



Exploring the role of the counties in preventing financial exclusion in population shrinking territories

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ABSTRACT

Over the past decades, numerous European rural regions have witnessed a decline in population, accompanied by the loss of essential services, including financial services. This study examines the dynamic interplay of these processes in the *comarcas* (counties) of Aragon, Spain. Utilizing a panel dataset at the *comarca* level and a combination of multivariate statistical techniques, we investigate how sociodemographic and economic profiles interact with financial exclusion arising from the absence or scarcity of bank branches. The absence of bank branches and the saturation of the remaining depend on the evolution of economic dynamism, the ageing process, and the percentage of foreign population. Our findings have allowed us to discern that there are differences between *comarcas*. Specifically, we have identified three groups, which must face different problems with respect to the lack or scarcity of bank branches, as well as depopulation. This segmentation provides a detailed view of the regional reality and lays the groundwork for more precise and effective intervention strategies, highlighting the potential of *comarca* capitals as hubs for centralized banking services. This approach optimizes the use of limited resources and enhances the prospects for promoting sustainable development in Aragon and other rural regions of Europe.

1. Introduction and research framework

In the 21st century, the world faces a complex set of sociodemographic, environmental, economic, and political challenges that deeply affect local regions and communities. Among these challenges in many European spaces, two critical concerns arise: depopulation, a very serious phenomenon that transcends borders and encompasses diverse realities (ESPON, 2018; European Union, 2020), and financial exclusion, a much more specific but also significant problem (Caplan et al., 2020). While these two issues differ in scope and nature, their effects are intricately intertwined and exert substantial influence on social cohesion, economic development and quality of life in many regions, threatening their social and economic fabric (Náñez-Alonso et al., 2022; Syssner, 2016, 2020; Yu, 2023). By exploring and connecting these two phenomena, we can contribute to a more effective territorial planning

and promote sustainable and equitable development.

Depopulation in Europe affects a sizable number of territories, which suffer a sustained and significant decrease in their population (Delgado, 2019; ESPON, 2018; Newsham & Rowe, 2022; Pinilla & Sáez, 2021). Numerous factors contribute to the depopulation of rural territories in Europe (Pérez-Morote et al., 2021; Woods, 2005). The decline of traditional activities and the modernization of agricultural tasks leads to the loss of jobs and negative economic dynamics, causing a population decline when young people leave rural areas seeking new job opportunities and improving their quality of life (Reynaud & Miccoli, 2018; Llorent-Bedmar et al., 2021; Merino & Prats, 2020; Li et al., 2019; Gil-Alonso et al., 2023). Added to the above are the low birth rates in European countries, especially in rural areas, which leads to an ageing population and, progressively, fewer births (Tomatis & Impicciatore, 2023; Turok & Mykhnenko, 2007). This ageing process is intertwined

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with demographic masculinity since the proportion of women who leave rural areas in search of better opportunities is greater, affecting the sociodemographic dynamics of the affected areas (Camarero & Sampeiro, 2016; Johansson, 2016). Only in some territories does immigration counterbalance this general regressive situation (Pinilla & Sáez, 2017). Furthermore, the lack of qualified labour and reduced demand for products and services create a vicious circle that challenges implementing and maintaining local businesses in rural areas affected by these processes (Bock, 2016; Granados et al., 2018).

Therefore, depopulation occurring in rural Europe is a complex phenomenon where several factors and interactions intervene in multiple dimensions (Newsham & Rowe, 2022). It is a multifaceted challenge that has profound implications for local communities and the dynamics of countries in general (Bruno et al., 2021; Gómez-Ullate et al., 2020; Hospers & Reverda, 2015; Merino & Prats, 2020), and it can interact with other problems as, for instance, the employment dynamics (Alamá-Sabater et al., 2022), that can deepen its adverse effects.

Among these problems, one of significant relevance is territorial financial exclusion (Alamá & Tortosa-Ausina, 2012; Fernández-Olit et al., 2019; Leyshon & Thrift, 1995; Mylonidis et al., 2019; Sinclair, 2001) caused by the lack of physical access to basic banking services essential for full participation in the economy and society (Carbó et al., 2007; Nández-Alonso et al., 2020; Sinclair, 2001).

Since the 2008 Crisis, financial institutions seek to improve their efficiency and profitability closing offices in areas with a small, elderly, or low-income population (Alonso et al., 2014; Fernández-Olit et al., 2019; Martin-Oliver, 2018). At the same time, the digitalization of banking activities has also driven the closure of more bank offices. While this measure may be profitable from a business perspective, it has significant consequences for people who rely on in-person banking services (De la Cuesta et al., 2021; Llorente, 2019; Manta, 2022).

The closure of offices can cause two types of financial exclusion (Alonso et al., 2023). *Type I financial exclusion* (branchless territory) could occur when financial institutions close unprofitable branches in areas with low population density, leaving their residents without any bank branch. The reasons can be higher operating costs, less income generation due to low economic and population activity, or limited transportation infrastructure for a dispersed population (Camacho et al., 2021). On the other hand, *Type II financial exclusion* (oversaturated branches) could occur when bank office closures cause the offices that remain open to become overloaded with customers, making it difficult to access services due to the considerable number of residents who use them, and who increasingly find it more difficult to find bank offices near their homes.

Therefore, in both situations, the absence or scarcity of bank offices hinders in-person access to essential financial services, such as access to cash, transactions, credit services, or the possibility of conducting effective economic management (De la Cuesta et al., 2021; Fernández-Olit et al., 2019; Martin-Oliver, 2018). Branch closures may also influence the local economy, as businesses in the area face difficulties in transacting and accessing credit, which could affect their ability to grow and generate employment (Appleyard, 2011; Demirguc-Kunt et al., 2017; Ho & Berggren, 2020). However, recent research shows that the density of bank branches is not directly related to income inequality, suggesting the need for further research on the territorial effects of digitization or office downsizing in the long term (Cruz-García & Peiró-Palomino, 2023).

In any case, while many banking services are now available online, some people may not have access to the Internet or be familiar with the technology (digital divide), especially older people or those with low incomes. Physical access to financial services can be vital for these population groups, who may feel excluded from digital services (Dubois & Sielker, 2022; Jiménez & Tejero, 2018; van Deursen & Helsper, 2015).

In this context, it is necessary to balance the efficient management of financial services by banking entities and the accessibility of bank offices by the population, as minimum number of branches can help to

minimize the effects of exclusion in order to address this exclusion (Cruz-García & Peiró-Palomino, 2023). Identifying and managing both forms of financial exclusion in specific regions can be essential to ensure that all individuals have equal access to necessary banking services (Alonso et al., 2023; Panigyrakis et al., 2002).

To analyze these processes, this paper approaches a case study, Spain, which is one of the European countries significantly affected by depopulation (Merino & Prats, 2020). The country has also experienced a substantial number of bank branch closures since 2008, reflecting a broader trend of bank restructuring (Alamá et al., 2015; Alonso et al., 2014; Maudos, 2017). In Spain, the territorial effects of bank restructuring have been studied because of the social interest of this process, for which the authors have mainly used approaches from the fields of economics and economic geography. Given the availability of data, the most common scales of geographical analysis of financial exclusion in Spain have been at the provincial (Alamá et al., 2015; Alamá & Tortosa-Ausina, 2011; Alamá & Tortosa-Ausina, 2012; Alonso et al., 2014; Cruz-García & Peiró-Palomino, 2023) and municipal levels (Alamá et al., 2015; Bernad et al., 2008; Camacho et al., 2021; Martin-Oliver, 2018; Maudos, 2017; Nández-Alonso et al., 2020).

Among the Spanish regions, Aragon stands out as one of the most affected by both of these issues (Alonso et al., 2023). Despite sharing both processes with other regions, their uniqueness lies in the complexity that define their challenges. Aragon faces a combination of geographical, economic, and sociodemographic factors that converge in a dynamic of population decline in a large part of its rural space (Palacios et al., 2022; Pinilla et al., 2008) and limited access to financial services (Alonso & López-Escolano, 2021). Furthermore, in Aragon, both types of territorial financial exclusion could be present. Type I financial exclusion is likely prevalent in remote, sparsely populated rural areas where bank branches have vanished. Type II financial exclusion could be observed in the municipalities that form the urban network of cities or county seats providing services to other smaller municipalities. These urban centres, also grappling with bank office closures, may face an oversaturation of branches due to concentrated population, serving not only their own residents but also those of neighbouring municipalities left without bank branches.

In the case of Aragon, the counties (known as *comarcas*, and henceforth referred to as such in this paper), supra-municipal administrative units (aggregation of municipalities), and infra-provincial (several *comarcas* usually make up a province) present a unit of analysis that captures both local particularities and regional patterns (Membrado-Tena, 2016). Although municipal analyses are valuable to understanding both phenomena, choosing a perspective based on *comarcas* emerges as a strategic approach to address these challenges. In many municipalities where demographic losses have left them practically empty, it is difficult to provide solutions at the municipal level due to their small number of inhabitants and limited resources. In these cases, it may be more effective to address these problems from supra-municipal administrative units such as the *comarcas* (Allain-Dupré, 2020). More specifically, from their capitals, a network of small cities that could provide essential financial services to the rest of the rural municipalities, as it happens with other public services (Clarimont, 2005; Corbacho-Quintela, 2016; Palacios et al., 2017; Precedo, 2004).

By focusing on the *comarcas*, this study recognizes that demographic and financial dynamics are not limited to municipal borders but are intertwined with factors at a sub-regional scale and respond reliably to the population's basins and spaces of daily life (Calvo et al., 2008).

With all this background, the central objective of this study is to analyze the interaction between depopulation and financial exclusion in the *comarcas* of Aragon, to understand their interconnections, and to provide a basis for the design of sustainable and equitable development strategies. This relationship can be dynamic and bidirectional, so we seek to understand how the sociodemographic and economic profiles of the *comarcas* relate to financial exclusion caused by the absence or scarcity of bank offices. An exhaustive analysis of the current situation of

each Aragonese *comarca*, both those that group municipalities with depopulation problems and those whose municipalities have a high level of socioeconomic development, allows us to observe how the characteristics of these places influence the type of territorial financial exclusion they could experience (Type I or Type II). By proposing measures to address these dynamics, we aim to improve financial inclusion, increase accessibility to services, and promote equity across the region, while also contributing to the fight against depopulation.

To achieve this objective, we use a panel data set of sociodemographic and bank branches availability variables, working at *comarca* level. This will allow us to capture the dynamics of the relationships and establish differences among them through the combined use of a set of multivariate statistical techniques.

