrative capital condition, among others (Reig et al., 2016; Miranda-García et al., 2019). Paniagua (2004) and Sancho & Reinoso (2012) highlight the importance of using traditional indicators to characterize rural areas, such as the population's strong connection to its environment, reflected in local identity and culture, and the strong social bonds within small, stable communities.

For Molinero (2019), the combined use of several indicators can be effective on the path to a better definition of rural areas. Thus, for example, the combined use of volume and population density indicators allowed, within the European context, to exclude from the rural category those peri-urban areas that did not reach the minimum demographic threshold but did have high densities. Esparcia et al. (2017) advocates that rural areas are more defined by their contrast with urban areas than by their own nature, which means that areas that do not have clearly urban characteristics are considered rural. Rural areas are thus defined almost as "urban area discard".

2.2 Diversity of rural areas

The rural world is not uniform, as rurality presents two antagonistic realities (Cunha, 2004; Carmo, 2013; Johnson & Lichter, 2019; Li et al., 2019; Molinero, 2019; Molinero & Alario, 2019; Silva et al., 2022). On one hand, there is a declining rural area from a demographic, economic, and social point of view, and on the other hand, there is a vibrant rural area that is capable of growing —or at least maintaining itself. Both "types" of rural areas have almost opposite characteristics.

Rural territories experiencing depopulation and abandonment coincide with those with more regressive demographic indicators (Esparcia et al., 2017; Molinero, 2019). These rural territories losing population are characterized by negative demographic dynamics, lower demographic volume, lower population densities, loss of young people, and pronounced aging with a consequent decrease in birth rates, low education levels, decline and lack of diversification of

economic activity, greater relative importance of agriculture, loss of services, infrastructure, and facilities, difficulty in maintaining social relationships, deterioration of local culture, etc.

The lack of opportunities in rural areas triggers migratory flows to cities, which in some cases lead to the extreme result of abandoned villages. Since approximately the 1960s, the rural space of most of the European continent has been marked by a large exodus characterized by a continuous and profound emptying of the countryside. This exodus was a direct consequence of a change in the economic model from traditional agriculture to an industrial society (Pinilla & Sáez, 2021). Moreover, one must consider the dominant imaginary of the time that associated progress and quality of life with urbanity (Tomé-Martín, 2020). Currently, migration of the population from rural areas to cities remains predominant. Cities are seen as places offering greater job opportunities, higher wages, and a richer social life (Collantes & Pinilla, 2019; Pinilla & Sáez, 2021). Today, in addition to the already mentioned deagrarianization[2] of the countryside, other factors contribute to permanently expelling the population from rural areas: lack of accessibility, both physical and telematic; reduction of economic and entrepreneurial vitality; and depletion of services linked to population loss (López-Laborda & Salas, 2002; Miranda-García et al., 2019; Goerlich et al., 2020). Demographic loss in rural areas also negatively affects many other domains such as the preservation of cultural heritage or the environment (Plaza-Gutiérrez, 2006; Grau & Aide, 2007; Filipe & De Mascarenhas, 2011).

Negative demographic dynamics are interpreted by Sá-Marques et al. (2021) as difficult to reverse, as they involve strong and continuous losses —over several decades— in fragile areas. In the Spanish context, this situation led to referring to the depopulation suffered by these territories in different ways: "irreversible depopulation" (Recaño, 2017), "severe depopulation" (Comisionado del Gobierno Frente al Reto Demográfico, 2019) or "extreme depopulation" (Gómez-Villarino & Gómez-Orea, 2021). From a demographic point of view, these areas share low to very low population densities. The *General Guidelines of the National Strategy Facing the Demographic Challenge* elaborated by the Government of Spain indicate population densities lower than 8 inhabitants/km^2.

On the other side of the scale, opposite of these territories of depopulation, the dynamic rural area is identified, capable of maintaining or even growing its population. Wood (2008) and Li et al. (2019) identify two types of rural areas that do not decline demographically and economically: a)

2 In the context of our research work, we understand deagrarianization as "(...) the loss of centrality of agrarian activity as the economic basis of societies, and it refers especially to the dissolution of the directing role that it has had for the organization of rural life and in the configuration of the social structures of said areas" (Camarero, 2017, p.165).

those near large cities and metropolitan areas; and, b) those farther from large cities with self-sufficient processes. In the case of the Iberian Peninsula, Bigotte et al. (2019) and Molinero (2019) identify a third type of dynamic rural area: c) coastal and littoral spaces.

Rural areas near major urban agglomerations experience demographic growth processes, high volumes and population densities, rejuvenated and diversified economies, and a high presence of services (Wood, 2008; Li et al., 2019). These are traditional rural spaces that have been captured by the urbanization process as a result of improvements in communications and transportation. However, scholars like Entrena (2005) argue that it is more appropriate to speak of peri-urban, rur-urban, or suburban areas rather than strictly rural territories, as their dynamics and functions are part of the city.

Outside the influence area of major urban centres, in properly rural spaces, in addition to territories of depopulation and demographic decline, it is also possible to observe some areas of certain demographic and economic vitality. These are rural areas that base their demographic growth —or stability— on endogenous and self-sufficient processes in which there is still a certain industrial and market strength (Wood, 2008; Li et al., 2019). However, Davoudi & Stead (2002) point out that rural communities have never been independent and separate societies, but there have always been certain links and relationships of interdependence with cities. Bayona-Carrasco & Gil-Alonso (2010) and Collantes et al. (2010) also observe that their positive demographic vitality may be due to immigration flows to these territories.

These spaces coincide with small population settlements whose demographic dynamism obeys various reasons (Rodríguez-González, 1997; Zuzańska, 2007; Vaishar & Zapletalová, 2009; Barreiro-Quintáns et al., 2019). Mainly, they are nuclei providing services, employment, and social contacts, not only for their own residents but also for the rural environment around them. Vaishar & Zapletalová (2009) indicate that these small towns and their rural hinterland are inseparable, so the existence of these nuclei with positive demographic dynamics is functionally linked to their rural environment, forming a "functioning market on the basic level". Several academics observe a direct relationship between these nuclei and their rural environment so that if depopulation worsens across these rural territories, the service functions they are assigned will deteriorate (Escalona-Orcao & Díez-Cornago, 2003; Wojewódzka, 2019; Álvarez-Lorente et al., 2020; Józefowicz, 2022).

Another group of these small nuclei are those specialized in some economic activity, usually industry or tourism, around which their positive demographic behaviour revolves (Zuzańska, 2007). There is also a group of small towns whose demographic vitality is due to their status as the political-

administrative capital of a certain territorial level. These rural poles of resistance hold significant importance within rural regions.

