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Incorporating the life-course approach into shrinking cities assessment: the uneven geographies of urban population decline

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ABSTRACT

The demographic dynamics of urban areas is highly relevant for urban and regional planning, in a global context marked by rapid socioeconomic changes and growing competition between cities. Demographic and economic decline processes associated with shrinking cities are usually analyzed by the evolution of the overall population, indicators of the natural and spatial population dynamics and socioeconomic variables. This article proposes a complementary method to enrich the vision of urban dynamics, based on incorporating the life-course approach to the study of demographic variations. The evolution of population groups with an indicator value on socioeconomic changes over time is studied. The population groups correspond to different birth cohorts, including the generations that have reached higher education or their first jobs in the labor market, and the generations that have remained at a mature working age during the study period. The case study comprises 404 Spanish urban areas in 2002-2017, a time when the overall population of the country grew by 11.3%. While 7.2% of the cities saw a decline in the overall population, 65.1% experienced population decline in some population indicator group.

KEYWORDS: shrinking cities, population decline, life-course, socioeconomic change, Spain.

1 INTRODUCTION

Population decline is not an endemic phenomenon exclusive to rural areas suffering from rural exodus, nor to core cities due to the relocation of their population to surrounding suburban areas. Population decline processes concern an increasing number of urban areas as a whole, considered as the sum of the core cities and their urban fringes or suburban peripheries (Bontge, 2016). The "shrinking cities", considered as urban areas that are facing population losses and are experiencing a significant decline in their economic, employment and social basis (Pallagst *et al.*, 2013), are mostly found in Global North countries (Martinez-Fernandez *et al.*, 2016).

1.1 Shrinking cities, a research topic of growing interest

In those urban areas where the economy was built around activities that experienced an economic crisis, or were otherwise relocated, an increase in outmigration of the working population to other areas resulted in a negative net migration rate (Pallagst *et al.*, 2013; Mendez *et al.*, 2015; Haase *et al.*, 2016; Martinez-Fernandez *et al.*, 2016; Wolff & Wiechman, 2018). In tandem, a growing number of urban areas in the Global North show negative natural population balance due to low fertility rates and an increase in the aging population (Lesthaeghe, 2014). Certain regions and urban areas suffered from demographic decline linked to natural negative growth due to low fertility rates and an increase in the aging population, negative migration rates resulting from emigration of the population in search of better economic opportunities, or were a consequence of the synergies between both factors (Martínez-Fernández *et al.*, 2016; Gloersen *et al.*, 2016).

Socioeconomic changes are occurring at an ever faster pace due to the synergistic effect of factors such as the globalization of the economy and the labor market, the growing competitiveness between cities, and the technological revolution. Globalization is contributing to the relocation of a significant amount of industrial operations from western countries to countries offering lower wages. De-industrialized urban areas where the services sector cannot compensate for the loss of industrial jobs experience decline in their working population (Turok & Mykhnenko, 2007; Pallagst *et al*., 2013; Haase *et al*., 2016; Martínez-Fernández *et al*., 2016; Wolff & Wiechmann, 2010).

Growing competitiveness among post-industrial cities to attract capital and economic growth in the context of market-led globalization increases the economic divergence between regions and urban areas with higher and lesser competitive power (Porter, 2000; Lang *et al.*, 2015). Highly populated urban areas have the competitive advantage in regards to maintaining or increasing populations of a working age when compared to lower rank cities, thanks to the centralization of cultural, economic and political institutions, as well as more complex communications and varied services. International demographic predictions point to a growing increase in the population of the main metropolitan areas (United Nations, 2018). At the same time, there are second-order cities that after decades of decline have been able to reinvent themselves and have begun growing again, both demographically and economically (Champion *et al.*, 2014; Bontge, 2016).