The contributions of the paper are three-fold:

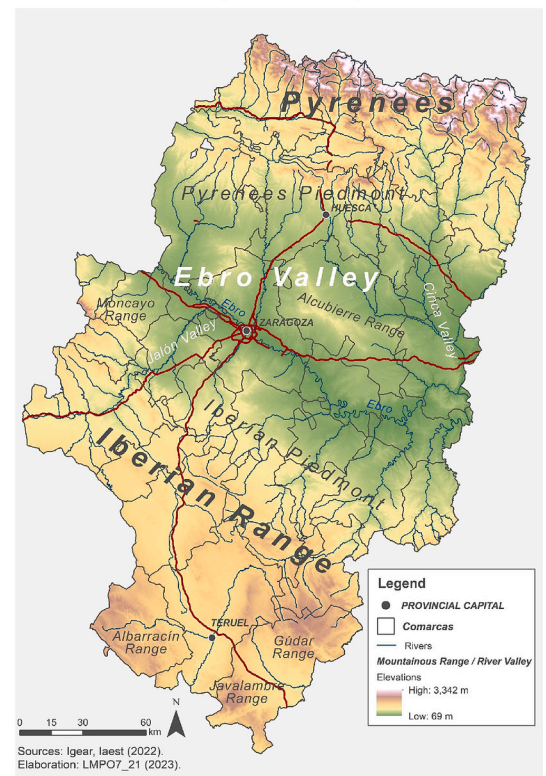
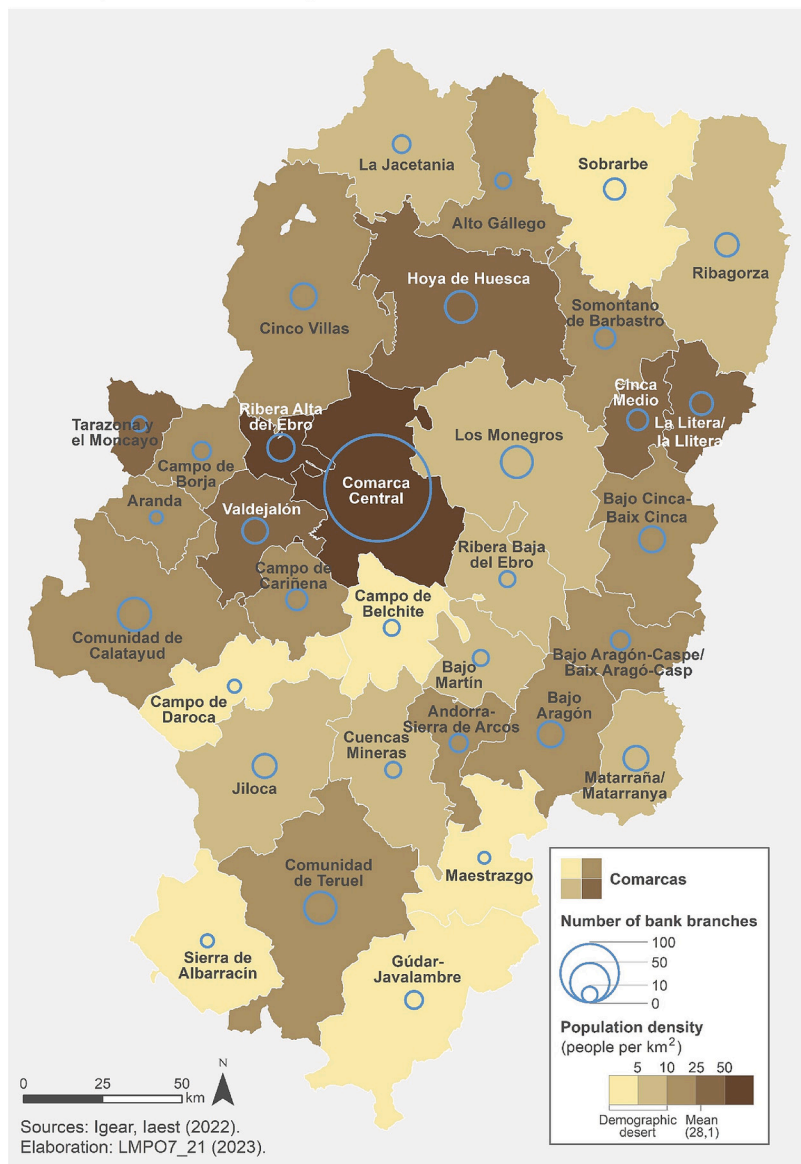
1) It jointly addresses the problems of depopulation and territorial financial exclusion at *comarca* scale, which is, to our level of knowledge, the first time it has been done in the literature. Although

both issues are relevant separately, our study demonstrates how they are intertwined, unravelling their underlying determinants, and classifying *comarcas* with similar patterns which enables the design of more specific solutions adapted to each group. Our study considers territorial financial exclusion from two perspectives, including the effects of the absence of bank offices and the oversaturation of clients in the remaining bank branches. This approach brings significant value to the field of study, especially in the European context, where many territories face similar problems. Until now, both types of exclusion have been addressed in a piecemeal manner. Therefore, this work can serve for future research and territorial policy design.

2) It analyses the temporal dynamics existing in the joint evolution of financial exclusion and depopulation. This perspective reveals emergent patterns and cumulative effects that would not be evident in a static analysis. These techniques explore how variations in selected variables in a given year can influence their behavior in the following period.

Population density and number of bank branches

Physical map



Localization map



Fig. 1. The map on the left displays population density and the number of bank offices, while the maps on the right depict physical characteristics at the top and the location of Aragon within Spain at the bottom. Acronyms of *comarcas* can be found in Appendix A.

3) Through an approach focused on *comarcas*, this study allows to provide solutions to the demographic voids and the lack of bank offices in many areas, which it will enable us to reorganize the needs of the municipalities of each *comarca*. In Aragon, where *comarcas* play a crucial role in some service provision and administrative decision-making, this approach is essential to address the problems of depopulation and financial exclusion more effectively.

This paper is structured as follows: Section 2 presents the case study and describes the variables and the statistical methodology used. Section 3 presents and analyzes the results obtained, and Section 4 discusses the implications of the findings and proposes recommendations and actions based on a classification of the *comarcas*. Finally, Section 5 concludes and presents some future lines of research. Three Appendices are also included in the Supplementary Material in which the acronyms used to name *comarcas* and some of the results of the statistical analyses conducted in the work are described in more detail.

2. Materials and methods

2.1. Study area

Aragon is a region located in the northeast of Spain. It strategically connects various regions of the Iberian Peninsula (Fig. 1). The area comprises three provinces (Huesca, Zaragoza, and Teruel) and 33 *comarcas*, each with specific geographical, cultural, economic, and demographic characteristics and particularities. The configuration of Aragon in *comarcas* arises as a reflection of its history and geography, which ranges from mountainous areas such as the Iberian System or the Pyrenean area, with the typical problems of access to these spaces, to fertile plains linked to the riverbeds that cross it and that offer irrigated spaces with relevant agricultural development (Infante, 2010).

Aragon is characterized by great internal diversity both in its economic and demographic dynamics. Still, it faces a worrying challenge from the point of view of territorial planning – the large concentration of population in its capital (Zaragoza), which brings together 51 % of the region's inhabitants (Fig. 1). This territorial macrocephaly brings together a wide variety of services and productive activities, along with other small cities that function as articulators of both a provincial (Huesca or Teruel) and *comarcas* environment, and they contrast with a vast demographic desert that extends across most of its territory, marked by low population densities. According to data from the *Aragonese Institute of Statistics* (IAEST) the average density was 27 inhabitants/km² in 2022, but behind this figure hide much more worrying statistics. 71 % (522) of its municipalities had less than 10 inhabitants/km² densities, and 20 % (140) did not reach 2 inhabitants/km². At the *comarca* scale, of the 33 *comarcas*, 14 had densities of less than 10 inhabitants/km², and of these, 4 did not reach 5 inhabitants/km².

Added to the demographic decline in most of the region (Collantes & Pinilla, 2004) are the problems of access to essential services suffered by some inhabitants, including banking services. Financial entities, since the 2008 Crisis, have undertaken processes of closing bank offices that have led to a significant decrease in the presence of offices in a large part of Aragon (Alonso & López-Escolano, 2021). In 2015, this region had 1077 bank offices, the majority concentrated in the Comarca Central of Zaragoza (38 %), but *comarcas* such as Maestrazgo only had 7 offices to serve its entire population. In 2022, the situation has worsened since only 846 offices remain open for the region. All *comarcas* have lost office presence, but, in absolute terms, the *comarcas* that have lost the most coincide with those with the most offices. Currently, 15 *comarcas* have less than 15 offices, and 5 do not even have 10 offices. This situation becomes even more concerning when many municipalities lack bank offices within these *comarcas*. In 15 *comarcas*, the percentage of these municipalities exceeds 65 %. These data reveal a general absence of bank offices in much of the Aragonese territory, and what is even more concerning; this trend seems to continue increasing.

The approach of the analysis conducted in this study focuses on the *comarcas*, which are functional groups of municipalities formalized by different laws from 1993 to 2019. Currently, they help allow for a closer and more efficient governance and administrative structure that permits the design of more coherent that avoid duplication of efforts. In many cases, these areas share economic and service systems that transcend municipal boundaries, making an approach based on *comarcas* increase the probability of success of the proposed measures. All this encourages different administrations to act at the *comarca* scale, as addressing problems that require shared resources and a broader perspective becomes more practical. For all these reasons, the *comarca* approach has become a fundamental strategy for the Government of Aragon, allowing it to adapt its policies and programs according to the specific needs of each territory. Therefore, this scale can also be valid for the organization of financial services, activities of a private nature but of public utility.

2.2. Data and variables

The database covers the period from 2015 to 2022 and has been built from various reliable sources of information. Firstly, the IAEST was used to obtain sociodemographic information. The information on bank offices to complete the study data was obtained from the *Registry of Offices of Supervised Entities*, prepared by the Bank of Spain, which has provided quarterly information since 2015.

The variables selected for this study consider key sociodemographic aspects related to depopulation and financial exclusion due to the closure of bank branches. They have been chosen based on previous literature, providing a detailed view of the challenges faced by the *comarcas* of Aragon (Alonso et al., 2023).

Thus, variables related to demographic dynamics are necessary to understand changes in the population structure of the *comarcas*. In *comarcas* where depopulation becomes noticeable, there is a loss of population and an ageing and masculinization of the remaining population. Therefore, the consideration of these aspects allow us to measure the consequences directly related to depopulation, helping us to clarify the demographic trends of each *comarca*, both those that are in demographic decline and those that are booming.

Furthermore, variables reflecting the structure of the active population and its relationship with the dependent population are important for assessing the pressure on the workforce and the challenges faced by the *comarcas* in terms of job creation and economic dynamism.

Regarding variables related to financial exclusion, these focus on two key aspects: the lack of bank branches and the saturation of existing ones. The former for its potential contribution to type I financial exclusion of the local population, and the latter to reflect possible congestion problems and difficulties in accessing these services, contributing to type II financial exclusion.

Below, we present all the variables:

Population increase rate from 2005 to year t , where $t = 2015, \dots, 2022$ (*Pop_Growth_Rate*): this variable provides relevant information on the temporal evolution of demographic dynamics in the *comarcas* of Aragon.

Percentage of People over 65 Years of Age (*%Pop_GE65*): This indicator reveals the proportion of the population in an advanced stage of life. In *comarcas* with a high percentage of people over 65, there is a greater probability of facing problems related to the ageing of the population, such as the lack of generational change and the decrease in the active workforce.

Average Ages (*Average_Age*): This indicator is crucial to evaluate demographic dynamics. A high average age indicates a significant population ageing, often correlated with decreased birth rates and the emigration of young people seeking opportunities.

Youth Rate (*Youth_Index*): This rate shows the population proportion in the early stage of life. A low youth rate may indicate a lack of opportunities for young people in the region, which could contribute to migration to more urban areas.

Dependency Rate (*Age_Dependency*): This rate relates the dependent

population (young and older people) to the working-age population. A high dependency ratio may indicate pressures on the workforce to support an economically inactive population. All this may affect employment generation and the *comarca's* economic development.

Masculinity Ratio (Masculinity_Rate): This ratio measures the proportion of men to women in a population. An imbalance in this ratio may have implications for the replacement of different cohorts, while it may reflect specific migration flows and labour dynamics.

Replacement Rate of the Active Population (Replacement_Index): This variable shows the relationship between young people of working age and older adults who retire. A low replacement rate indicates that fewer young people are entering the workforce to replace those who retire. All this may result in a labour shortage and affect the *comarca's* economic vitality.

Active Population Structure Rate (Structure_Index): This variable reflects the proportion of the working-age population concerning the total population. A low rate may suggest a lack of job opportunities and the need to seek employment elsewhere. All this can have direct implications for depopulation and migration.

Percentage of Social Security Affiliates in the General Regime (%Affiliates): This indicator reflects the labour market's strength in employment in various sectors. The general social security regime includes a wide range of professions and economic activities, covering most jobs, which makes it a robust indicator to present the economic vitality of the *comarcas*.

Percentage of Foreigners (%Foreigners): This variable can offer perspectives on the diversity of the population and its attractiveness as a place of residence for people who arrive from other regions or countries looking for job opportunities.

For its part, financial exclusion is explored through variables reflecting bank offices' absence or scarcity.

Percentage of Population without Office in Their Municipality (%Branchless_Pop): This variable reveals how many inhabitants of the *comarca* face this lack of access to financial services in their place of residence within each *comarca*. A high percentage may indicate physical access to banking and financial services limitations, which could contribute to financial exclusion.

Percentage of Municipalities without Offices (%Branchless_Mun): This measure may indicate the presence of "banking desert zones" where residents do not have physical access to financial services, as it reflects the proportion of localities in a *comarca* that lack bank offices. A high percentage could mean that options for banking services are limited in various areas of the *comarca*, which may reduce its attractiveness to live and work there.