3 Research methodology

3.1 Case studies

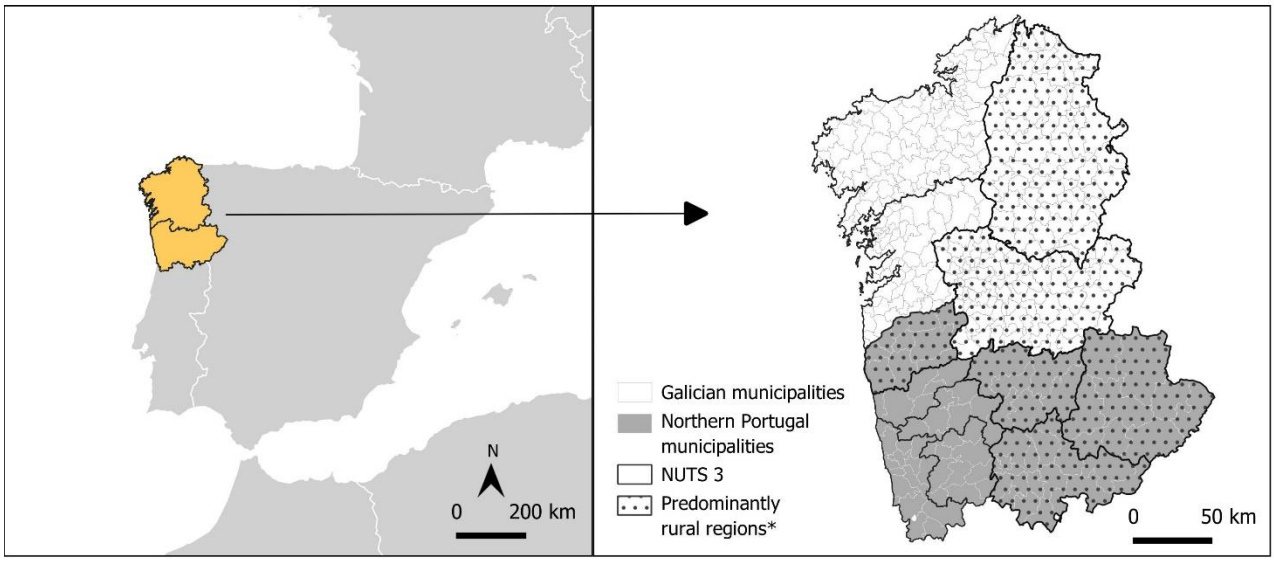
Our analysis is centred on the territories situated in the northwest region of the Iberian Peninsula, specifically encompassing the Autonomous Community of Galicia in Spain and the Planning Region of Northern Portugal, as is presented in Figure 1. Galicia spans 29,577 km^2 and is home to approximately 2.69 million inhabitants (IGE, 2022). Administratively, this Autonomous Community is divided into four provinces corresponding to NUTS 3 regions: A Coruña, Lugo, Ourense, and Pontevedra. It comprises 313 municipalities and 3,771 parishes. Northern Portugal covers an area of 21,278 km^2 and accommodates around 3.63 million people (INE.pt, 2022). This Planning Region is divided into eight NUTS 3 regions: Alto Minho, Alto Tâmega, Área Metropolitana do Porto, Ave, Cávado, Douro, Tâmega e Sousa, and Terras de Trás-os-Montes. It is organized into 86 municipalities, with 1,426 parishes serving as the smallest level of administration.

Despite sharing late urbanization processes compared to the rest of Europe, Portugal and Spain historically followed very different economic and political paths, which explains why, despite some similarities, their territorial structures are distinct today. If we consider the process of industrialization and urbanization experienced between the 19th century and the first half of the 20th century, we see that while Spain concentrated its economic growth throughout the coastal area or in important urban axes, such as Valladolid-Burgos and Madrid-Zaragoza, Portugal opted for a simpler urban growth, highlighting Lisbon and Porto as centres of demographic and economic concentration (Lois-González, 2004). Currently, the tendency of Portuguese "litoralization" is much more pronounced than in Spain. In addition to the coast, the greatest growth in both territories is occurring in the outskirts of major cities, which are commonly referred to as peri-urban, rur-urban, or suburban areas (Zoido & Arroyo, 2003).

The Northern Portugal region has a polycentric urban system and a littoral area where a multitude of regional and national functions are concentrated, and where population densities reach high levels (Direção Geral do Território, 2018). However, the entire system is polarized by the Metropolitan Area of Porto (AMP) with 1.74 million inhabitants, approximately 50% of the region's population. In the region, there are other municipalities of reference such as Braga, which together with Guimarães, Famalicão, and Barcelos form a node of strong urban dynamics and economic polarizing capacity. Also, Viana do Castelo stands out as an important link in the Atlantic Urban

Axis. Further inland, municipalities like Vila Real, due to its strategic location and the important integration it develops between a strongly rural economic base and the university, are connected to Bragança, Chaves, Lamego, and Régua. The strength and prominence that the area surrounding the city of Porto has within the North is evident, with its economic and demographic dynamism particularly potent, differentiating itself from an interior undergoing emptying and devitalization (Comissão de Coordenação e Desenvolvimento Regional do Norte, 2013).

Figure 1. Galicia and Northern Portugal administrative map



Source: produced by the authors

The territorial articulation of Galicia is also defined by different growth on the coast and in the interior (Lois-González & Piñeira-Mantiñán, 2011). The formation in the western part of the Atlantic Urban Axis began to accumulate most of the population and economy of the entire Galician region. Galicia is defined by seven major cities: A Coruña, Ferrol, Lugo, Ourense, Pontevedra, Santiago, and Vigo, and many small cities (around 50) which in no case have more than 20,000 inhabitants. The cities of A Coruña to the north and Vigo to the south of the Atlantic Urban Axis are the major demographic and economic hubs of the region. The former forms a metropolitan area with Ferrol, while the latter forms its own with Pontevedra, both reaching population volumes of half a million inhabitants. The remaining three cities, Lugo, Ourense, and Santiago, function as second-tier cities, but with an important role in the articulation of the territory. Thus, Santiago, located within the Atlantic Urban Axis, is the political capital of the region, while Lugo and Ourense, the only ones that fall outside this Urban Axis, organize all the interior and rural space of Galicia.

In recent decades, Northern Portugal and Galicia have witnessed a process of attractiveness of urban areas and the concomitant concentration of people, while rural areas continue to depopulate, resulting in a highly segmented regional territory. In Northern Portugal, according to demographic projections by the INE.pt, between 2020 and 2040, a loss of over 274 thousand inhabitants is expected, with a decrease of 14% in the young population (under 15 years old), 15% in the adult population (between 15 and 64 years old), and an increase of 13% in the elderly population (over 65 years old). Similarly, Galicia presents a demographic future marked by three facts: aging, depopulation, and desertification, which do not seem to be reversing due to the growing urban immigration process recorded in recent decades. Both projections point to an accentuation of disparities between urban and rural areas, as well as a territorial imbalance between low population density areas and the rest of the region.

3.2 Data collection and analysis

Data collection and analysis for this study aimed to comprehensively evaluate the sociodemographic dynamics within the study area. Three temporal periods, 2001, 2011 and 2021, were selected to capture demographic changes over the past two decades. The choice of 2021 aligned with the most recent publication of demographic censuses for both Spain and Portugal. Official sources such as the statistical national institutes were used to collect the demographic and socioeconomic data. Through this analysis, we aimed to identify territories at higher risk of depopulation and aging, as well as those displaying demographic and socioeconomic vitality. The indicators utilized for constructing the database are detailed in Table 1.

Data were examined at both parish and municipal levels. Parishes were chosen for their proximity to the territory and its citizens, while municipalities provided more comprehensive statistical information. Adjustments were made to 2001 and 2011 parish-level data for Portugal to account for administrative reorganization in 2013, ensuring comparability with 2021 figures. Official data sources utilized include the Instituto Nacional de Estadística (INE.es), Instituto Nacional de Estatística (INE.pt), and Instituto Galego de Estatística (IGE). The challenge of comparing demographic data across different states due to the use of different methodologies and potential discrepancies in census years has been acknowledged (Lukić et al., 2012).

Table 1. Demographic and socioeconomic indicators employed

Indicator	Definition	Adm. unit
Population	Number of inhabitants in 2021	Parish
Population density	Relationship between the number of inhabitants in 2021 and the surface (inhabitants/km^2)	Parish
Population change I	Population changes between 2001 and 2021 (%)	Parish
Population change II	Population changes between 2011 and 2021 (%)	Parish
Young population	Population under 20 years old as a percentage of the total population in 2021 (%)	Municipality
Elderly population	Population over 65 years old as a percentage of the total population in 2021 (%)	Municipality
Net migration rate	Difference between the number of immigrants and emigrants in relation to the total population in 2011	Municipality
Employed population in the primary sector	Employment in the primary sector as a percentage of the total employed population in 2021 (%)	Municipality
Employed population in the tertiary sector	Employment in the tertiary sector as a percentage of the total employed population in 2021 (%)	Municipality
Public emergency medical service	Public medical facilities with emergency services	Parish/ Municipality

Source: produced by the authors

The majority of the indicators have been analyzed using the most recent data in both countries, the 2021 census. However, the net migration rate was analysed using data from the 2011 census, with the primary aim of measuring the impact of the 2008 economic crisis. Employment data by economic sector were obtained from quarterly records of Social Security affiliations in Galicia. In Portugal these data were obtained from the Labour Force Survey, provided by Statistics Portugal based on the economic sector (CAE REV.3), which classification coincides with the Spanish equivalent. The locations of public healthcare centres were obtained from databases provided by the Servicio Galego de Saúde (SERGAS) for Galicia and the Sistema Nacional de Saúde (SNS) for Portugal.