1.2 Life-course approach to analyzing the demographic variations related to the socioeconomic changes in urban areas

The evolution of the entire population is the most common indicator used to identify shrinking cities as it implies several assumptions regarding households and investments (Turok & Mykhnenko, 2007; Martinez-Fernandez *et al.*, 2016; Wolff & Wiechmann, 2018). In addition, to investigate demographic and socioeconomic changes across space and time it is important to study migration flows and natural population change (Gil-Alonso *et al.*, 2016, 2017; Bayona-i-Carrasco *et al.*, 2018; Gutierrez-Portilla *et al.*, 2018; Hierro *et al.*, 2018; Palomares-Linares & van Ham, 2019; Prieto-Rosas *et al.*, 2018; Sabater & Graham, 2019) as well as socioeconomic dynamics such as household incomes, economic activity and employment opportunities, housing affordability, welfare institutions and governance (Champion *et al.*, 2014; Sanchez-Moral *et al.*, 2014; Findlay *et al.*, 2015; Haase et a., 2016; Baker *et al.*, 2016; Bontge, 2016; Guimaraes *et al.*, 2016; Musterd *et al.*, 2018; Prada-Trigo, 2018; Wolff & Wiechmann, 2018).

In this paper we propose the relevance of the life-course approach as a method to assess the demographic consequences of socioeconomic changes in urban areas, a point of view which is useful to enrich the understanding of population dynamics. The life-course approach enables the assessment of variations in socioeconomic conditions in different locations and the study of the geographic distribution of different birth-cohorts at different life-course stages, during particular periods of time, given that each generation responds in different ways to structural changes happening in society (Bailey, 2009; Findlay et al., 2015; Coulter, 2016; Sabater et al., 2017). This article uses data on the variation of the number of individuals in different generations in order to show their relevance as a variable to be integrated into future comprehensive diagnoses on socioeconomic and demographic dynamics in different territories over time. The generations at working age in the study time period are specifically used in this article, due to their direct relationship with the dynamics of the labor market. To complete the vision of the demographic dynamics in different locations, further studies should also take into account the variations of the elderly population after reaching the retirement age. Official data sources such as the official Municipal Registers which annually register the population residing in each municipality, and small area population Censuses, provide reliable longitudinal data for analysis of the detailed demographic variations (Finney, 2011; Gloersen et al, 2016; Gil-Alonso *et al.*, 2016; Sabater *et al.*, 2017; Danko & Hanink, 2018; Darlington-Pollock *et al.*, 2019).

The Great Recession which began in 2008 is an important factor to consider as the socioeconomic changes experienced in different locations had an impact on the spatial distribution of working-age cohorts. The cohorts who experienced the Great Recession during the first years of their working life were affected in different ways to those individuals of previous generations, because of their increased geographic mobility, the higher probability of engaging in low-paid employment and the lesser chances of owning dwellings (Lennatz *et al.*, 2015; King, 2017; Ronald & Kadi, 2018; Hoolachan & McKee, 2019). Therefore, it is appropriate to distinguish at least two working-age cohorts when analyzing population dynamics in the different urban areas. On the one hand the generations who gained access to their first occupations or higher level education during the study period, and on the other the generations who were of mature working age during the same time period.

The stimulation of international migrations as a consequence of globalization should also be assessed. In the West, foreign immigration is helping replenish the working population needed in the labor market (Docquier *et al.*, 2014). In general terms recently arrived foreign immigrants who are of working age respond to labor market changes with greater and faster geographical mobility than the native population. This greater mobility of foreigners who are of working age has an impact on the study area of this paper. In Spain, immigration of foreign-born population for employment reasons is a recent phenomenon (Gutierrez-Portilla *et al.*, 2018; Palomares-Linares & van Ham, 2019). Traditionally Spain was a country of working emigrants but during the first decade of the 21st century it became the second country in the World with the highest net international migration balance (United Nations, 2017). This is why it is important to make the distinction between the overall population and the native-born population in the Spanish urban areas studied in this study.

1.3 The uneven recent demographic and economic trajectory of Spain as a case study

The Great Recession that began in 2008 triggered important structural changes in the labor market of the West, as well as renewed interest in the phenomenon of shrinking cities in regions which saw a significant increase in unemployment rates. Spain was one of the countries that experienced a notable rise in unemployment rates after the Great Recession, and is therefore an interesting country for the study of recent demographic fluctuations in urban areas (Gil-Alonso *et al.*, 2016). In the years preceding the economic crisis the number of employed in Spain increased significantly, from 16.8 million in 2002 to 20.6 million in 2007, during that time there was also a large influx of foreign immigration (INE, 2018; United

Nations, 2017). However, during the Great Recession the number of employed dropped to 17.1 million in 2013. Subsequently it increased to 18.8 million in 2017 (INE, 2018). From 2008, the decline in the rate of employment was mainly localized in the construction sector, due to the housing bubble burst in Spain, and also in the industry sector (Albertos-Puebla & Sanchez-Hernandez, 2014; Mendez *et al.*, 2015; Hierro *et al.*, 2018; INE, 2018).