Combining these last two variables allows us to understand the extent of the type I financial exclusion problem in a specific *comarca*. Suppose a high percentage of municipalities lack bank offices, and a considerable proportion of the population lives in these areas. In that case, this may indicate a general deficiency in the availability of face-to-face financial services.

Number of Inhabitants per Bank Office (Saturation): This measure indicates how saturated bank offices are regarding the population they must serve. High saturation implies that many inhabitants depend on a single bank office, which could result in long lines, service delays, and more difficulty in accessing financial services. In short, a high saturation may indicate potential problems of type II financial exclusion.

The information provided by these last three variables can be valuable in prioritizing areas that might require specific interventions to improve access to banking services and reduce financial exclusion, helping to direct intervention efforts and resource allocation.

Table 1 presents a descriptive analysis of the variables studied at *comarca* and year scale during the period 2015–2022. It highlights the high percentage of municipalities without bank branches (around 52.63 %), reaching values around 91 % in some *comarcas*. Despite only around 13.22 % of the population residing in these municipalities and therefore have physical difficulties in accessing offices, alarming figures go up to

50.61 % in some *comarcas*. The average number of inhabitants per office is around 850, but in specific *comarcas*, this number rises to 2,645, potentially indicating the oversaturation of some offices in certain areas.

Annual growth rates tend to show negative values, ranging around –4.68 %, but reaching as low as –29.52 % in certain *comarcas*. In contrast, some *comarcas* exhibit positive values, with growth of up to 15.76 %. Regarding ageing, measured as the percentage of the population over 65 years old, it hovers around 24 %, reaching 36 % in certain *comarcas* but 17 % in others. The dependency ratio presents an average of approximately 57 %, with maximum values of up to 77 % in some *comarcas*, contrasting with values below 50 % in others. Lastly, the youth rate fluctuates around 51 %, with minimum values of 19 % up to a maximum of 87 %.

All this underscores that Aragon is a region of contrasts, where some *comarcas* exhibit significantly high levels of ageing and depopulation, contrasting with others that are much younger and even experiencing demographic growth. Additionally, the potential severity of financial exclusion issues of both types (Type I and Type II) is observed.

2.3. Methodology

The methodology used in this study is based on a multidimensional approach that combines various multivariate statistical techniques – factor analysis, cluster analysis, and panel-data regression. Thus, factor analysis, with its ability to identify latent structures in complex data sets, is essential to understanding how sociodemographic variables and physical availability of bank branches interact, as well as to unravel the underlying determinants of financial exclusion and depopulation in Aragonese *comarcas*. On the other hand, cluster analysis allows the classification of the Aragonese *comarcas* into homogeneous groups based on shared characteristics. This grouping strategy makes it easier to identify similar patterns that could go unnoticed in an individual evaluation of each *comarca*. Creating groups allows us to discern common trends and challenges in *comarcas* with similar sociodemographic, and physical availability of bank branches profiles.

Finally, for a deeper understanding of the phenomena analyzed in the *comarcas* of Aragon, we have implemented a series of panel-data regressions. Each of these regressions focuses on a specific variable of interest. The objective is, on the one hand, to understand how the underlying determinants of financial exclusion and depopulation in the *comarcas* of Aragon can evolve and, on the other hand, how these trends can vary in the different groups of *comarcas* found through cluster analysis. The models used are dynamic panel data models with fixed effects and variable regression coefficients by groups, and are given by the expression:

$$Y_{i,t} = \alpha_i + \rho Y_{i,t-1} + \beta_1^g x_{1,t-1} + \dots + \beta_k^g x_{k,t-1} + \varepsilon_{i,t} \text{ with } \varepsilon_{i,t} \sim N(0, \sigma^2), g = 1, \dots, G \quad (1)$$

where the data corresponds to a balanced panel given by:

$$\{(Y_{it}; x_{1it}, \dots, x_{kit}); i = 1, \dots, N; t = 1, \dots, T\}$$

where i indexes *comarcas*, $N = 33$, t indexes time, $T = 8$ (years 2015 to 2022), and g indexes groups of *comarcas* with homogeneous behavior.

The model assumes that the dependency relationship between the dependent variable Y and the explanatory covariates (X_1, \dots, X_k) is similar for the *comarca* included in the same group and different from those existing in the rest of the groups. Furthermore, the explanatory variables appear delayed for a period to weaken the potential problems of endogeneity between the variable Y and the rest, seeking to eliminate the bias existing due to this problem in estimating the regression coefficients and increasing the predictive nature of the model. We have also included an autoregressive term of order 1 to capture the residual dependencies in the model's error term.

Table 1
Descriptive analysis of the variables at *comarca* and year scale.

	Mean	Std.dev.	Minimum	Median	Maximum	Skewness	Kurtosis
%Foreigners	11.69	4.40	5.21	10.83	27.31	1.22	1.29
%Affiliates	28.88	10.47	12.84	26.64	67.04	1.03	1.51
%Branchless_Mun	50.41	23.61	0.00	52.63	91.43	-0.42	-1.07
%Branchless_Pop	13.22	11.57	0.00	11.34	50.61	1.06	0.50
%Pob_GE65	24.66	3.91	17.91	23.86	36.05	0.82	0.30
Age_Dependency	58.41	5.97	49.48	56.93	76.98	0.98	0.48
Average_Age	46.92	2.52	42.50	46.67	53.75	0.68	0.14
LSaturation	6.70	0.43	5.86	6.74	7.88	0.11	-0.64
Masculinity_Rate	106.81	6.47	92.76	106.85	125.15	0.19	0.17
Pop_Growth_Rate	-3.25	8.39	-20.52	-4.68	15.76	0.26	-0.94
Replacement_Index	54.36	10.22	29.52	54.79	75.64	-0.07	-0.83
Structure_Index	69.47	6.86	51.01	69.13	91.79	0.17	0.39
Youth_Index	51.41	15.17	19.17	51.26	86.72	-0.02	-0.53

Source: Own elaboration based on data from the Aragonese Institute of Statistics (IAEST).

3. Results²

3.1. Factor analysis

The factor analysis results allow us to identify two key factors underlying the region’s dynamics of depopulation and financial exclusion. The optimal number of factors to retain was determined using parallel analysis of the scree plot that corrects the bias existing in estimating the eigenvalues of the correlation matrix by selecting those with eigenvalues greater than one. The chosen factors also explain a significant amount (73.66 %) of the variability in the data. In their determination, those variables with a complexity index lower than 1.6 were used, eliminating the rest of the variables to improve the interpretability and measurement of the selected factors. The factor loadings were estimated by applying the method of principal components with rotation *oblimin* to the set of selected variables, ignoring the temporal component (see Appendices B.1 and B.2 for more details). The results obtained are shown in Table 2 and Fig. 2.

The first factor, which we have named *Type II Financial Exclusion and Economic Dynamism versus Ageing* (from now on, *FType II*), contrasts type II financial exclusion and the economic dynamism of a *comarca*, compared to its ageing level. High positive values in *FType II* indicate a greater socio-economic dynamism, a significant presence of young people, a higher banking saturation, a sustained population growth, a robust replacement rate of the active population, and a high percentage of affiliates to social security under the general regime. Additionally, there is a noticeable trend towards a less ageing population, represented by a lower average age, a lower proportion population over 65 years of

Table 2
Results of the factor analysis.

Average_Age	-0.9634	-0.3456	0.9496	1.0518
Youth_Index	0.9598	0.3581	0.9469	1.0627
%Pob_GE65	-0.9410	-0.2878	0.8940	1.0211
LSaturation	0.7997	-0.1766	0.7636	1.3295
Masculinity_Rate	-0.7016	0.2758	0.6794	1.5660
Pop_Growth_Rate	0.8326	0.4184	0.7554	1.2116
Age_Dependency	-0.7676	-0.1781	0.5895	1.0011
Replacement_Index	0.7666	0.2978	0.6073	1.0755
%Affiliates	0.6737	0.2021	0.4577	1.0185
%Foreigners	0.2867	0.8777	0.7813	1.0314
%Branchless_Mun	-0.3927	-0.7896	0.6773	1.2040

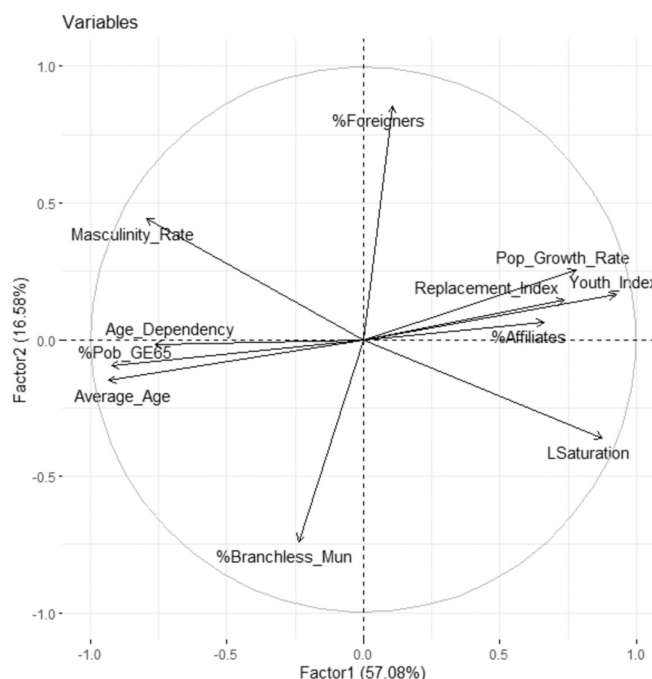


Fig. 2. Correlation diagram between variables and factors.

age, a high masculinity rate and a higher dependency rate. The opposite would occur if *FType II* were negative.

The second factor,³ named *Type I Financial Exclusion versus Diversity* (from now on, *FType I*), contrasts type I financial exclusion, measured by the percentage of municipalities without bank offices, and the degree of sociocultural diversity quantified by the percentage of foreigners residing in the *comarca*. This factor reflects how both aspects are interconnected in the Aragonese *comarcas*. Thus, *comarcas* with more municipalities without bank offices tend to have higher values in this factor, which indicates worse accessibility to financial services for their residents. On the other hand, in *comarcas* with a significant presence of a foreign population, lower values are observed in this factor, which suggests greater sociocultural diversity and, at the same time, less type I financial exclusion.

These two factors highlight the importance of simultaneously addressing population ageing, economic dynamism, sociocultural diversification, and financial exclusion to develop effective regional

² The results show in this section were obtained using R 4.2.3.

³ We have multiplied the second factor by (-1) so that high values in the factor indicate the existence of type I financial exclusion.

intervention strategies. They provide a complementary vision of the dynamics that affect the *comarcas* concerning financial exclusion and their socio-economic development. *FType II* shows that in *comarcas* with high values in this factor, there is a positive, constructive relationship between economic dynamism and type II financial exclusion. For its part, *FType I* highlights the positive influence of sociocultural diversity, particularly the presence of a foreign population, in mitigating type I financial exclusion. This fact may be related to the entrepreneurial mentality that often characterizes foreign migrant communities that reside in municipalities with bank offices due to growing economic activity.

Figs. 3 and 4 show, respectively, the box plots of the scores distribution of *FType I*⁴ and *FType II* in each *comarca* over the years. Fig. 5 shows, in biplot form, the simultaneous evolution of the factor scores of the two factors by *comarca*-year. In this figure, the *comarca*-year pairs are represented as points in the biplot, and we can see how they are grouped or dispersed depending on their scores on the two factors. The *comarcas* close in the biplot have similar profiles regarding the two factors. In this way, the biplot allows us to identify patterns, relationships, and groupings that help us better understand the socio-demographic dynamics in the *comarcas* concerning the *FType II* and *FType I* factors. All this allows evaluating their differences and similarities, identifying patterns or groupings between the *comarcas* based on their profile in this factor.

Thus, *comarcas* that present high values in *FType I* (ARN, HUE, JAC, SOM, TAR, TER) have a lack of bank offices in a significant percentage of their municipalities. On the contrary, *comarcas* with lower values in this factor (BCI, CAR, CAS, VAL) present greater economic diversity due to a more substantial portion of the immigrant population that performs work tasks linked especially to abundant fruit crops (Figs. 3 and 5). The greater economic diversity of the latter has generated economic dynamism and, as a result, greater availability of banking services.