In the second section of results, the *demographic oases* are presented. Their identification was based on the following criteria applicable to the parish level, both in Galicia and Northern Portugal:

- Population exceeding 1,000 inhabitants (in 2021);
- Distance exceeding 20 km from cities with populations over 50,000 inhabitants;

- Demographic variation between 2001 and 2011 more positive than the average in its respective NUTS 3 region;
- Demographic variation between 2001 and 2021 more positive than the average in its respective NUTS 3 region;
- Exhibiting a demographic variation not exceeding -10% negatively in both the 2001-2021 and 2011-2021 periods.

As we will see below, the *demographic oases* presented do not form a homogeneous group. For this reason, we found it appropriate to distinguish between "more dynamic" and "less dynamic" *demographic oases*. To make this classification, in addition to considering the demographic variation between 2001-2021 and 2011-2021, other indicators have been incorporated. Specifically, we considered the ratio of young population (under 20 years old), elderly population (over 65 years old) and net migration rate. These values were compared against the NUTS 3 regional averages, with a focus on identifying areas where at least two of these three variables were below the regional average.

4 Results

Galicia and Northern Portugal form a space with significant demographic similarities. The highest volumes, densities, and population growth are found in the western part, while the interior is characterized by a vast demographic void where depopulation, low densities, and aging prevail (Lois-González, 2004). However, this duality also encompasses distinct differences and varied situations within each region, as highlighted by the results of our analysis.

4.1 The Atlantic Urban Axis and the interior periphery

At first glance, Figure 2 and Figure 3 show an uneven distribution of the population across both regions. The results confirm that the highest volumes are found in the western part of the study area, in the so-called Atlantic Urban Axis; that is, from north to south: a) the metropolitan area of A Coruña-Ferrol, b) Santiago de Compostela and the Arousa ría, c) the metropolitan area of Vigo-Pontevedra, d) Viana do Castelo and its bordering towns, e) Braga and Guimarães, and f) the greater metropolitan area of Porto, which extends inland. It is also around these areas are found. Also along this Urban Axis are the main cities of the study area: A Coruña, Braga, Vigo, and especially Porto, where densities exceed 1,000 inhabitants/km^2.

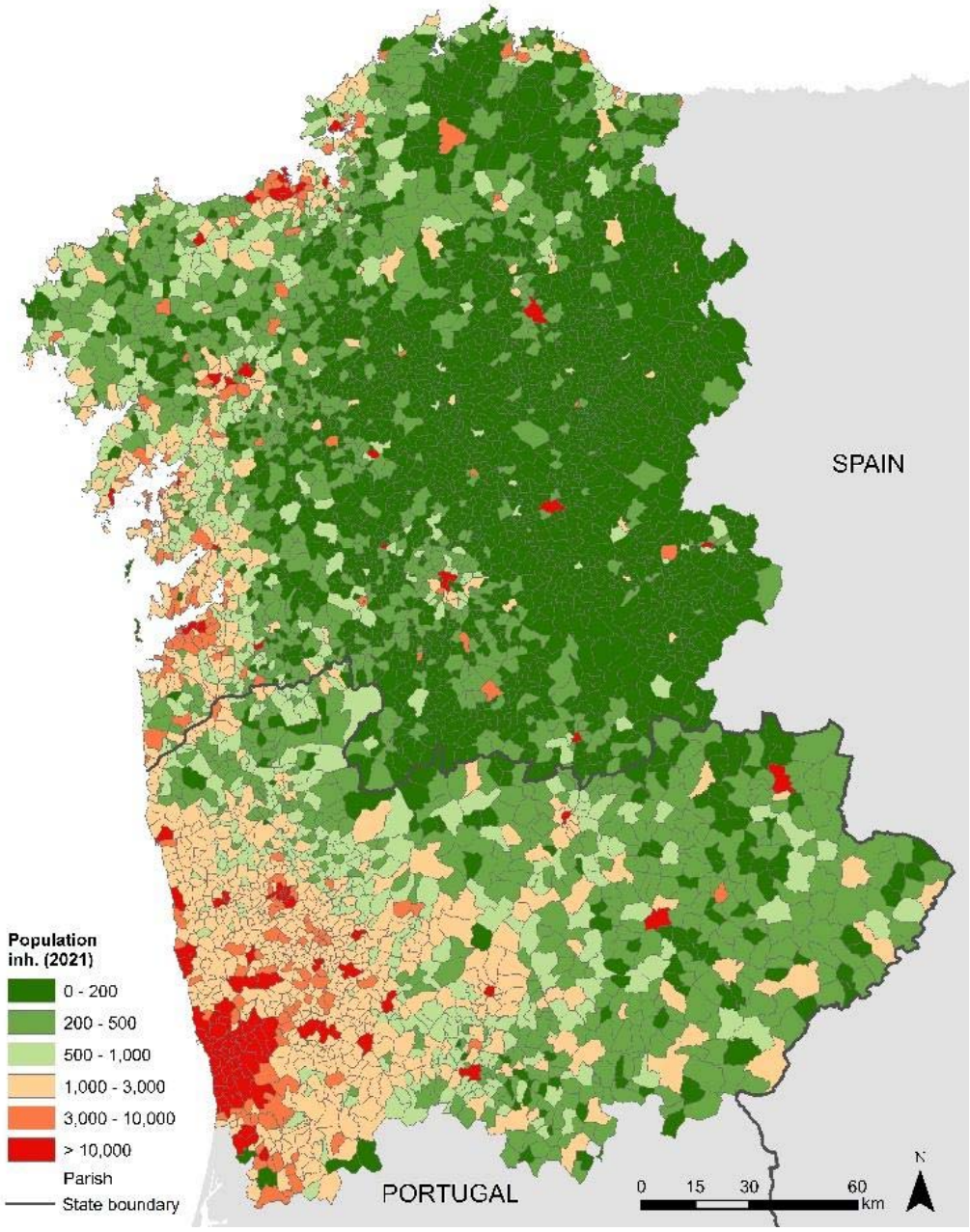
Conversely, in the interior, the study area is predominantly characterized by sparsely populated regions. The geographic distribution of the population shown in Figure 2 reveals that population is more pronounced in Galicia than in Northern Portugal. Approximately 40% of Galician parishes contain fewer than 100 inhabitants, whereas in Northern Portugal, this level is observed in only one parish. However, it is important to note that the average size of parishes varies significantly between these regions, with Galician parishes spanning 7.8 km^2 on average, compared to 14.9 km^2 in Northern Portugal. Additionally, it is worth highlighting that within the interior of the study area are the cities of Lugo and Ourense in Galicia, as well as Bragança and Vila Real in Portugal, which are key urban centres in these regions due to their administrative significance.

The lowest densities (below 50 inhabitants/km^2) coincide with those most territories sparsely populated in the interior of the study area (Figure 3). Densities that are extremely low (below 10 inhabitants/km^2) are identified in the interior of the border area between Galicia and Portugal, and in the border between these regions and the rest of Spain. These low densities coincide with a more rugged terrain and their greater distance from major cities.

Taking an evolutionary perspective, we analyze the demographic variation between 2001 and 2021 (Figure 4). Parishes exhibiting a positive demographic change over the analyzed 20-year period are scarce, accounting for only around 19% of total parishes in Northern Portugal and 12% in Galicia. A positive demographic clustering of parishes in the areas closest to the main cities can be observed.