On a demographic level, the overall population registered in Spain reached its maximum level in 2012 (INE, 2018). Until recently, the shrinking cities phenomenon has not been researched or studied at length in Spain due to the significant population growth at a national level since the beginning of the 21st century. This research provides an analysis of Spanish urban areas which suffered losses in population groups between 2002 and 2017, and distinguishes between two partial time periods: demographic growth at a national scale between 2002 and 2012, and population decline between 2012 and 2017.

1.4 Objectives

The goal of the present research is to introduce a methodological framework based on life-course approach to identify urban areas that present symptoms of population decline and are affected by significant socioeconomic fluctuations during a specific time period. There are six population groups studied which serve as indicators of socioeconomic and demographic changes according to their spatial distribution throughout time: i) the entire population, commonly used to identify shrinking cities, ii) a birth-cohort of individuals who gained access to their first occupations in the labor market or to higher level education during the time period of the research, and iii) a birth-cohort consisting of individuals who remained of working age for the duration of the study. In all three cases, the study compares the whole population on the one hand and the population born in the country of study on the other. At the same time, the demographic evolution of the remaining non-urban national territory was assessed. Thus, a clearer understanding of population decline processes is made possible as well as their causes and consequences, which in turn complements the information on demographic and socioeconomic variables used in other study methods.

2 METHODS

2.1 Study area

The area covered in this study comprises Spain (SW Europe), yielding 8,124 municipalities and 50 provinces, and a population of 46.6 million inhabitants in 2017 (INE, 2018). According to the demarcation of urban areas by the Spanish Government (2018), there are 404 urban areas in Spain comprising a total of 1,071 municipalities and covering 82% of the population. Out of 404 cities, 86 have more than 50,000 inhabitants, 120 between 20,000 and 50,000, and 198 between 5,000 and 20,000 inhabitants (Figure 1).

Concurrently, the research incorporates the review of the demographic evolution in the remaining non-urban Spanish territory. This is made possible by the delimitation of 50 rural areas (Figure 1) which integrate in each province the non-urban municipalities. The non-urban areas consist of 7,053 municipalities and cover 18% of the population in Spain (Spanish Government, 2018).

2.2 Period of study

The selected period of study, 2002–2017, spans fifteen years and coincides with important demographic and socioeconomic changes that took place in the study area. According to the Spanish Statistical Office, the registered population in Spain grew by 11.3%, or 4.7 million inhabitants, between 2002 and 2017 (INE 2018). The demographic evolution during that time is divided into two distinct partial time periods, first a high growth period between 2002 and 2012 and second a decrease period between 2012 and 2017. As such, the demographic variation is calculated for the entire time period, 2002–2017, as well as for the partial periods, 2002–2012 and 2012–2017. During 2002-2012 the population grew from 41.8 million to 47.3 million inhabitants, and between 2012 and 2017 there was a decrease of 0.8 million. Natural population growth, or the difference between the number of births and deaths, was positive between 2002 and 2014 and negative from 2015 (INE, 2018).

2.3 Population decline criteria in population groups

The percentage change in urban and non-urban population was calculated for all time periods, 2002–2017, 2002–2012 and 2012–2017, for six population groups: i) the entire population, because it showcases the general tendency towards gain or loss of inhabitants; ii) the entire population born in Spain because its geographical mobility is reduced compared to the foreign population; iii) the birth-cohort of individuals born between 1973 and 1992, who gained access to their first occupations in the labor market or to higher level education during the study period and were between 25 and 44 years of age in 2017; iv) the birth-cohort of individuals born between 1973 and 1992 in Spain, v) the birth-cohort of individuals born between 1953 and 1972, comprising generations of working age for the duration of the study period and were between 45 and 64 years of age in 2017; and vi) the birth-cohort of individuals born between 1953 and 1972 in Spain. Thus, the whole population groups (i, iii and v) are used as indicators of the changes of the total number of inhabitants that is agglutinated in each urban and rural area over time. On the other hand, the native population groups (ii, iv and vi) reflect the dynamics of the population born in the study country, which usually tends to move little.