With respect to the factor scores of *FType II*, *comarcas* with higher values (HUE, RAE, VAL, ZAR) tend to have a younger population, a more vibrant economic dynamic, and a greater oversaturation of some of their offices. On the other hand, those *comarcas* that tend to have the lowest values (ALB, BEL, CAR, MAE) are older, have a lower economic vitality and, therefore, less saturation in their few offices (Figs. 4 and 5).

In addition, it can be noticed that, in general, the evolution of each *comarca* is in the same area of the biplot, given that its points in different years are close together (Fig. 5). All this suggests a persistence in the behavior of the regions over time concerning the factors analyzed, reflecting that their sociodemographic and financial characteristics remain constant over time. There is, therefore, evidence that *comarcas* tend to have a distinctive pattern in terms of socio-economic dynamism, ageing, and financial exclusion that persists over the years.

Some *comarcas* tend to present high values in both factors (JAC, HUE, SOM, TER). This indicates that they have a greater economic and demographic dynamism, which could be the cause for the saturation of some of the bank offices in its urban municipalities, causing problems of type II financial exclusion. At the same time, they are experiencing type I financial exclusion since a non-negligible part of their municipalities also do not have bank offices. Other *comarcas* (CAR, MAT, SOB) present a combination of low values in both factors, which indicates that they face some challenges related to the ageing of the population. However, they also have a diverse population, with many foreign residents. Therefore, the *comarcas* in this group do not seem to suffer significant problems of financial exclusion. Finally, some *comarcas* (ALB, ARN, BEL, DAR) have high levels of depopulation and ageing, as well as low levels of economic-labour dynamism, fewer problems of type II financial exclusion, and high levels of type I financial exclusion, marking important problems to reverse their situation.

Finally, in Fig. 6, we show in two panels the temporal evolution of the spatial distribution of both factors. The 16 maps that represent this evolution provide a detailed and dynamic vision of how the Aragonese *comarcas* have evolved throughout the study period in terms of economic dynamism, population ageing, sociocultural diversity, and financial exclusion. In panel A, we can see that the regions colored in deep brown are the ones that show more problems of type I financial exclusion and a lower presence of foreigners. On the contrary, the *comarcas* in beige are the most diverse and have the lowest percentage of municipalities without offices. Similarly, in panel B, we can see that the *comarcas* colored in deep brown are the ones that present more type II financial exclusion problems, as well as greater economic dynamism and less ageing of their population. On the contrary, the regions in beige are the most aged, with the most significant lack of work dynamics, and with little presence of saturated offices.

Temporal stability is observed in the behavior of the *comarcas* concerning the two factors. The lowest scores regarding the factor *FType I* tend to correspond to agricultural, livestock, and industrial communities with high percentages of foreign workers, while the highest correspond to *comarcas* with higher rates of municipalities without bank offices (Figs. 5 and 6). Regarding the *FType II* factor, the highest scores tend to occur in *comarcas* with saturation problems in their bank offices and a higher level of economic-social development. In contrast, the lowest levels correspond to regions with lower saturation levels or economic-social growth (Figs. 5 and 6). However, despite the general stability observed in these maps over time, the segmentation into intervals highlights the significant differences between the *comarcas*. All this justifies the application of cluster analysis techniques to determine groups of *comarcas* with similar patterns in both factors, a study presented in Section 3.2.

3.2. Classification of the *comarcas* of Aragon

In this section, we present the cluster analysis results conducted in each of the eight years of the study. Firstly, a hierarchical analysis with Ward's method has been applied to explore the general grouping structure in the *comarcas* of Aragon. The *Nbclust* function of the statistical program R, which considers multiple criteria for evaluating the number of groups, was used to determine the optimal number each year. The results indicated three groups were the most appropriate solution in all years. Subsequently, this solution was refined using the k-means algorithm to assign each *comarca* to one of the three groups identified yearly. This approach guaranteed consistency in the segmentation of the *comarcas* throughout the period analyzed, providing an interpretation of the groups' profiles regarding economic dynamism, population ageing, sociocultural diversity, and financial exclusion. PANEL A of Fig. 7 shows the temporal evolution of the spatial distribution of the three groups. It is observed that the groupings provided by the different cluster analyses using the two factors as grouping variables are reasonably consistent throughout the 8 years. The grouping formed by the assignment of each *comarca* to the group to which it has belonged for most of said years is shown in PANEL B.

Fig. 8 shows a visual representation that allows us to discern the differences between the groups of *comarcas* identified in our study. The means of the two factor scores are shown in Panel A, and here, we can observe distinctive patterns. Group 1 tends to take significantly higher values on both factors; Group 2 tends to take average values in factor *FType I* and significantly lower values in factor *FType II*; finally, Group 3 is characterized by its tendency to take considerably lower values in the factor *FType I* and higher in the factor *FType II*.

In Panel B, the temporal evolution of the factor scores for each *comarca* is represented in line diagrams, colored according to their membership in the three identified groups. The purpose of panel B is not to identify the *comarcas* individually, but to visualize the grouping of all the *comarcas* that belong to the same group around the error bar graphs represented in panel A, as well as their stability over time. Overall, this

⁴ Estimates of the factor scores of the two factors were carried out by the regression method.

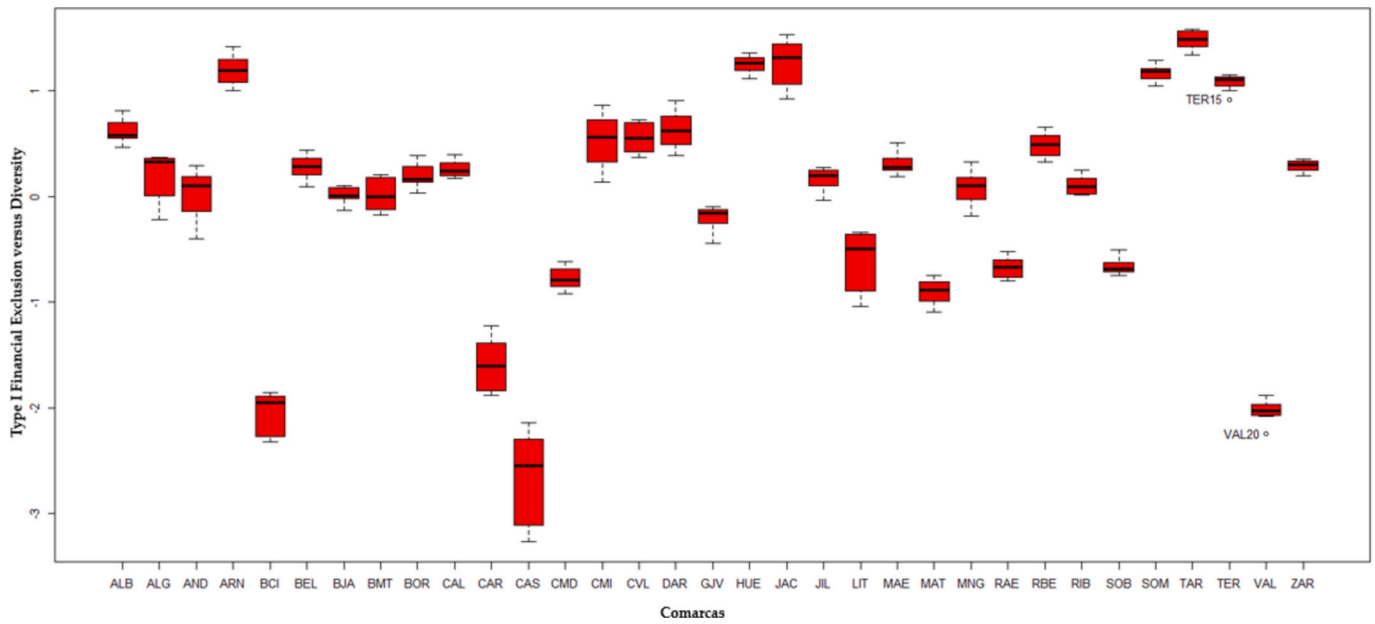


Fig. 3. Boxplots with the distribution of the scores of the *FType I* factor.

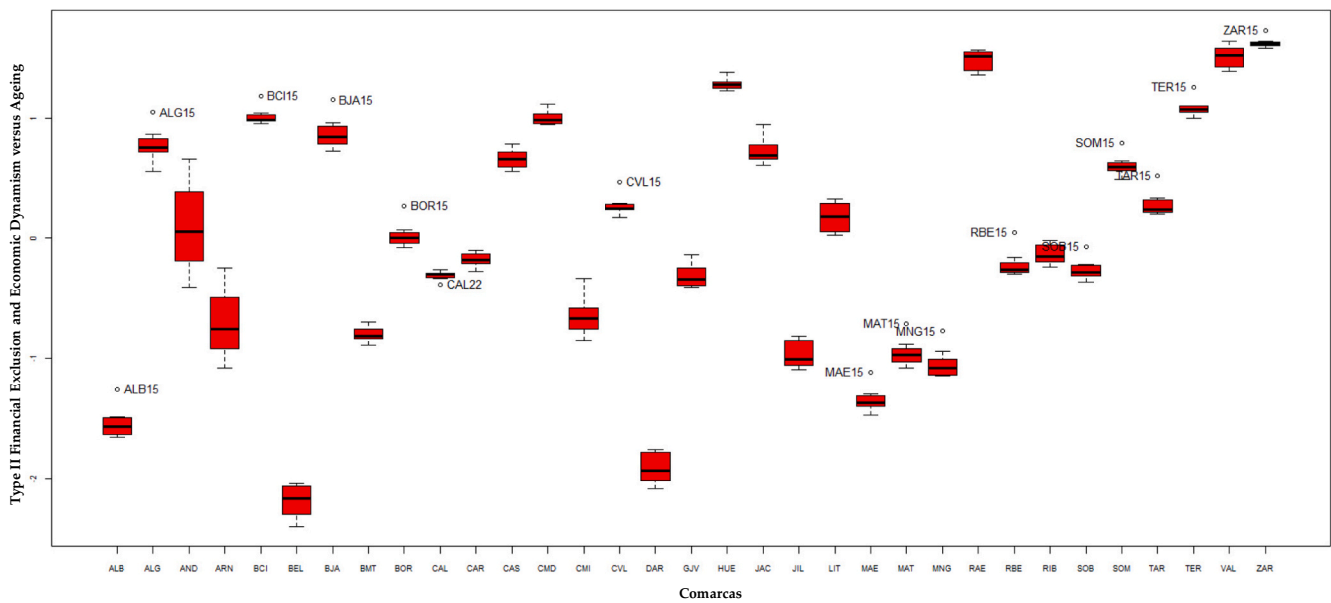


Fig. 4. Boxplots with the distribution of the scores of the *FType II* factor.

visualization reinforces the robustness of our segmentation and provides us with a more complete understanding of the diversity of the *comarcas* in terms of these two factors.

In general terms, we can conclude that the profile of the three groups that we have identified in each year is the following:

Group 1: This group is characterized by showing high values in both factors. All this indicates that these *comarcas* have a young population and positive economic dynamics, although they face challenges in terms of financial exclusion. On the one hand, they experience type II financial exclusion due to a significant saturation of some bank offices. On the other, they suffer from type I financial exclusion, as some of their municipalities lack bank offices, making it difficult to access financial services in those territories.

Group 2: This group presents low values in the factor *FType II* but average values in the factor *FType I*. All this indicates that these *comarcas*

face a challenging panorama, characterized by an ageing population with hardly any economic dynamism and experiencing type I financial exclusion since many of their municipalities lack bank offices.

Group 3: This group exhibits high values in the factor *FType II* and low in the factor *FType I*. All this implies that these areas experience positive economic dynamism and population ageing but with slight type II financial exclusion problems. What stands out in these *comarcas* is their great sociocultural diversity due to a significant percentage of foreigners. All this translates into a low presence of municipalities without bank offices, associated with their greater labour dynamism. In other words, most residents in these *comarcas* can access bank offices with lower congestion levels. Therefore, they have the best situation regarding the financial exclusion of the three groups.