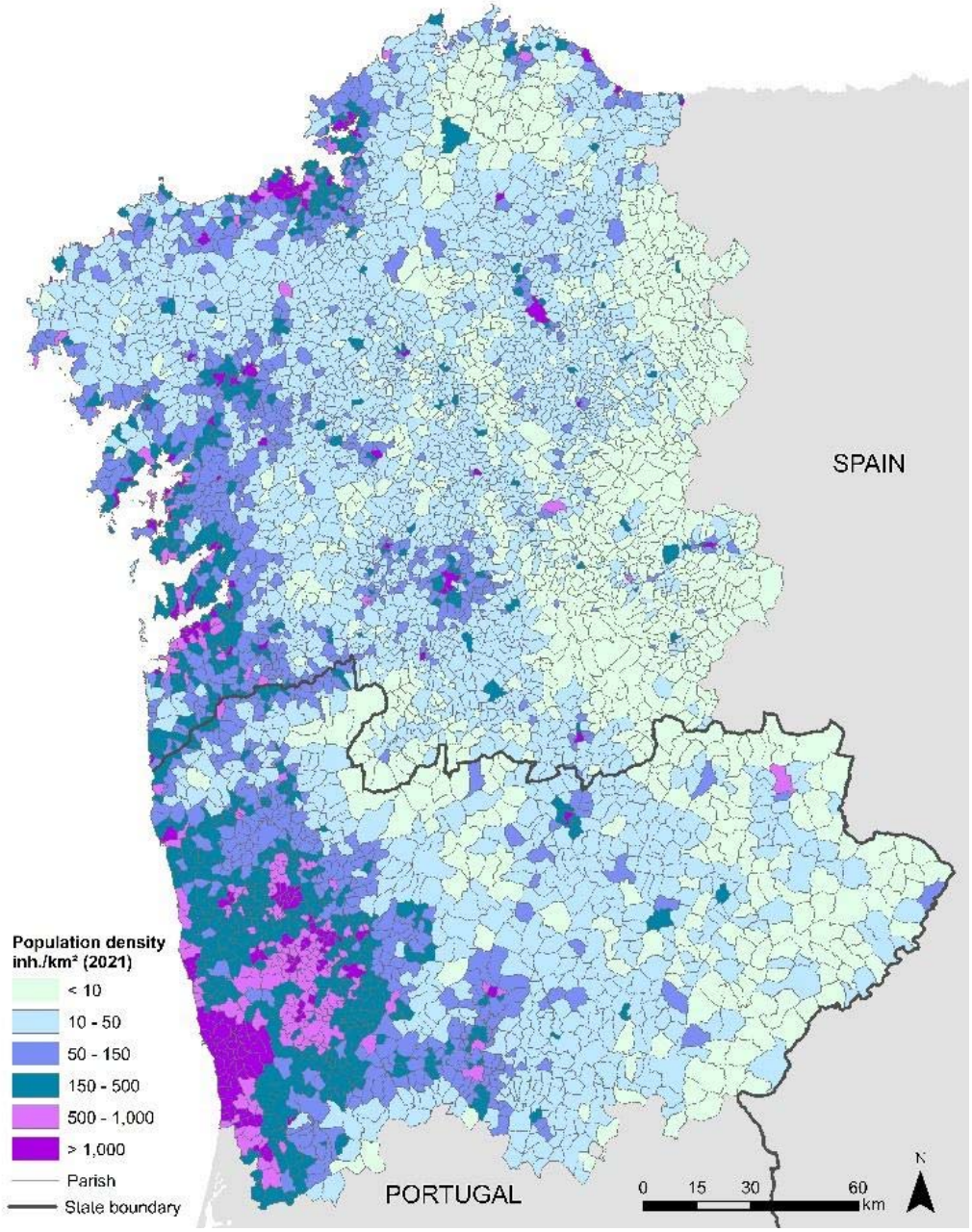
Demographic variation also allows us to reinforce the dichotomous situation between a rural and depopulated interior and an urban and high-density coast. On the one hand, territories that gain population (or lose less than -10%) coincide with the most densely populated coastal areas. Certain enclaves in the interior that stand out in a strongly depopulated environment also present a positive or stable demographic dynamic. It should be noted that some of the demographically dynamic enclaves present in regressive rural areas are not significant, especially on the Galician side, as they are parishes with very low population volumes —sometimes, less than 10 inhabitants. And, on the other hand, the territory studied loses population intensely and constantly. Population loss is greater in inland areas, where 24% of parishes in Northern Portugal and 48% in Galicia have lost more than 30% of the population between 2001 and 2021.

Figure 2. Population distribution (2021), at the parish scale



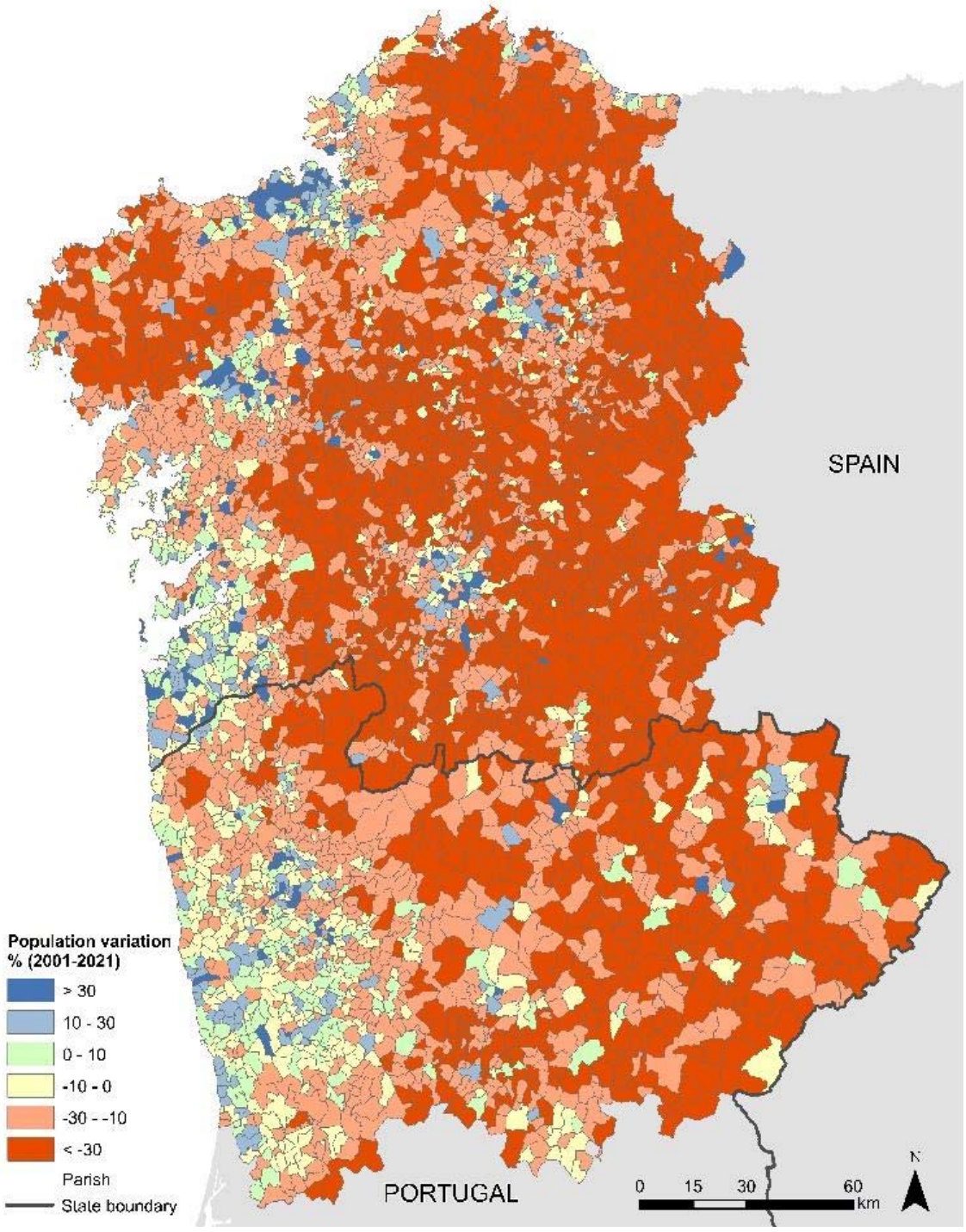
Source: produced by the authors based on data from INE.pt and IGE