A median population loss of at least 0.15% was a criteria used to identify cities and rural areas which had a demographic decline in each period and population group (Wolff & Wiechmann, 2018). Finally, the study included the calculation of the total number of accumulated cases in demographic decline for each city and rural area in relation to the six groups being assessed.

2.4 Data

Demographic data by year, age and native country were obtained at a municipal scale from the Continuous Municipal Register of the Spanish Statistical Office (INE 2018). The Spanish Continuous Municipal Register is an official and reliable source of data, even if the data is not always precise because migrants may take some time to register in their new places of residence and notify their previous municipality of their departure (Gil-Alonso *et al.*, 2016; Bayona-i-Carrasco, 2018). The delimitation of each urban area was obtained from the Atlas of Urban Areas in Spain, the official data source which delimits the functional urban areas in Spain (Spanish Government, 2018).

3 RESULTS AND DISCUSSION

When examining the whole total population, 7.2% of cities and 44% of rural areas experienced population decline between 2002 and 2017. During the distinct partial periods studied, there was a decline in population in the majority of cities (60.6%) and rural areas (92%) during 2012–2017, however these percentages were significantly lower in the period between 2002 and 2012 (5.4% of cities and 24% of rural areas). During both partial periods, 4.2% of cities and 24% of rural areas experienced population decline, but 57.7% of cities and 68% of rural areas suffered population decline during only one of the partial periods (Table 1, Figure 2). The urban areas which experienced population decline during the entire period of 2002–2017 showed a marked loss in employment in the agri-food, industrial or mining sectors that had sustained their economies (Albertos-Puebla & Sanchez-Hernandez, 2014; Mendez *et al.*, 2015; Herce, 2017).

In relation to the group of the population born in Spain, 18.6% of cities and 60% of rural areas saw population decline between 2002 and 2017. During the partial periods, 42.8% of cities and 80% of rural areas suffered population decline during 2012–2017, but during 2002–2012 the population decline was in 14.1% of cities and 52% of rural areas. During both partial periods there was population decline in 11.9% of cities and 52% of rural areas, while 33.2% of cities and 28% of rural areas experienced population decline during only one of the periods (Table 1, Figure 3). Comparing Figure 3 with Figure 2 shows that international immigration was a particularly positive factor in holding off rural population decline, and without such immigration 60% of the provinces would have experienced demographic decline in their rural areas (Collantes *et al.*, 2014).

For the birth-cohort of individuals born in the years between 1973 and 1992, 17.8% of cities and 40% of rural areas showed a decline in 2002–2017 (Table 1, Figure 4), a number which increased to 57.7% of cities and 66% of rural areas when looking only at those born in Spain (Table 1, Figure 5). In the partial period of 2002–2012 there were more cities losing population born in Spain (49%) than population belonging to the entire birth-cohort (8.7%), but from 2012–2017 more cities experienced loss of inhabitants in the entire birth-cohort (75.2%) than in the native-born birth-cohort (71%). During both partial periods, 2002-2012 and 2012-2017, 8.2% of cities suffered population decline in their entire 1973-1992 birth-cohort (Table 1, Figure 4). For the Spanish-born birth-cohort of 1973–1992, 42.8% of cities experienced a decline in both partial periods (Table 1, Figure 5). In numerous cities the Spanish-born population declined but the whole population belonging to the 1953–1972 birth-cohort did not decrease (Figures 4 and 5). This could be associated to the fact that in many cities jobs created at the time were largely unattractive to Spaniards and were taken up by foreign immigrants. It is important to note that foreign immigrants in Spain were employed in their majority in sectors which native-born individuals avoided, such as intensive agriculture, construction, home-care and hostelry (Gil-Alonso & Vidal-Coso, 2015). In some provinces, for example in Madrid, Cantabria, Biscay and Girona the number of Spaniards living in rural areas did not decrease while it did in certain urban areas, the reason is possibly due to high housing prices which forced this generation to move to more affordable areas (Figure 5).