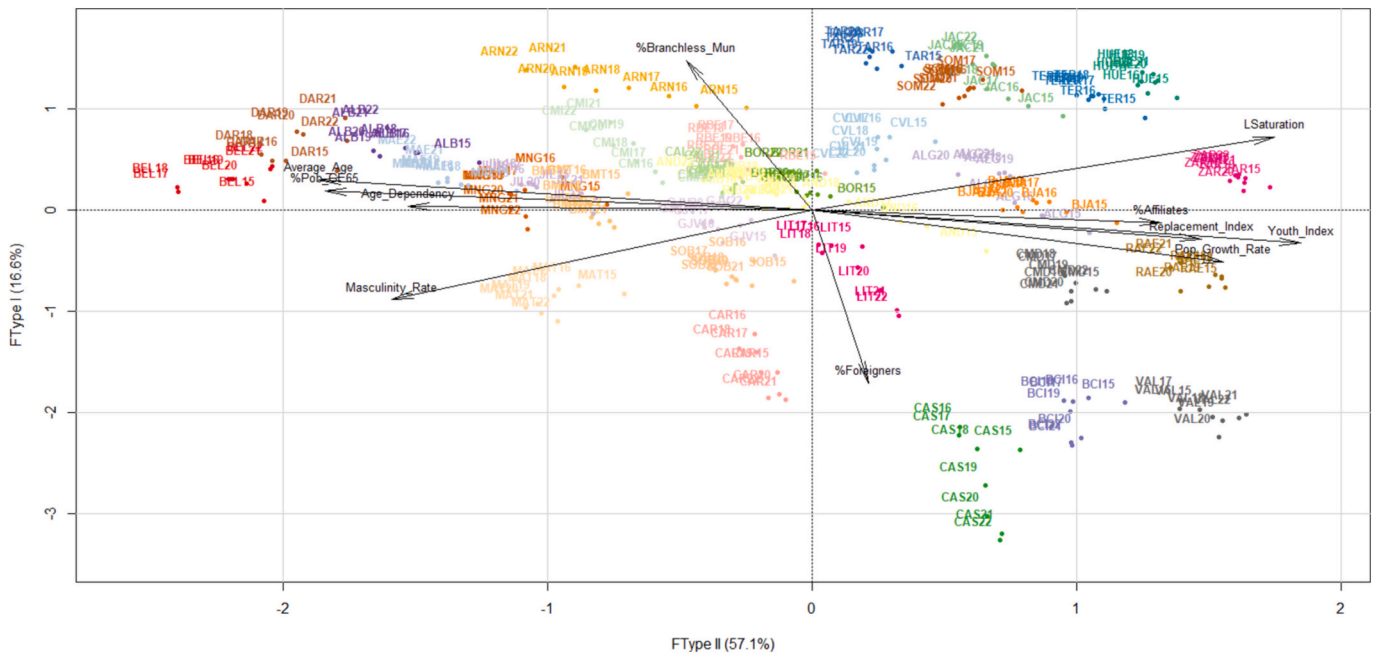


Fig. 5. Biplot of *FType II* (X-Axis) and *FType I* (Y-Axis) in the comarcas of Aragon.

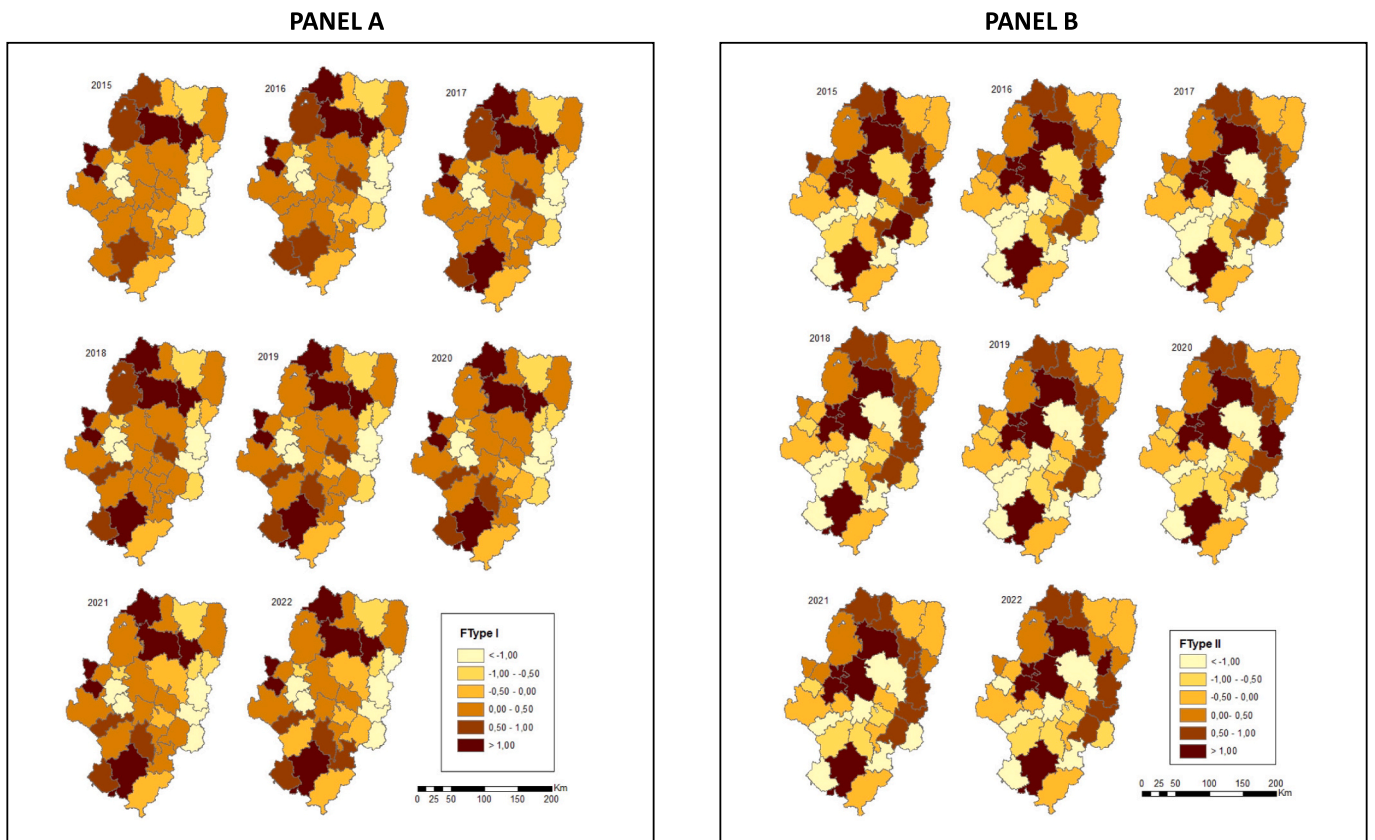


Fig. 6. Temporal evolution of the spatial distribution of the two factors' scores (*FType I* in PANEL A and *FType II* in PANEL B).

3.3. Panel-data regression analysis

Conducting panel data regressions is justified by the need to deepen the understanding of the underlying dynamics. These dynamics influence the depopulation and financial exclusion of the comarcas of Aragon. It also gives us a more complete view of how key variables interact over

time and within specific groups of comarcas. Panel-data regressions allow us to address the temporal dimension of the phenomena studied and analyze how relationships have evolved over the years. Furthermore, they offer the opportunity to evaluate the persistence of the effects of the independent variables on the dependent variable over time, which is crucial to understanding the dynamics of these phenomena in the

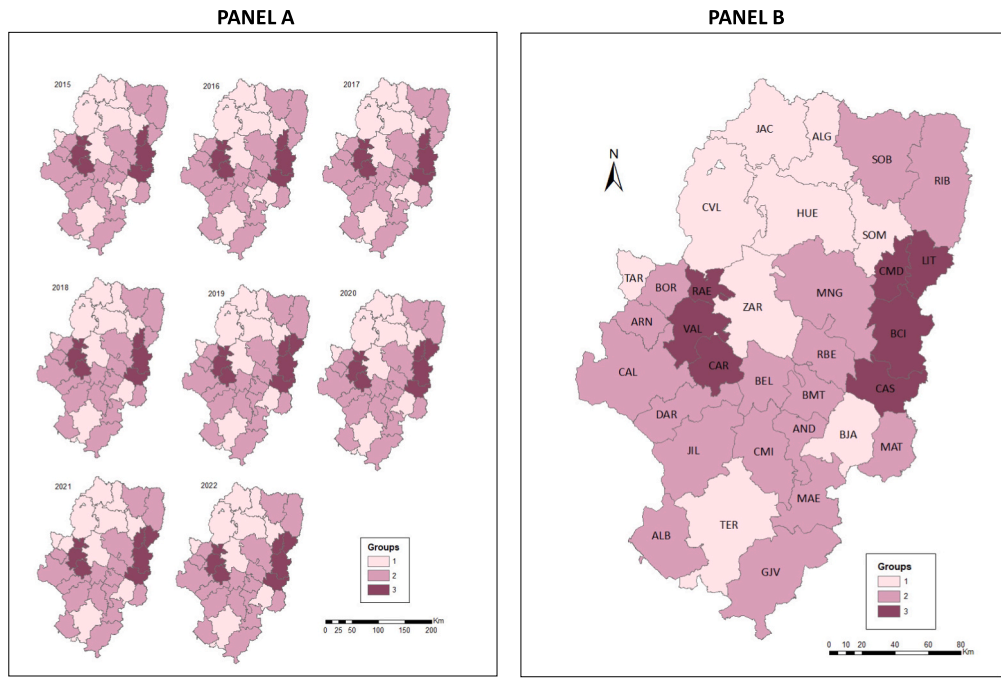


Fig. 7. Temporal evolution of the spatial distribution of the three groups of *comarcas* (PANEL A) and the combined summary grouping with the abbreviations of the 33 *comarcas*' names (PANEL B).

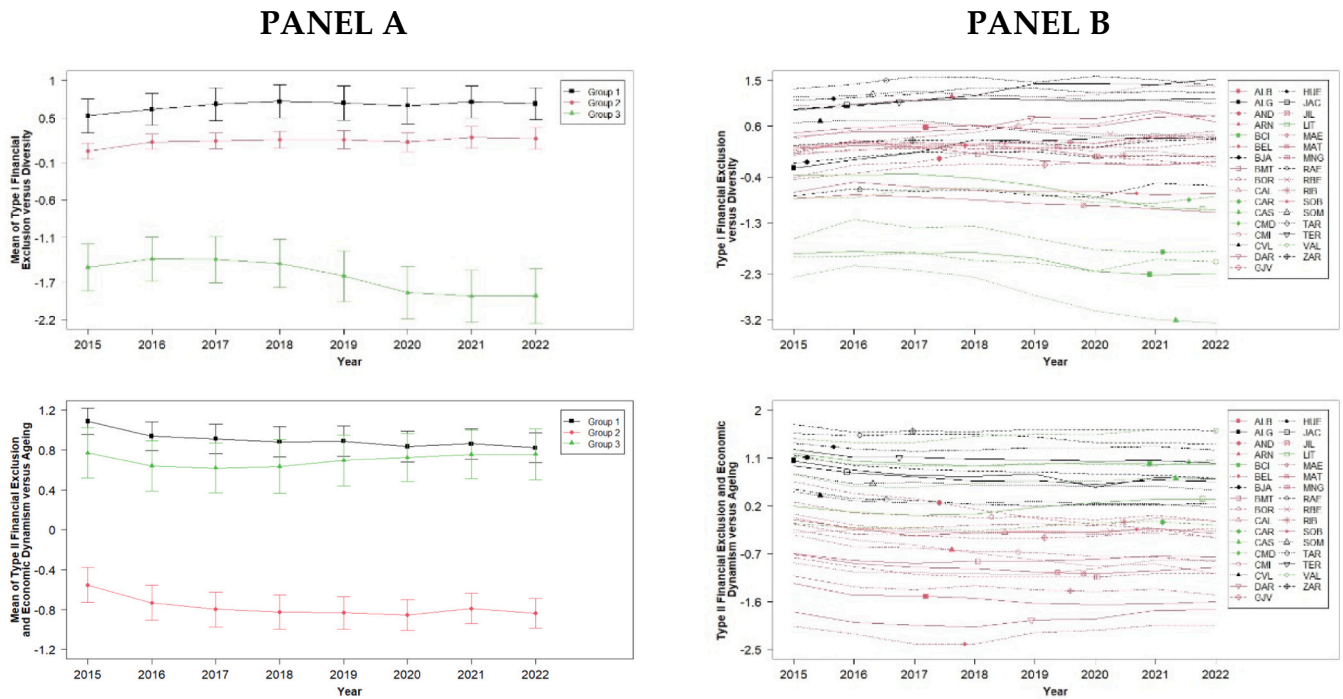


Fig. 8. Plot means with error bars of the two factors' scores distinguishing by groups of *comarcas* (PANEL A) and *comarcas*' line graphs with the two factors' scores colored by groups (PANEL B).

context of the Aragonese *comarcas*, as well as the possibility of making predictions about the short- and long-term evolution of the analyzed variables.