Figure 3. Population densities (2021), at the parish scale



Source: produced by the authors based on data from INE.pt and IGE

Figure 4. Population variation between 2001 and 2021, at the parish scale

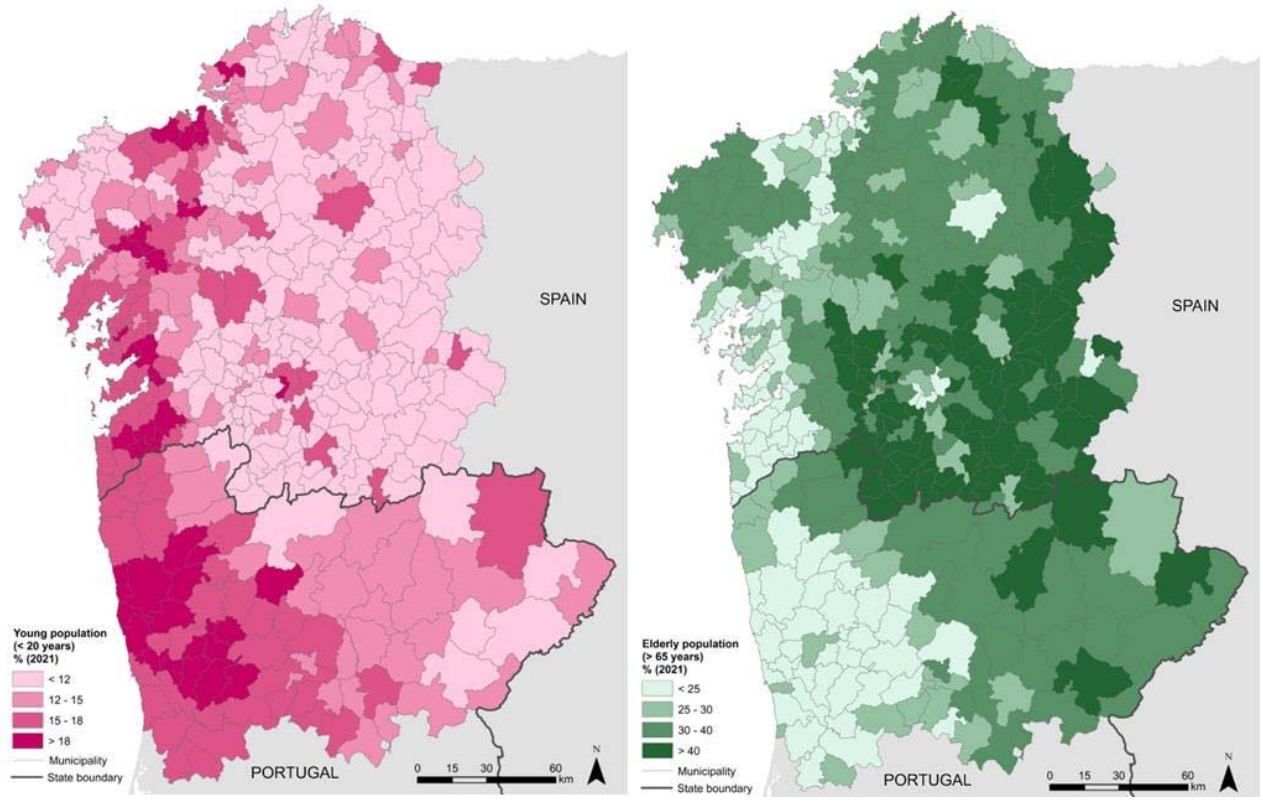


Source: produced by the authors based on data from INE.pt and IGE

Another indicator that allows us to perceive the demographic differences in the study area is the population structure by age (Figure 5). The youngest and least aged population is concentrated in coastal and littoral areas: around the metropolitan area of Porto and in the western part of the provinces of A Coruña and Pontevedra. Likewise, in the interior, several municipalities with relatively young populations can be noted.

In general, in the interior, the population is older, causing the few births not to compensate for the high number of deaths. In a good number of municipalities, especially on the Galician side, practically half of the population is over 65 years old. However, if we compare the situation between both regions, we see that the dynamics are more favourable on the Portuguese side than on the Galician side. In Galicia, 63% of municipalities have less than 15% young people and more than 30% older people. In Northern Portugal, municipalities with less than 15% young people and more than 30% older people represent 35% of the total, although here, the municipal terms are more extensive than on the Galician side.

Figure 5. Proportion of young and aging population (2021), at the municipal scale

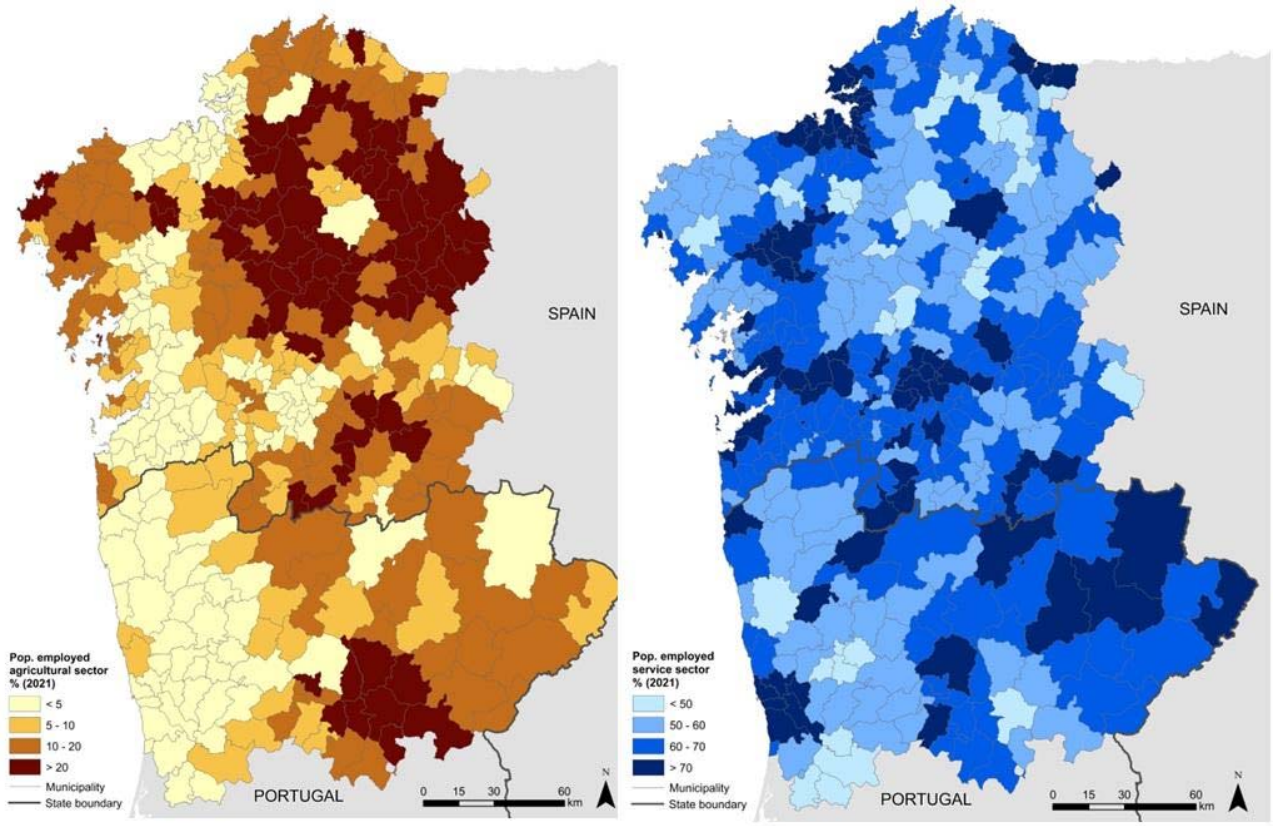


Source: produced by the authors based on data from INE.pt and INE.es

The structure of the population occupied by economic activity sector, presented in Figure 6, also allows us to make a demographic reading of the study area. Interior territories, characterized by low volumes, low densities, and an older population, show a greater economic dependence on the primary sector. We also observe relatively high employment figures in the Galician primary sector —linked to fishing— in coastal municipalities in areas that escape the attraction of major cities: in the northwestern sector of the province of A Coruña and in northern municipalities bathed

by the Cantabrian Sea. In Galicia, 52% of municipalities have more than 10% of their population employed in the primary sector, compared to 31% in Northern Portugal.