During 2002–2017, the entire 1953–1972 birth-cohort experienced a decline in 17.3% of cities and 20% of rural areas (Table 1, Figure 6), however for those born in Spain there was population decline in 48.3% of cities and 52% of rural areas (Table 1, Figure 7). Similar to the previous group, there were more urban areas during the 2002–2012 partial period that lost inhabitants born in Spain (35.6%) than population of the entire cohort (9.4%). In 2012–2017 more cities experienced population decline of the entire cohort (95%) than the Spanish-born cohort (82.4%). In both partial periods, 2002–2012 and 2012–2017, 8.9% of urban areas suffered population decline in the entire 1953–1972 birth-cohort (Table 1, Figure 6), but 33.2% of cities experienced decline in the Spanish-born cohort (Table 1, Figure 7). The generation of 1953–1972 was less affected by population decline in urban and rural areas than the generation of 1973–1992 (Table 1).

Taking into account the sum of all cases of population decline in the six study groups, 34.9% of cities and 26% of rural areas did not show any decline. Namely, 65.1% of cities and 74% of rural areas lost inhabitants in at least one of the population groups in question. There was population decline in 5% of cities and 18% of rural areas in the six population groups of the study (Table 2, Figure 8). The results indicate that many cities without population decline as a whole did see a loss in inhabitants in some of the indicator groups, which demonstrates the added value of assessing demographic evolution by generations. Cities without any type of population decline were located in their majority around the Mediterranean coast and around a large area surrounding Madrid. In addition, the non-urban areas surrounding the urban areas in Madrid (including the surrounding non-urban areas of Toledo and Guadalajara), Seville, Biscay (including Cantabria and Alava) and the Mediterranean coast (Girona, Barcelona, Tarragona, Valencia and Alicante) did not experience population decline of any population group (Figure 8). The possible reason in some cases is that the area of influence of the urban areas is larger than the delimitation defined by the Spanish Government (2018). The delimitation of the functional urban areas would encompass larger areas if wider criteria were adopted to assess travelling time and daily commute frequency between the places of residence and work or study, such as other agencies like Eurostat (2017) do.

In future, the demographic evolution of each urban area will be conditioned by the economic sectors and labor niches maintained and developed in the area, always in the framework of a global and changing market. In the Spanish case, competition to maintain population numbers will be high due to increasingly low birth rates caused by low fertility and the diminishment of the generations of fertile age (INE, 2018). If the United Nations (2015) estimated 2.78% reduction of the population projected in Spain between 2015 and 2050 became a reality, a high number of Spanish cities would see a decrease in their populations.

4 CONCLUSION

The incorporation of the life-course approach into the analysis of population evolution has allowed for the detection of previously unpublished geographical patterns in demographic variations throughout the Spanish urban network. This type of analysis is important in urban and regional planning because it allows us to detect the generations which are losing inhabitants at defined periods of time in each urban area. This information is valuable for the design of adequate policies in economic diversification, employment, governance, taxation, welfare, housing, services, infrastructures and heritage (Pallagst *et al.*, 2013; Martinez-Fernandez *et al.*, 2016; Guimaraes *et al.*, 2016).

The overall total population in most Global North countries is predicted to decrease in the next decades (United Nations, 2015) due to low fertility rates (Lesthaeghe, 2014), meaning that population shrinkage is set to become the "new normal" not only in rural areas but surely also in a large number of cities (Bontje, 2016). Within this context, the distribution dynamics of different generations in space and time is of crucial importance in order to understand socioeconomic changes and how they will influence spatial planning.

The demographic evolution of birth-cohorts in different locations is an important indicator used to complete the information obtained from study methods that are based on other demographic and socioeconomic variables. This paper proposes that the variations in the number of inhabitants in different generations, as those calculated here, are a relevant variable to be integrated into future comprehensive diagnoses on the relations between local socioeconomic contexts and demographic dynamics in different urban and rural areas over time.