Type I financial exclusion is analyzed based on the variable *%Branchless Mun*, and type II financial exclusion is based on the variable *LSaturation*. Regarding depopulation, we have selected many socio-demographic variables to analyze it. To solve the multicollinearity problems among them, we have carried out a factor analysis to reduce

the dimension of the data and increase the degree of intelligibility of the results obtained. Thus, two factors have been obtained: *FDIn Ageing*, which reflects the relationship between economic dynamism and the age structure of the population, and *FForeigners*, which is related to the sociocultural diversity in the *comarcas*, particularly in the presence of a foreign population (see details in Appendix B.3).

Next, we present the results of the four regressions in the following sub-sections in which we have taken as dependent variables $Y =$

LSaturation (Subsection 3.3.1), $Y = \%Branchless_Mun$ (Subsection 3.3.2), $Y = FDin_Ageing$ (Subsection 3.3.3) and $Y = FForeigners$ (Subsection 3.3.4). In each case, the remaining variables have been taken as independent variables ($k = 3$). The number of groups has been taken equal to 3 ($G = 3$), and their composition corresponds to the groups shown in Fig. 7 PANEL B. This approach has been adopted given that the existing dependencies between the four variables are, most likely, bidirectional. This way, we measure these dependencies as accurately and straightforwardly as possible. In each case, the results obtained were compared with the model that assumes homogeneity and simplified versions of the models that assume that some of the previous regression coefficients are equal to 0. All regressions were performed using the package *plm* of the statistical program R (Croissant & Millo, 2008).

3.3.1. Panel regression on the saturation variable

Table 3 presents the estimated values of the regression coefficients of the finally selected model (1), while Appendix C.1 shows the estimates of all the models considered in the study.

The results reveal that although the estimated regression coefficients for each group show the same sign, most of their values are significantly different. The estimates suggest a persistence over time in the levels of saturation, being significantly higher in the *comarcas* of Group 1. This indicates, in particular, that the *comarcas* with oversaturation issues (Group 3) continue to experience this situation for an extended period. Furthermore, it is observed that greater economic dynamism and, therefore, a lower proportion of the ageing population tend to reduce banking congestion in the following period, with a more pronounced impact on Groups 1 and 3.

Regarding the factor *FForeigners*, it is evident that the presence of a foreign population is associated with an increase in banking congestion in the following period. However, this influence does not reach statistical significance in Group 1. Finally, there is no considerable influence on the proportion of municipalities without bank offices, possibly because type I financial exclusion prevails in significantly depopulated and ageing municipalities. At the same time, type II financial exclusion affects larger and more dynamic municipalities, resulting in orthogonal evolutions of both processes, as reflected in the biplot of Fig. 5.

These findings have highly relevant implications for developing policies addressing the congestion of bank offices in various *comarcas* of Aragon. *Comarcas* that experience growth in their economic dynamism become attractive destinations for investment quite often, both by local companies and foreign investors. These investments can lead to the opening of new businesses, the expansion of existing operations, and the creation of jobs. In an expanding economic environment, financial institutions find an additional incentive to establish bank offices and offer complementary services that support these economic activities. Regarding the presence of foreign population, its influence tends to increase congestion levels in *comarcas* belonging to Group 2, which have a smaller population, and Group 3, where higher proportions of foreign residents are observed due to the presence of economic activities, such as agriculture, with high employability for a foreign population that has no other job expectations. However, its influence does not achieve statistical significance in the *comarcas* of Group 1, which are much more populated and have a proportionally smaller presence of foreigners. Consequently, this factor does not directly translate into congestion

levels, as the non-foreign population in these *comarcas* predominantly determines them.

3.3.2. Regression on the variable percentage of municipalities without bank offices

Table 4 presents the estimated values of the regression coefficients of the finally selected model (1). Additional results can be found in Appendix C.2.

The results indicate that the percentage of municipalities without bank offices tends to persist over time in all groups of *comarcas* of Aragon. Furthermore, lower economic dynamism and an older population in the previous period are related to an increase in the proportion of municipalities without bank offices in the following period and, therefore, to a rise in type I financial exclusion, especially in the *comarcas* of Groups 1 and 2. However, saturation (type II financial exclusion) does not influence the percentage of municipalities without offices for the same reason discussed in the previous section. Finally, a foreign population increases the rate of municipalities without bank offices in the *comarcas* of Group 1. This fact could be justified because this type of population, as already indicated, usually settles in towns with more significant economic and labour dynamics, increasing its attractiveness for both foreigners and nationals. All this creates other spaces that do not receive the flow of immigrants and are losing population and therefore bank offices.

3.3.3. Regression on the *FDin_Ageing* factor

Table 5 presents the estimated values of the regression coefficients of the finally selected model (1); Appendix C.3 shows the estimates of all the models considered in the study.

Our analysis highlights that the socio-economic dynamism in the *comarcas* of Aragon is positively influenced by its previous history, as reflected in the lagged factor. Furthermore, the lack of considerable evidence on the influence of type I or type II financial exclusion in the *comarcas* indicates the robustness and stability of their economic and financial environment. The relationship between the percentage of foreign population and economic and demographic dynamism varies according to the group, showing adverse effects in Group 2 and positive impact in the rest of the groups, being especially significant in the *comarcas* of Group 3. All this may be because foreigners tend to settle in areas with greater economic and labour dynamism, which occurs in Groups 1 and 3.

3.3.4. Regression on the *FForeigners* factor

Table 6 presents the estimated values of the regression coefficients of the finally selected model (1). Appendix B.4 shows the estimates of all the models considered in the study.

The results indicate that the presence of foreign residents in the *comarcas* of Aragon tends to persist over time in all groups, with this effect being more significant in the *comarcas* of Group 3, which are the ones that offer them the most jobs. The results of the factor *FDin_Ageing* are, however, of a negative nature, especially for the *comarcas* of Group 3, given that foreign workers tend to occupy the worst jobs and those abandoned by retired national workers. Again, we do not find evidence that the absence of bank offices significantly influences the proportion of foreigners in these *comarcas* in the following period. Type I financial

Table 3
Estimates of the regression model for the *Saturation* variable*.

Variable	Group 1			Group 2			Group 3		
	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue
lag(<i>LSaturation</i> ,1)	0.7835	0.0821	0.0000	0.5531	0.0928	0.0000	0.5051	0.1605	0.0035
lag(<i>FDin_Ageing</i> ,1)	-0.1457	0.0232	0.0000	-0.0601	0.0210	0.0051	-0.1085	0.0443	0.0198
lag(<i>FForeigners</i> ,1)	0.0219	0.0380	0.5664	0.1495	0.0434	0.0008	0.0847	0.0293	0.0068

Table 4
Estimates of the regression model for the %Brancheless_Mun variable*.

Variable	Group 1			Group 2			Group 3		
	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue
lag(%Brancheless_Mun,1)	0.6575	0.0649	0.0000	0.4922	0.1110	0.0000	0.6676	0.0915	0.0000
lag(FDin_Ageing,1)	-1.7811	0.5866	0.0027	-4.9439	1.2525	0.0002	-10282	0.6480	0.1157
lag(FForeigners,1)	1.7497	0.7334	0.0180	0.6855	1.7500	0.6967	1.6924	1.2093	0.1648

Table 5
Estimates of the regression model for the FDin_Ageing factor*.

Variable	Group 1			Group 2			Group 3		
	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue
lag(FDin_Ageing,1)	0.6581	0.0263	0.0000	0.6401	0.0388	0.0000	0.6710	0.0362	0.0000
lag(FForeigners,1)	0.0445	0.0331	0.1806	-0.1660	0.0606	0.0082	0.1685	0.0658	0.0119

Table 6
Regression model estimates for the FForeigners factor*.

Variable	Group 1			Group 2			Group 3		
	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue	Beta	Std,Error	Pvalue
lag(FDin_Ageing,1)	-0.2838	0.0359	0.0000	-0.1570	0.0271	0.0000	-0.4729	0.1191	0.0004
lag(FForeigners,1)	0.8471	0.0562	0.0000	0.9751	0.0493	0.0000	10215	0.0618	0.0000

exclusion may be because foreign workers do not usually settle in small municipalities with no jobs and a worse quality of life. The lack of influence of type II financial exclusion could be because it usually occurs in the largest and most dynamic population centers where foreign workers go because there are more employment possibilities and not because the bank offices are congested.

4. Discussion

The analysis conducted provides a valuable approach to understanding the relationship between different sociodemographic situations and the presence or absence of financial services in the *comarcas* of Aragon in the period 2015 to 2022. In what follows, we discuss the most notable results obtained in the study.

4.1. Economic dynamism and ageing

One of the most notable findings is the strong relationship between economic dynamism and the population’s age structure in the *comarcas* of Aragon. *Comarcas* with higher economic dynamism tend to have a younger population. All this suggests that economic growth and job creation can contribute significantly to retaining young people in the region. These results indicate that promoting local economic development can effectively address depopulation and ensure demographic sustainability in Aragon. The influence of type I and II financial exclusions on this factor is not significant, showing that the role played by the existence or absence of bank offices is marginal given that our results show that financial exclusion is an effect rather than a cause of Aragon’s economic dynamism and ageing processes.

Regarding the influence of the existence of foreigners on economic dynamism, it is diverse. In the *comarcas* of Groups 1 and 3, their effect is generally positive due to a higher standard of living and more jobs for them. The same is not true for the *comarcas* of Group 2, where there is a higher number of ageing municipalities and worse living conditions, leading the local population to migrate in search of better living conditions. Meanwhile, foreign residents in these areas often take up the

jobs vacated by the original inhabitants.

4.2. Sociocultural diversity and financial exclusion

The presence of a foreign population, considered a key component of sociocultural diversity, has proven to be a factor of limited influence in the context of type II financial exclusion. All this is because the foreign population tends to settle in areas with greater economic and labour dynamism due to their more significant job opportunities. However, type II financial exclusion tends to arise more in these places due to a more substantial number of national residents than foreigners do.

On the other hand, in the case of municipalities without bank offices (type I financial exclusion), foreign residents tend not to settle there due to less favorable living conditions. In *comarcas* with greater sociocultural diversity, characterized by a higher proportion of foreign residents (Group 3), a lower type I financial exclusion is observed since there are few municipalities without bank offices in this category. All this suggests that the contribution of migrants to the local economy in this group of *comarcas* and the continued opening of bank offices in areas with a foreign population can improve access to financial services for the entire region. These results underline the importance of implementing policies that encourage diversity and promote the inclusion of the foreign population in the economic and social life of the Aragonese *comarcas*.

4.3. Banking congestion and access to financial services

The relationship between banking congestion and other factors is complex and varies depending on the group of *comarcas* considered. In some *comarcas*, greater economic dynamism and a younger population are associated with a reduction in banking congestion, resulting from the greater penetration of online banking due to the more excellent computer skills of the younger generation. In contrast, in others, the presence of a foreign population is related to an increase in banking oversaturation since they have established their residence in large towns, where offices have been reduced. Still, this type of service continues to exist. These results highlight the need to address banking

congestion differently depending on local and demographic characteristics.

4.4. Persistence of problems and intervention policies

Our results show that depopulation and the problems of bank congestion and lack of bank offices in some *comarcas* tend to persist over time. Therefore, it is crucial to recognize that the *comarcas* in Groups 1 and 2 tend to face significant challenges of financial exclusion. At the same time, those in Group 3 have managed to remain free of these problems. On the other hand, in terms of socio-economic development, the *comarcas* of Groups 1 and 3 are prospering, while those of Group 2 are in a less favorable situation.

All this underlines the importance of implementing policies and intervention strategies that address these issues continuously and sustainably. There is no universal solution to address depopulation and financial exclusion in all *comarcas* of Aragon. Each group of *comarcas* has its particularities and demands specific and adapted political approaches.