Figure 6. Proportion of population employed
in the primary and tertiary sectors (2021), at the municipal scale



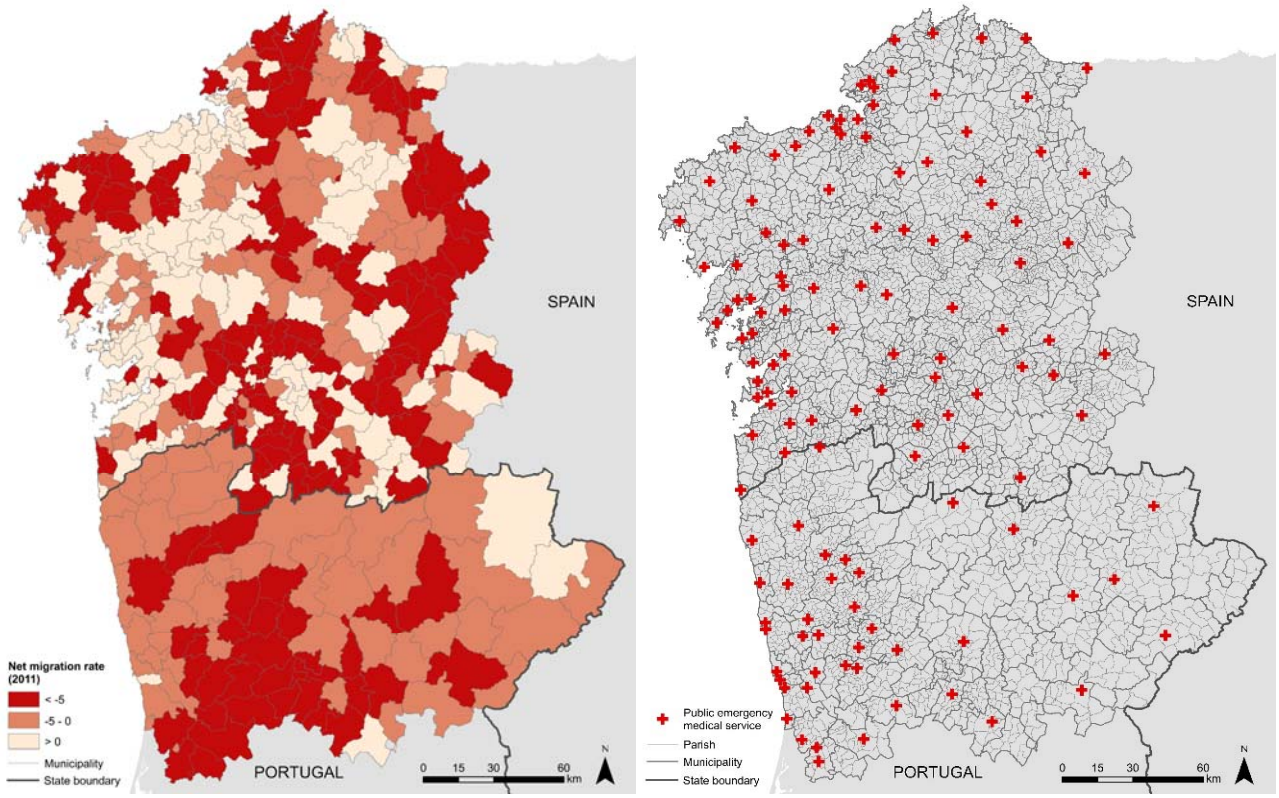
Source: Produced by the authors based on data from INE.pt and INE.es

In addition to the Atlantic Urban Axis area, certain enclaves in the interior of the study area also exhibit reduced dependence on agriculture. These enclaves correspond to small and medium-sized cities where the service sector predominates in employment. This sector constitutes the main economic activity in densely populated urban municipalities in the western part of the study area, with the exception of some areas near the Porto metropolitan region, where the secondary sector is more prominent.

Considering the significant insights provided by various studies on rural areas of the Iberian Peninsula regarding the impact of the 2008 economic crisis —particularly in relation to population variations (Giménez-García et al., 2023) and the provision of public services (Almeida, 2017)— we analyzed the net migration rate for 2011 and the distribution of public emergency medical services (Figure 7). The left map of Figure 7 reveals a more pronounced disparity between the north and south, making it challenging to identify the patterns observed previously. Additionally,

we note that the more industrialized municipalities in Northern Portugal tend to exhibit the most negative net migration rates.

Figure 7. Net migration rate (2011) and centres
with public emergency health services (2023), at the municipal scale



Source: produced by the authors based on data from INE.pt, INE.es, SERGAS and SNS

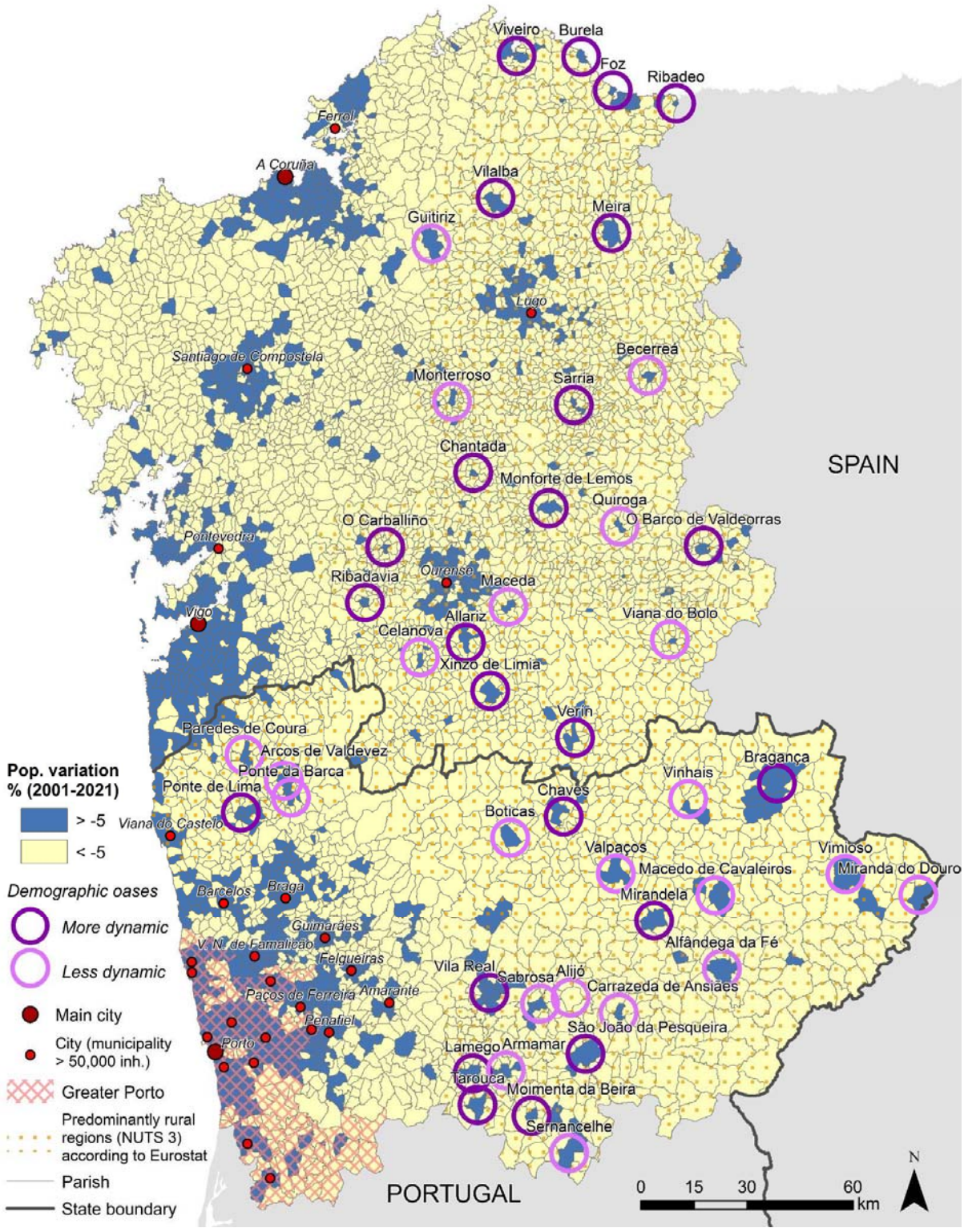
The distribution of public emergency medical services —encompassing hospitals and community health centres— indicates a concentration of these resources in the most populous and densely populated areas, as shown in the second map of Figure 7. In contrast, the number of public centres providing emergency medical services is lower in the interior regions. However, within the interior of Galicia, emergency medical services are more prevalent, with facilities present in 18 municipalities in Lugo and 14 in Ourense, while Northern Portugal has a lower presence, with only 10 municipalities in the predominantly rural NUTS 3 that have these centres.