The method described herein for entire urban areas can also be applied at a different scale to give a better spatial overview of demographic dynamics, this includes regions (Gloersen *et al.*, 2016; Ubarevičienė & van Ham, 2017; Prieto-Rosas *et al.*, 2018), provinces (Gil-Alonso *et al.*, 2017; Gutierrez-Portilla *et al.*, 2018; Hierro *et al.*, 2018; Palomares-Linares & van Maarten, 2018; Sabater & Graham, 2019); and parts of urban areas (Gil-Alonso *et al.*, 2016; Musterd *et al.*, 2017; Sabater *et al.*, 2017; Bayona-i-Carrasco *et al.*, 2018; Prada-Trigo, 2018). Furthermore, the method can be applied to increasingly differentiated generations that are defined by specific criteria, such as smaller birth-cohorts (Smith & Sage, 2014) and to population segments that display other concrete characteristics (Finney, 2011; Marcu, 2017; Danko & Hannink, 2018; Darlington-Pollock *et al.*, 2019).

Further research is need to continue assessing urban demographic dynamics with the life-course approach, as each generation will continue to choose their place of residence based on multiple and ever changing factors. In the recent past, we saw a decline in demographics in de-industrialized urban areas where the services sector was unable to compensate for employment losses in other sectors (Turok & Mykhnenko, 2007; Wolff & Wiechmann, 2010).

Currently it is necessary to take into account also other socioeconomic dynamics of post-industrial cities that impact in the spatial distribution of generations throughout the urban network, such as the digitization and robotization processes in certain subsectors of services and industry typically associated with urban areas (Frey & Osborne, 2013; Beng *et al.*, 2018), the rise of home-based businesses (Kane & Clark, 2019), changes in the frequency and modes of transport for commuting (Banister & Hickman, 2013; Kent *et al.*, 2017), the uneven spatial variations in housing affordability (Baker *et al.*, 2016), the uncertain geography of welfare regimes (Musterd *et al.*, 2017; Hoolachan & McKee, 2019) and the changing residential preferences in the different lifecycle stages (Beer *et al.*, 2011; Nefs *et al.*, 2013; Stockdale & Catney, 2014; Moos, 2016).

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TABLE 1 Number of cities and rural areas that have decreased their population at least 0.15% per year in each population group in the period 2002–2017, in the two partial periods analyzed (2002–2012/2012–2017), and according to whether they have lost population in both partial periods or only in one of them.

Population decline (< –0.15% per annum)	Whole period 2002–2017	Each parcial period		Sum of parcial periods	
		2012–2012	2012–2017	Both	One
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Cities (n=404)					
Total population	29 (7.2)	22 (5.4)	245 (60.6)	17 (4.2)	233 (57.7)
Population born in Spain	75 (18.6)	57 (14.1)	173 (42.8)	48 (11.9)	134 (33.2)
Birth cohort 1973–1992	72 (17.8)	35 (8.7)	304 (75.2)	33 (8.2)	273 (67.6)
Cohort 1973–1992 born in Spain	233 (57.7)	198 (49.0)	287 (71.0)	173 (42.8)	139 (34.4)
Birth cohort 1953–1972	70 (17.3)	38 (9.4)	384 (95.0)	36 (8.9)	350 (86.6)
Cohort 1953–1972 born in Spain	195 (48.3)	144 (35.6)	333 (82.4)	134 (33.2)	209 (51.7)
Rural areas by province (n=50)					
Total population	22 (44.0)	12 (24.0)	46 (92.0)	12 (24.0)	34 (68.0)
Population born in Spain	30 (60.0)	26 (52.0)	40 (80.0)	26 (52.0)	14 (28.0)
Birth cohort 1973–1992	20 (40.0)	10 (20.0)	45 (90.0)	10 (20.0)	35 (70.0)
Cohort 1973–1992 born in Spain	33 (66.0)	27 (54.0)	45 (90.0)	27 (54.0)	18 (36.0)
Birth cohort 1953–1972	10 (20.0)	4 (8.0)	50 (100)	4 (8.0)	46 (92.0)
Cohort 1953–1972 born in Spain	26 (52.0)	18 (36.0)	45 (90.0)	17 (34.0)	29 (58.0)

TABLE 2 Accumulated number of cases of population decline in cities and rural areas taking into account the six population groups analyzed (2002–2017).