Thus, in the *comarcas* of Group 1, which faces problems of financial exclusion of both types, it would be necessary to encourage opening bank offices in underserved areas and promote online banking services and financial education to empower the local population. However, to achieve this, it is crucial to ensure the availability of internet access, which is sometimes lacking due to inadequate infrastructure, particularly in information and communication technologies (Maudos, 2017).

Concerning the *comarcas* in Group 2 that face poor socio-economic development, a high rate of depopulation and ageing, and a lack of bank offices in many of their municipalities, specific measures are required and focused on increasing their economic activity and generating medium and long-term employment. This can be particularly effective when managed from the *comarca* capitals, as they serve as territorial centralities for organizing various services. Economic policies that promote studies on the management of natural resources, cultural heritage, and the job training of the foreign population could provide crucial solutions to enhance economic dynamism. Additionally, analyzing the provision of basic services and infrastructure to meet the needs of local entrepreneurs could play a significant role in revitalizing these areas. By centralizing these efforts in the *comarca* capitals, coordination and implementation can be streamlined, ensuring a more efficient and targeted approach to address the particular challenges faced by each municipality. This strategic focus not only promotes economic growth but also fosters social development, ultimately leading to sustainable progress and an improved quality of life for residents in the *comarcas* of Group 2. However, as these middle and long-term strategies take shape, there is an immediate need for short-term solutions. Collaboration with post offices and other public services could provide essential banking services, temporarily addressing type I financial exclusion issues. The *comarca* capitals, serving as services hubs, could also centralize financial activities to consolidate banking functions and improve accessibility for all residents. This dual approach, focusing on both middle and long-term economic revitalization and short-term financial inclusion, aims to create a more resilient and prosperous future for the *comarcas* in Group 2.

Finally, for the *comarcas* of Group 3, it would be essential to consolidate and strengthen their current socio-economic development so that they continue to be attractive places to live and work. Furthermore, they should prevent the appearance of saturation problems by controlling their number of offices, guaranteeing that all their residents have adequate access to their financial services.

5. Conclusions and future perspectives

In this study, we have explored the dynamics of depopulation and financial exclusion in the Aragonese *comarcas* over eight years. Our research has been based on a multivariate analysis of panel data that has

included a factor analysis to identify underlying factors in the variables used, a cluster analysis to group the *comarcas* into homogeneous categories, and panel-data regressions to understand how diverse socio-demographic and financial variables interact over time and within specific groups of *comarcas*.

Our findings have revealed a significant interconnection between depopulation and financial exclusion in the Aragonese *comarcas*. We have confirmed that the saturation of bank offices and their absence are linked to the evolution of economic dynamism, the ageing process, and the percentage of the foreign population. However, we have not identified a reverse causal relationship, suggesting that both forms of financial exclusion, type I and type II, are a derivative effect rather than a cause of the socio-economic evolution of the region.

We have shown that focusing on *comarcas* as a unit of analysis provides a solid basis for understanding and addressing depopulation and financial exclusion. The specific characteristics of each *comarca*, encompassing socio-demographic factors and the presence or absence of bank branches, play a substantial role in influencing these phenomena. This detailed perspective at *comarca* scale has allowed us to identify patterns and trends that might otherwise have gone unnoticed. By recognizing the importance of local differences, we can design more effective intervention strategies and take advantage of synergies that may exist at the municipal scale.

Our research has identified three groups of *comarcas* with similar patterns of economic dynamism, population ageing, sociocultural diversity, and levels of type I and type II financial exclusion. This segmentation provides a deeper and more nuanced vision of the regional reality and lays the foundation for more precise and effective intervention strategies. Recognizing that there is no one-size-fits-all solution, policies and programs designed to address depopulation and financial exclusion can now be tailored more specifically to the needs of each group of *comarcas*. All this optimizes the use of limited resources and increases the chances of success in promoting sustainable development in Aragon and other rural regions of Europe.

However, it is essential to recognize the inherent limitations of our study. The research was based on data from 2015 to 2022, establishing a specific time for the analysis. The challenges of financial exclusion and depopulation began before this period, and a temporal extension covering earlier years could have provided an even more complete understanding of their historical evolution. Furthermore, although our findings shed light on the *comarcas* of Aragon, the extrapolation of these results to other regions must be conducted with caution due to the contextual differences between different geographical areas.

Moreover, although we currently cannot make direct comparisons due to the lack of studies at this county scale, we recognize the potential for our work to serve as a reference for future analyses. Therefore, a future line of investigation beyond local boundaries would be to extend our study to districts in other European regions, thus providing a more comprehensive understanding of the challenges and opportunities to promote financial inclusion and sustainable development at the local level in Europe. By examining these specific administrative units, we aim to bridge a critical gap in the existing literature and provide valuable insights for policymakers and researchers.

Our approach has focused solely on financial exclusion from a territorial perspective, particularly concerning the physical access difficulties to bank branches due to their scarcity. However, there are very recent papers in the literature (Dircio-Palacios-Macedo et al., 2023; Tram et al., 2023; Zheng et al., 2024) that consider various dimensions of financial inclusion/exclusion, such as availability, penetration, usage, and quality of financial services. In addition, it is necessary to consider several environmental and health factors (Liao et al., 2023) that can provide greater clarity on the effects of financial exclusion from a territorial perspective. To address this limitation of our study, we propose a future line of research that delves into the complexities of financial exclusion in all its dimensions at *comarca* scale. By considering these multiple facets, we will be able to better understand the specific

challenges faced by different *comarcas*, allowing us to propose more nuanced and context-specific solutions to address financial exclusion in each case.

Finally, the four regressions presented in Section 3.3 of our study capture the temporal dynamics. However, two promising extensions using advanced statistical tools for future research include quantile regressions and Poisson regression models. Quantile regressions, as demonstrated in Alamá and Tortosa-Ausina (2012), offer a more detailed analysis of the stochastic relationships between socioeconomic and financial variables by considering the entire distribution of location patterns. This technique could provide insights into how factors influencing branch locations vary across different percentiles of the distribution, enabling policymakers and financial institutions to tailor interventions more effectively. Additionally, employing Poisson regression models (Alamá et al., 2015) could delve deeper into the dynamics of depopulation and financial exclusion in the *comarcas* of Aragón. These models are well-suited for analyzing count data related to bank branches, as they account for the influence of demographic, economic, and geographic variables. By using Poisson regression within the Generalized Linear Mixed Model (GLMM) framework, we can more accurately model the spatial and temporal dimensions of financial exclusion and depopulation. These methodological advancements would enhance our understanding of regional banking dynamics and inform targeted strategies for promoting financial inclusion in underserved areas.

While there are still aspects to explore further, this initial contribution regarding the relationship between the sociodemographic situation in supra-municipal entities, such as municipal groupings in *comarcas*, reveals a significant correlation between depopulation and the physical absence of bank branches. This finding suggests the possible solution of centralizing these services in the *comarca* capitals, similar to how it is done with other essential services. This strategy would be particularly beneficial for the *comarcas* in Group 2, providing an option to meet the needs of the majority of municipalities in these areas lacking physical banking presence.

CRedit authorship contribution statement

M. Pilar Alonso: Writing – original draft, Visualization, Validation, Supervision, Resources, Investigation, Conceptualization. **Pilar Gargallo:** Writing – original draft, Validation, Supervision, Software, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Luis Lample:** Writing – review & editing, Validation, Resources. **Carlos López-Escolano:** Writing – review & editing, Validation, Resources, Investigation, Data curation. **Jesús A. Miguel:** Software, Formal analysis, Data curation. **Manuel Salvador:** Writing – original draft, Validation, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cities.2024.105495>.

[org/10.1016/j.cities.2024.105495](https://doi.org/10.1016/j.cities.2024.105495).

Data availability

Data will be made available on request.

References

- Alamá, L., Conesa, D., Forte, A., & Tortosa-Ausina, E. (2015). The geography of Spanish bank branches. *Journal of Applied Statistics*, 42(4), 722–744. <https://doi.org/10.1080/02664763.2014.980792>
- Alamá, L., & Tortosa-Ausina, E. (2011). *Bank branch geographic location patterns in Spain: Some implications for financial exclusion*. Instituto Valenciano de Investigaciones Económicas. WP-EC 2011-10.
- Alamá, L., & Tortosa-Ausina, E. (2012). Bank branch geographic location patterns in Spain: Some implications for financial exclusion. *Growth and Change*, 43(3), 505–543.
- Alamá-Sabater, L., Márquez, M.Á., & Tortosa-Ausina, E. (2022). Spatio-sectoral heterogeneity and population-employment dynamics: some implications for territorial development. *Regional Studies*, 1–24. <https://doi.org/10.1080/00343404.2022.2088725>
- Allain-Dupré, D. (2020). The multi-level governance imperative. *The British Journal of Politics and International Relations*, 4, 800–808. <https://doi.org/10.1177/1369148120937984>
- Alonso, M. P., Gargallo, P., López-Escolano, C., Miguel, J., & Salvador, M. (2023). Financial exclusion, depopulation, and ageing: An analysis based on panel data. *Journal of Rural Studies*, 103, Article 103105. <https://doi.org/10.1016/j.jrurstud.2023.103105>
- Alonso, M. P., & López-Escolano, C. (2021). Despoblación y falta de servicios en los espacios rurales: la exclusión financiera en Aragón. coords.. In R. C. Lois González, F. R. Durán Villa, & C. A. Patiño Romarís (Eds.), *Poboación e territorios rurais: estudos en homenaxe a Julio Hernández Borge e José M. López Andión* (pp. 143–166). Universidade de Santiago de Compostela, Grupo ANTE
- Alonso, M. P., Pueyo, A., Postigo, R., López-Escolano, C., & Rubio, J. L. (2014). La reestructuración del sector financiero. coords.. In J. M. Albertós, & J. L. Sánchez (Eds.), *Geografía de la crisis económica en España* (pp. 305–328). Publicacions de la Universitat de València
- Appleyard, L. (2011). Community development finance institutions (CDFIs): Geographies of financial inclusion in the US and UK. *Geoforum*, 42(2), 250–258. <https://doi.org/10.1016/j.geoforum.2010.09.004>
- Bernad, C., Fuentesels, L., & Gómez, J. (2008). Deregulation and its long-run effects on the availability of banking services in low-income communities. *Environment and Planning A*, 40(7), 1681–1696.
- Bock, B. B. (2016). Rural marginalisation and the role of social innovation; a turn towards nexogenous development and rural reconnection. *Sociologia Ruralis*, 56(4), 552–573. <https://doi.org/10.1111/soru.12119>
- Bruno, D., Sorando, R., Álvarez-Farizo, B., Castellano, C., Céspedes, V., Gallardo, B., ... Moret-Fernández, D. (2021). Depopulation impacts on ecosystem services in Mediterranean rural areas. *Ecosystem Services*, 52, Article 101369. <https://doi.org/10.1016/j.ecoser.2021.101369>
- Calvo, J. L., Jover, J. M., Pueyo, Á., & Zúñiga, M. (2008). Les nouveaux bassins de vie de la société espagnole à l'aube du XXIe siècle. *Sud-Ouest Européen*, 26, 89–110.
- Camacho, J. A., Molina, J., & Rodríguez, M. (2021). Financial accessibility in branchless municipalities: An analysis for Andalusia. *European Planning Studies*, 29, 883–898. <https://doi.org/10.1080/09654313.2020.1804533>
- Camarero, L., & Sampedro, R. (2016). Exploring female over-migration in rural Spain—Employment, care giving and mobility. In K. Wiest (Ed.), *Women and migration in rural Europe: Labour markets, representations and policies* (pp. 189–208). Palgrave MacMillan London.
- Caplan, M., Birkenmaier, J., & Bae, J. (2020). Financial exclusion in OECD countries: A scoping review. *International Journal of Social Welfare*, 30(1), 58–71. <https://doi.org/10.1111/ijsw.12430>
- Carbó, S., Gardener, E. P. M., & Molyneux, P. (2007). Financial exclusion in Europe. *Public Money & Management*, 27(1), 21–27. <https://doi.org/10.1111/j.1467-9302.2007.00551.x>
- Clarimont, S. (2005). L'émergence de nouveaux territoires de la prospective de la comarca des géographes à une structure intercommunale nouvelle. *Sud-Ouest Européen*, 20, 115–130.
- Collantes, F., & Pinilla, V. (2004). Extreme depopulation in the Spanish rural mountain areas: A case study of Aragón in the nineteenth and twentieth centuries. *Rural History*, 15, 149–166. <https://doi.org/10.1017/S0956793304001219>
- Corbacho-Quintela, A. (2016). La organización territorial. Especial referencia al papel de las áreas metropolitanas como entidades supramunicipales de gestión local. *Documentación administrativa, nueva época*, 3, 8.
- Croissant, Y., & Millo, G. (2008). Panel data econometrics in R: The plm package. *Journal of Statistical Software*, 27(2) (Special Volume: Econometrics in R: Past, Present, and Future (Editors: Achiz Zeileis and Roger Koenker)).
- Cruz-García, P., & Peiró-Palomino, J. (2023). Does bank branch density reduce income inequality in the Spanish provinces? *Finance Research Letters*, 58, Article 104625. <https://doi.org/10.1016/j.frl.2023.104625>
- De La Cuesta, M., Paredes-Gazquez, J., Ruza, C., & Fernández-Olit, B. (2021). The relationship between vulnerable financial consumers and banking institutions. A qualitative study in Spain. *Geoforum*, 119, 163–176. <https://doi.org/10.1016/j.geoforum.2021.01.006>