4.2 The *demographic oases* of the interior periphery

In the rural and inland areas, alongside regressive and declining territories and/or those more dynamically influenced by major cities like Lugo and Ourense, we can also pinpoint places that exhibit favourable demographic and socio-economic conditions. This is what we have termed as *demographic oases*. A total of 46 were identified (Figure 8). These are fairly evenly distributed

throughout the regions identified by EUROSTAT (2019) as "predominantly rural": the Galician provinces of Lugo and Ourense have 22 *demographic oases* and the Portuguese NUTS 3 regions of Alto Minho, Alto Tâmega, Douro, and Terras de Trás-os-Montes have 24.

Figure 8. *Demographic oases* of Galicia and Northern Portugal



Source: produced by the authors based on data from INE.pt, INE.es and IGE

Table 2. Galician *demographic oases*

	Populaton centre					Municipality		
Demographic oases	Pop. (2001)	Pop. (2011)	Pop. (2021)	Pop. variation (2001-21)	Pop. variation (2011-21)	Young pop. % (2021)	Elderly pop. % (2021)	Net migration rate (2021)
Becerreá	1,445	1,431	1,455	0.7	1.7	11	35	-9.7
Burela	8,105	9,575	9,428	16.3	-1.5	17.5	19.6	5.7
Chantada	4,160	4,433	4,557	9.5	2.8	13.4	31	2.8
Foz	4,463	5,034	5,452	22.2	8.3	15.2	26.4	13.5
Guitiriz	1,589	1,646	1,915	20.5	16.3	11.9	31.3	-10
Meira-A Pena	1,032	1,075	1,118	8.3	4	13.7	30.4	10.9
Monforte de Lemos	16,185	16,685	15,955	-1.4	-4.4	14.2	29.6	5.2
Monterroso	1,867	2,050	2,023	8.4	-1.3	11.6	32.9	17.9
Quiroga	1,440	1,537	1,457	1.2	-5.2	10.9	40.1	12.1
Ribadeo	5,291	6,580	6,922	30.8	5.2	16	25.5	2.6
Sarria	7,323	8,762	9,205	25.7	5.1	14.4	27.3	10.5
Vilalba	5,226	5,968	5,955	13.9	-0.2	13.6	29.3	3.7
Viveiro-Celeiro-Covas	11,515	12,699	12,418	7.8	-2.2	14.7	25.7	3.3
LUGO	357,648	348,067	326,068	-8.8	-6.3	13.5	29.6	4.8
Allariz	2,263	3,436	4,084	80.5	18.9	16.7	25.2	12
Celanova	3,171	3,507	3,612	13.9	3	12.3	34.9	3.2
Maceda	1,547	1,693	1,703	10.1	0.6	11.9	35.3	12.5
O Barco de Valdeorras	10,119	11,480	11,093	9.6	-3.4	16.6	21.7	-0.6
O Carballiño	9,096	11,118	11,266	23.9	1.3	14.7	29.1	13.8
Ribadavia	3,058	3,313	3,133	2.5	-5.4	13.8	29.1	5.6
Verín	8,971	10,489	10,024	11.7	-4.4	15.7	26.8	5.4
Viana do Bolo	1,607	1,450	1,450	-9.77	0	10.4	40.0	17.6
Xinzo de Limia	6,056	7,083	7,022	16	-0.9	16.1	28.1	6.7
OURENSE	338,446	328,697	305,297	-9.79	-7.1	13.3	31.6	7.5

Source: produced by the authors based on data from IGE and INE.es

The main defining criterion of these territories is their positive demographic growth (or scarcely negative) between 2001 and 2021 and between 2011 and 2021. In some cases, the capacity of these territories to grow in an unfavorable rural context is extraordinary: 80.5% in Allariz, 30.8% in Ribadeo, or 25.7% in Sarria, in the case of Galicia (in the period 2001-2021) (Table 2). On the Portuguese side, in the same period, the growth of the identified *demographic oases* is lower (Table 3); those that grow the most are: Moimenta da Beira (18.4%), Chaves (17.1%), Boticas (15.7%), and Bragança (12). We also consider certain nuclei as *demographic oases* that, starting from high demographic volumes, do not lose population at a sharp rate: Alfândega da Fé, Miranda do Douro, Monforte de Lemos, or Xinzo de Limia, to give some examples. In any case, we have considered demographic evolutions more positive than the average of the overall NUTS 3 region.

Another important feature of these *oases* is a significant demographic volume within their sparsely populated rural context. All the territories considered have more than 1,000 inhabitants (Tables 2 and 3). However, these territories' conditions are quite heterogeneous. In Galicia, there are *demographic oases* with just over 1,000 inhabitants, such as Becerreá, Meira, or Viana do Bolo, and others that exceed 10,000 like O Barco de Valdeorras, O Carballiño, or Verín. Monforte, with 16,000, is the most populous *demographic oasis*. The situation is similar in Northern Portugal: some have just over 1,000 inhabitants, such as Armamar, Sabrosa, or Vimioso; others like Bragança or Vila Real are around 20,000.

Their location patterns also exhibit significant heterogeneity. Some are situated near major cities, such as Allariz, Celanova, and Maceda in Ourense. Others are clustered together, fostering synergies and interdependencies, like Armamar, Lamego, and Tarouca in Portugal or Burela, Foz, Ribadeo, and Viveiro in Galicia. However, most of them are located in rural environments without the proximity of any other demographically and economically dynamic territory. Some examples that illustrate this situation well are Monforte de Lemos and O Barco de Valdeorras, located in a rural context of strong decline. Another *demographic oasis* that illustrates this situation well is Becerreá, located in the mountainous border part of Galicia with the rest of the Spanish state, which hosts the worst socioeconomic indicators in the region. On the Portuguese side, Bragança presents itself as the best example of a peripheral location in a context of marked decline.