Accumulated number of cases of population decline in 2002–2017		Cities (n=404)	Rural areas (n=50)
		Number (%)	Number (%)
In the 3 groups of whole population (total, birth cohort 1973–1992 and birth cohort 1953–1972)	0	298 (73.8)	26 (52.0)
	1	61 (15.1)	5 (10.0)
	2	25 (6.2)	10 (20.0)
	3	20 (5.0)	9 (18.0)
In the 3 groups of population born in Spain (total, birth cohort 1973–1992 and birth cohort 1953–1972)	0	141 (34.9)	13 (26.0)
	1	89 (22.0)	7 (14.0)
	2	108 (26.7)	8 (16.0)
	3	66 (16.3)	22 (44.0)
In the 6 groups of population analized	0	141 (34.9)	13 (26.0)
	1	78 (19.3)	6 (12.0)
	2	78 (19.3)	5 (10.0)
	3	40 (9.9)	4 (8.0)
	4	35 (8.7)	6 (12.0)
	5	12 (3.0)	7 (14.0)
	6	20 (5.0)	9 (18.0)

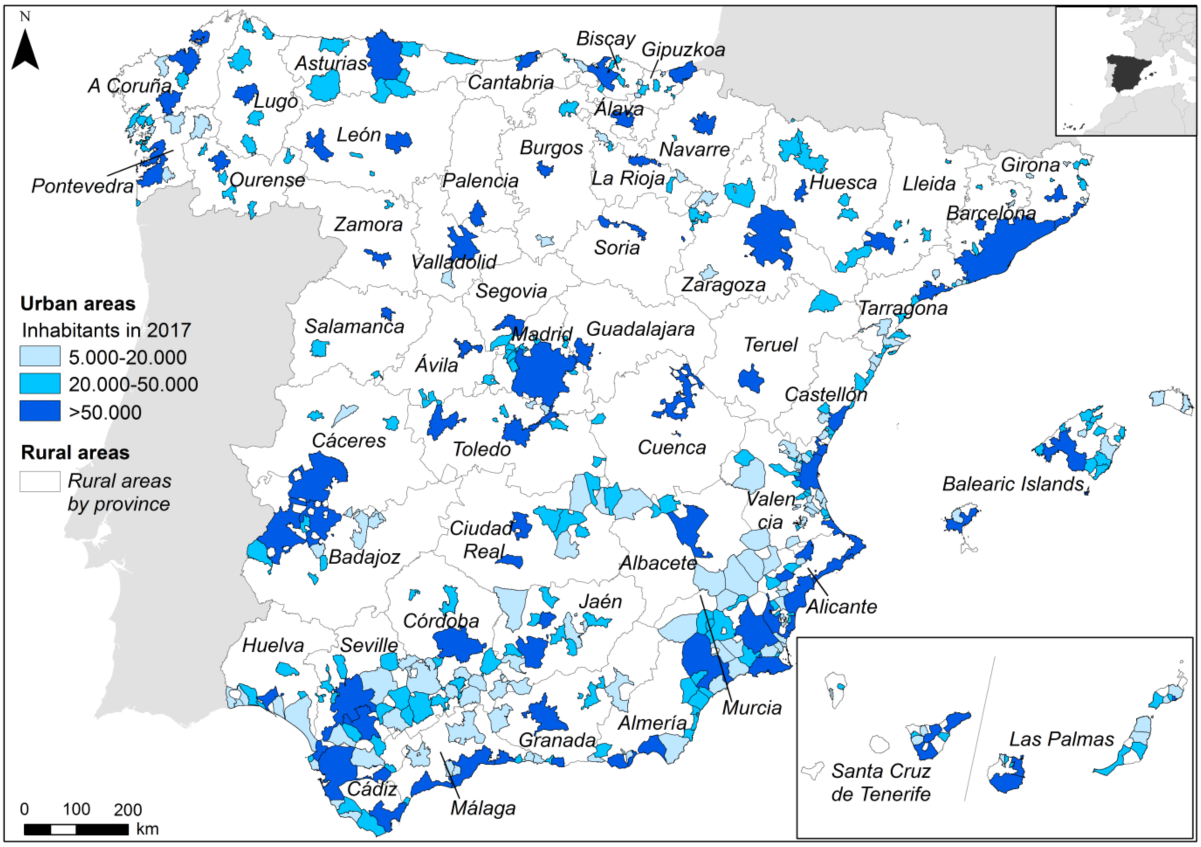

FIGURE 1 Map of the study area, composed by 404 cities and 50 rural areas.