- Delgado, C. (2019). Depopulation processes in European rural areas: A case study of Cantabria (Spain). *European Countryside*, 11(3), 341–369. <https://doi.org/10.2478/euco-2019-0021>
- Demirguc-Kunt, A., Klapper, L., & Singer, D. (2017). *Financial inclusion and inclusive growth: A review of recent empirical evidence*. Policy Research Working Paper Series 8040. The World Bank.
- Dircio-Palacios-Macedo, M. C., Cruz-García, P., Hernández-Trillo, F., & Tortosa-Ausina, E. (2023). Constructing a financial inclusion for Mexican municipalities. *Finance Research Letters*, 52, Article 103368. <https://doi.org/10.1016/j.frl.2022.103368>
- Dubois, A., & Sielker, F. (2022). Digitalization in sparsely populated areas: Between place-based practices and the smart region agenda. *Regional Studies*, 56(10), 1771–1782. <https://doi.org/10.1080/00343404.2022.2035707>
- ESPON. (2018). *Fighting rural depopulation in Southern Europe-transnational observation* (pp. 1–12). Luxembourg ESPON European Union [Online] Available at: www.espon.eu/sites/default/files/attachments/af-espon_spain_02052018.pdf (Accessed 7 September 2023).
- European Union. (2020). Territorial Agenda 2030. A future for all places. Informal meeting of ministers responsible for spatial planning, territorial development and/or territorial cohesion, 1 December 2020, Germany. [Online] Available at: https://territorialagenda.eu/wp-content/uploads/TA2030_jun2021_en.pdf (Accessed 1 September 2023).
- Fernández-Olit, B., Martín Martín, J. M., & Porras González, E. (2019). Systematized literature review on financial inclusion and exclusion in developed countries. *International Journal of Bank Marketing*, 42(2), 600–626. <https://doi.org/10.1108/IJBM-06-2019-0203>
- Gil-Alonso, F., Bayona-i-Carrasco, J., & Pujadas-Rúbies, I. (2023). Is Spanish depopulation irreversible? Recent demographic and spatial changes in small municipalities. *Vienna Yearbook of Population Research*, 21, 1–33. <https://doi.org/10.1553/p-9fd9-h7g5>
- Gómez-Ullate, M., Rieutort, L., Kamara, A., Santos, A. S., Pirra, A., & Solís, M. G. (2020). Demographic challenges in rural Europe and cases of resilience based on cultural heritage management. A comparative analysis in Mediterranean countries inner regions. *European Countryside*, 12(3), 408–431. <https://doi.org/10.2478/euco-2020-0022>
- Granados, E., Rodríguez, R., & Vilachá, L. (2018). ¿El desarrollo sostenible como estrategia para abordar la despoblación en el medio rural? Estudio de caso: Almócita. *Equidad y Desarrollo*, 1(31), 217–237.
- Ho, C. S. T., & Berggren, B. (2020). The effect of bank branch closures on new firm formation: The Swedish case. *The Annals of Regional Science*, 65, 319–350. <https://doi.org/10.1007/s00168-020-00986-4>
- Hospers, G.-J., & Reverda, N. (2015). *Managing population decline in Europe's urban and rural areas*. Cham: Springer.
- Infante, J. (2010). Aproximación al modelo de comarcalización de Aragón. Una reflexión crítica. *Boletín de la Asociación de Geógrafos Españoles*, 52, 59–80.
- Jiménez, C., & Tejero, H. (2018). Cierre de oficinas bancarias y acceso al efectivo en España. *Revista de Estabilidad Financiera*, 34, 35–37.
- Johansson, M. (2016). Young women and rural exodus-Swedish experiences. *Journal of Rural Studies*, 43, 291–300. <https://doi.org/10.1016/j.jrurstud.2015.04.002>
- Leyshon, A., & Thrift, N. (1995). Geographies of financial exclusion: Financial abandonment in Britain and the United States. *Transactions of the Institute of British Geographers, New Series*, 20, 312–341.
- Li, Y., Westlund, H., & Liu, Y. (2019). Why some rural areas decline while some others not: An overview of rural evolution in the world. *Journal of Rural Studies*, 68, 135–143. <https://doi.org/10.1016/j.jrurstud.2019.03.003>
- Liao, L., Du, M., & Chen, Z. (2023). Environmental pollution and socioeconomic health inequality: Evidence from China. *Sustainable Cities and Society*, 95, Article 104579. <https://doi.org/10.1016/j.scs.2023.104579>
- Llorent-Bedmar, V., Palma, V. C. C.-D., & Navarro-Granados, M. (2021). The rural exodus of young people from empty Spain. Socio-educational aspects. *Journal of Rural Studies*, 82, 303–314. <https://doi.org/10.1016/j.jrurstud.2021.01.014>
- Llorente, I. (2019). Financial exclusion and equal treatment in access to banking services. *Revista de Derecho Civil*, 6(1), 399–443.
- Manta, O. (2022). *Digitalization of finances instrument of current challenges at the payment system*. Available at SSRN: <https://doi.org/10.2139/ssrn.3523827>
- Martin-Oliver, A. (2018). Financial exclusion and branch closures in Spain after the Great Recession. *Regional Studies*, 53(4), 1–12. <https://doi.org/10.1080/00343404.2018.1462485>
- Maudos, J. (2017). Bank restructuring and access to financial services: The Spanish case. *Growth and Change*, 48(4), 963–990. <https://doi.org/10.1111/grow.12211>
- Membrado-Tena, J. C. (2016). Entes territoriales de escala comarcal en la administración local española. *Documents d'Anàlisi Geogràfica*, 62(2), 347–371.
- Merino, F., & Prats, M. A. (2020). Why do some areas depopulate? The role of economic factors and local governments. *Cities*, 97, Article 102506. <https://doi.org/10.1016/j.cities.2019.102506>
- Mylonidis, N., Chletos, M., & Barbagianni, V. (2019). Financial exclusion in the USA: Looking beyond demographics. *Journal of Financial Stability*, 40(C), 144–158. <https://doi.org/10.1016/j.jfs.2017.09.004>
- Náñez-Alonso, S. L., Jorge-Vázquez, J., & Reier-Forradellas, R. (2020). Detection of financial inclusion vulnerable rural areas through an access to cash index: Solutions based on the pharmacy network and a CBDC. Evidence Based on Ávila (Spain). *Sustainability*, 12, 7480. <https://doi.org/10.3390/su12187480>
- Náñez-Alonso, S. L., Jorge-Vázquez, J., Reier-Forradellas, R., & Ahijado-Dochado, E. (2022). Solutions to financial exclusion in rural and depopulated areas: Evidence based in Castilla y León (Spain). *Land*, 11(1), 74. <https://doi.org/10.3390/land11010074>
- Newsham, N., & Rowe, F. (2022). Understanding trajectories of population decline across rural and urban Europe: A sequence analysis. *Population, Space and Place*, Article e2630. <https://doi.org/10.1002/psp.2630>
- Palacios, A., Pinilla, V., & Silvestre, J. (2022). Emigrating to depopulated regions in Mediterranean Europe: Demographic impact and choice of destination in a case study in North-East Spain (Aragón). *European Countryside*, 14(2), 258–280. <https://doi.org/10.2478/euco-2022-0013>
- Palacios, A., Sáez, L. A., & Pinilla, V. (2017). *La despoblación en Aragón, 2000–2016: tendencias, datos y reflexiones para el diseño de políticas*. Documentos de trabajo (Universidad de Zaragoza). Facultad de Economía y Empresa. <http://www.dteconz.unizar.es/DT2017-06.pdf>
- Panigyrakis, G., Theodoridis, P., & Veloutsou, C. (2002). All customers are not treated equally: Financial exclusion in isolated Greek islands. *Journal of Financial Services Marketing*, 7(1), 54–66. <https://doi.org/10.1057/palgrave.fsm.4770072>
- Pérez-Morote, R., Pontones-Rosa, C., Núñez-Chicharro, M., & Merino-Madrid, E. (2021). Determinant factors of individuals' decision to emigrate in rural Spain: The role of ICT-based public policies. *Technology in Society*, 67, Article 101777. <https://doi.org/10.1016/j.techsoc.2021.101777>
- Pinilla, V., Ayuda, M. I., & Sáez, L. A. (2008). Rural depopulation and the migration turnaround in Mediterranean Western Europe: A case study of Aragón. *Journal of Rural and Community Development*, 3(1), 1–22.
- Pinilla, V., & Sáez, L. A. (2017). *Rural depopulation in Spain: Genesis of a problem and innovative policies*. Centre for Studies on Depopulation and Development of Rural Areas (CEDDAR). Report, 2017-2.
- Pinilla, V., & Sáez, L. A. (2021). What do public policies teach us about rural depopulation: The case study of Spain. *European Countryside*, 13(2), 330–351. <https://doi.org/10.2478/euco-2021-0021>
- Precedo, A. (2004). El modelo de desarrollo comarcal. *Boletín de la Asociación de Geógrafos Españoles*, 38, 29–45.
- Reynaud, C., & Miccoli, S. (2018). Depopulation and the ageing population: The relationship in Italian municipalities. *Sustainability*, 10(4), 1004. <https://doi.org/10.3390/su10041004>
- Sinclair, P. S. (2001). *Financial exclusion: An introductory survey*. Edinburgh: Centre for Research in Socially Inclusive Services (CRISIS), Heriot-Watt University.
- Syssner, J. (2016). Planning for shrinkage: Policy implications of demographic decline. *Journal of Depopulation and Rural Development Studies*, 20, 7–31. <https://doi.org/10.4422/ager.2015.14>
- Syssner, J. (2020). Policy implications of rural depopulation. In *Pathways to demographic adaptation*. Springer briefs in geography. Cham: Springer.
- Tomatis, F., & Impicciatore, R. (2023). Labour market participation and fertility in seven European countries: A comparative perspective. *Comparative Population Studies*, 48. <https://doi.org/10.12765/CPoS-2023-08>
- Tram, T. X. H., Lai, T. D., & Nguyen, T. T. H. (2023). Constructing a composite financial inclusion index for developing economies. *The Quarterly Review of Economics and Finance*, 87, 257–265. <https://doi.org/10.1016/j.qref.2021.01.003>
- Turok, I., & Mykhnenko, V. (2007). The trajectories of European cities, 1960–2005. *Cities*, 24(3), 165–182. <https://doi.org/10.1016/j.cities.2007.01.007>
- van Deursen, A. J. A. M., & Helsper, E. J. (2015). The third-level digital divide: Who benefits most from being online?. In *10. Communication and information technologies annual (studies in media and communications)* (pp. 29–52). Bingley: Emerald Group Publishing Limited.
- Woods, M. (2005). *Rural geography. Processes, responses and experiences in rural restructuring*. London: SAGE.
- Yu, L. (2023). Making space through finance: Spatial conceptions of the rural in China's rural financial reforms. *Geoforum*, 138, Article 103662. <https://doi.org/10.1016/j.geoforum.2022.11.004>
- Zheng, C., Rahman, M. A., Shahadat, H., & Siddik, M. N. A. (2024). Construction of a composite fintech index to measure financial inclusion for developing countries. *Applied Economics*, 1–18. <https://doi.org/10.1080/00036846.2024.2313600>