Table 3. Northern Portugal *demographic oases*

	Parish					Municipality		
Demographic oases	Pop. (2001)	Pop. (2011)	Pop. (2021)	Pop. variation (2001-21)	Pop. variation (2011-21)	Young pop. % (2021)	Elderly pop. % (2021)	Net migration rate (2021)
Arcos de Valdevez	3,792	4,241	4,430	16.8	4.5	13.6	36.1	6.2
Paredes de Coura	2,025	2,099	2,011	-0.7	-4.2	15.5	30.8	6
Ponte da Barca	4,202	4,372	4,192	-0.2	-4.1	14.9	30.1	5.5
Ponte de Lima	3,524	3,756	3,925	11.4	4.5	17.2	24.7	0.2
ALTO MINHO	250,275	244,836	231,266	-7.6	-5.5	15.8	28.1	7.7
Boticas	1,331	1,510	1,540	15.7	2	12.8	37.5	-3.6
Chaves	12,633	16,252	14,789	17.1	-9	14.5	32.7	0.5
Valpaços	4,629	4,752	4,660	0.7	-1,9	12	40.8	3.6
ALTO TÂMEGA	85,256	94,143	84,248	-1.2	-10.5	13.3	35	1
Alijó	2,806	2,635	2,584	-7.9	-1.9	13.4	32.9	3.2
Armamar	1,482	1,464	1,510	1.9	3.1	14.4	30.4	9.8
Carrazeda de Ansiães	1,605	1,701	1,706	6.3	0.3	12.6	37.8	-0.6
Lamego	10,883	12,214	12,071	10.9	-1.2	15.3	26.4	0.7
Moimenta da Beira	2,402	2,888	2,843	18.4	-1.6	16.2	29.6	11.3
Sabrosa	1,189	1,202	1,130	-5	-6	14	33.2	11.5
São João da Pesqueira	2,226	2,380	2,273	2.1	-4.5	15.4	27.7	3.8
Sernancelhe	1,790	1,713	1,755	-2	2.5	13.2	32	16.1
Tarouca	4,037	4,245	4,333	7.3	2.1	17.3	24.8	10.3
Vila Real	16,138	17,588	17,343	7.5	-1.4	17.2	23.8	1.1
DOURO	220,692	213,031	183,875	-16.7	-13.7	15.2	28.7	6.3
Alfândega da Fé	2,016	2,055	1,937	-3.9	-5.7	12	37.3	2.1
Bragança	20,185	22,016	22,689	12.4	3.1	15.2	28.4	7
Macedo de Cavaleiros	6,087	6,257	6,137	0.8	-1.9	13.3	35	1.5
Miranda do Douro	2,127	2,254	2,064	-3	-8.4	12.1	39.1	0.5
Mirandela	11,186	11,852	11,397	1.9	-3.8	14.4	32.4	3.5
Vimioso	1,208	1,285	1,245	3.1	-3.1	10.5	43.7	10.4
Vinhais	2,382	2,245	2,185	-8.3	-2.7	9.1	44.4	1
TRÁS-OS-MONTES	127,138	117,527	107,272	-15.6	-8.7	13.4	33.8	4

Source: produced by the authors based on data from INE.pt

The sectors of activity do not allow us to establish thresholds applicable to all identified *demographic oases*. However, for those with a larger demographic volume, we can observe a clear trend: higher percentages of the population in the tertiary sector and lower percentages in the primary sector (Figure 6). Clear examples are Monforte de Lemos, O Barco de Valdeorras, or Verín on the Galician side; and Bragança, Chaves, or Vila Real on the Portuguese side.

As we have pointed out, *demographic oases* do not form a group with homogeneous characteristics. This reality led us to attempt to classify them into two broad categories: those that are more dynamic and those that are less dynamic (Figure 8). The number of *demographic oases* considered more dynamic is 24, of which 15 are from Galicia and 9 are from Portugal. Meanwhile, the less dynamic *oases* total 22, of which 7 are from Galicia and 15 are from Portugal. Overall, we observe a trend based on the size of the place. Thus, the less dynamic *demographic oases* correspond to the smaller ones, while the more dynamic *oases* coincide with the main population centres.

5 Discussion and conclusions

Based on the results, we see that a growing disparity is emerging between urban and rural areas in Galicia and Northern Portugal. Urban areas are the ones gaining population and are also characterized by having a younger population. The results also show an uneven distribution of the population. The highest population concentrations and growth rates occur in the coastal areas of the study area, known as Atlantic Urban Axis (Lois-González, 2004; Bigotte et al., 2019; Molinero, 2019). Outside the Atlantic Urban Axis, the territory is perceived as a "periphery" with serious depopulation and aging issues. This "periphery" roughly coincides with the rural part of the study area. However, this rural space is not homogeneous but presents two different types. On one hand, a declining rural area characterized by depopulation and abandonment, experiencing continuous demographic losses. On the other hand, a more dynamic rural area capable of growing or maintaining itself demographically and/or economically (Wood, 2008; Li et al., 2019; Molinero & Alario, 2019; Sá-Marques et al., 2021).

EUROSTAT (2019) defines the Galician provinces of Lugo and Ourense, and the Portuguese NUTS 3 regions of Alto Minho, Alto Tâmega, Douro, and Terras de Trás-os-Montes as "predominantly rural". The results show that in fact most of the territory in these regions is in decline: experiencing strong and continuous population loss, low population densities, significant aging, and greater dependence on the primary sector. However, these regions are not homogeneous. Both the Galician provincial capitals of Lugo and Ourense, as well as the Portuguese Alto Minho region's

capital, Viana do Castelo, stand out as exceptions to the general rural decline. On one hand, the two Galician cities act as demographic and economic centres of their respective provinces and have high population densities and volumes exceeding 80,000 inhabitants. On the other hand, Viana do Castelo (also with more than 80,000 inhabitants) is nestled within the Atlantic Urban Axis, with a strong functional dependence on Vigo to the north and Braga and Porto to the south, making it difficult to consider it as peripheral rural.

In rural inland areas, outside these more dynamic cities, it is also possible to identify other territories that are vital from a demographic and socio-economic perspective. These are what we have defined as *demographic oases*, understanding that their favourable situation develops within a rural context of strong decline. These territories generally share three common characteristics that distinguish them from their surroundings: a) a higher demographic concentration; b) population growth or minimal decline over the last 20 years in relation to their NUTS 3 regions; and, c) sufficient distance from major urban areas, which prevents them from being classified as part of their peri-urban zones.

Generally, these *demographic oases* are small cities capable of resisting in contexts where demographic decline is pronounced. They provide essential public and private services, employment, and social contacts for both residents and nearby communities. For instance, all of these *oases* in Galicia host public emergency health service centres, while in Portugal, this relationship is less pronounced due to lower service presence. Austerity measures implemented in Portugal since 2011, following the 2008 economic crisis, significantly limited access to public services in rural areas, leading to facility closures (Almeida, 2017). The availability of essential services —such as medical assistance, education, courts,or employment offices— is crucial for the demographic sustainability of these territories, as they attract residents and promote positive demographic trends (Giménez-García et al., 2023). However, considering the insights from the studies of Escalona-Orcao & Díez-Cornago (2003), Álvarez-Lorente et al. (2020), and Józefowicz (2022), it is clear that providing basic services alone does not guarantee the stability of these *oases*. As surrounding rural areas continue to depopulate, these *oases* face decline due to deteriorating services and insufficient demographic presence, a situation exacerbated by government policies that cut investments and essential services. This situation is evident in territories that were once *demographic oases*, A Fonsagrada and A Pobra de Trives in Galicia, or Montalegre and Mogadouro in Northern Portugal, for example.

Based on our study's findings, we advocate for recognizing *demographic oases* in the rural landscapes of Galicia and Northern Portugal as essential for shaping territorial cohesion in both countries. It is crucial to reinforce their role as service providers to ensure the social and economic vitality of surrounding regions. Policymakers should move beyond narrow economic rationales to make proactive investments that enhance residents' well-being and access to essential services. This strategic approach aims to counteract rural decline and promote sustainable development in these areas, which are inherently fragile due to worsening conditions in their rural surroundings.

Our research offers valuable insights into the political strategies needed to address rural decline in Galicia and Northern Portugal, contributing to territorial cohesion. However, we acknowledge certain limitations, such as the need for a broader timeframe to capture rural dynamics more comprehensively and our reliance on specific indicators, which may overlook other critical factors influencing these areas' potential for revitalization. Future research should incorporate a wider range of indicators, especially those related to well-being, mobility patterns, and community interdependencies. Utilizing diverse methodologies, such as surveys and interviews, would enhance our understanding of the factors shaping the resilience of these rural territories. By addressing these limitations and broadening the analytical scope, future studies can provide more nuanced insights into sustainable rural development in Galicia, Northern Portugal, and beyond.

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