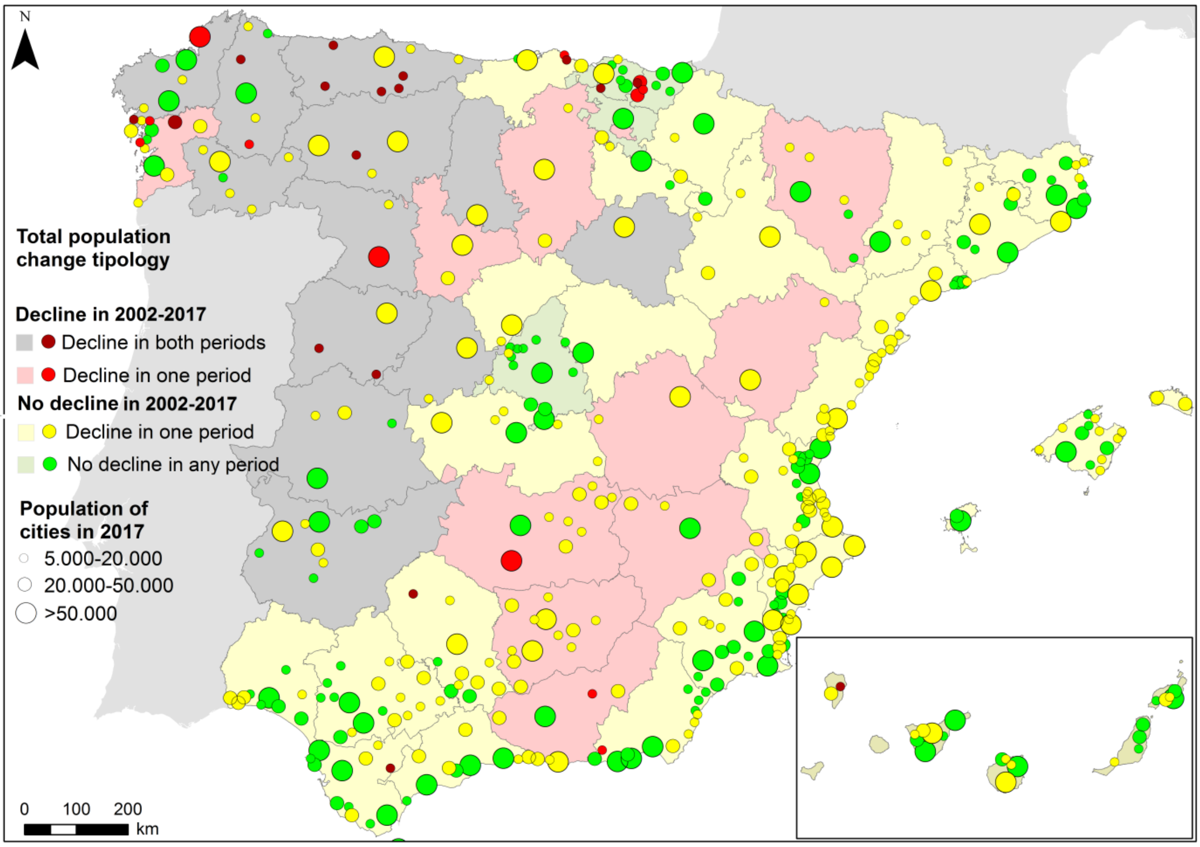

FIGURE 2 Map of cities (circles) and rural areas (colour indicated by squares in the legend) according to whether their total population decreased or not in 2002–2017, further indicating whether they decline in both partial periods (2002–2012/2012–2017), in one of them, or in none of them.

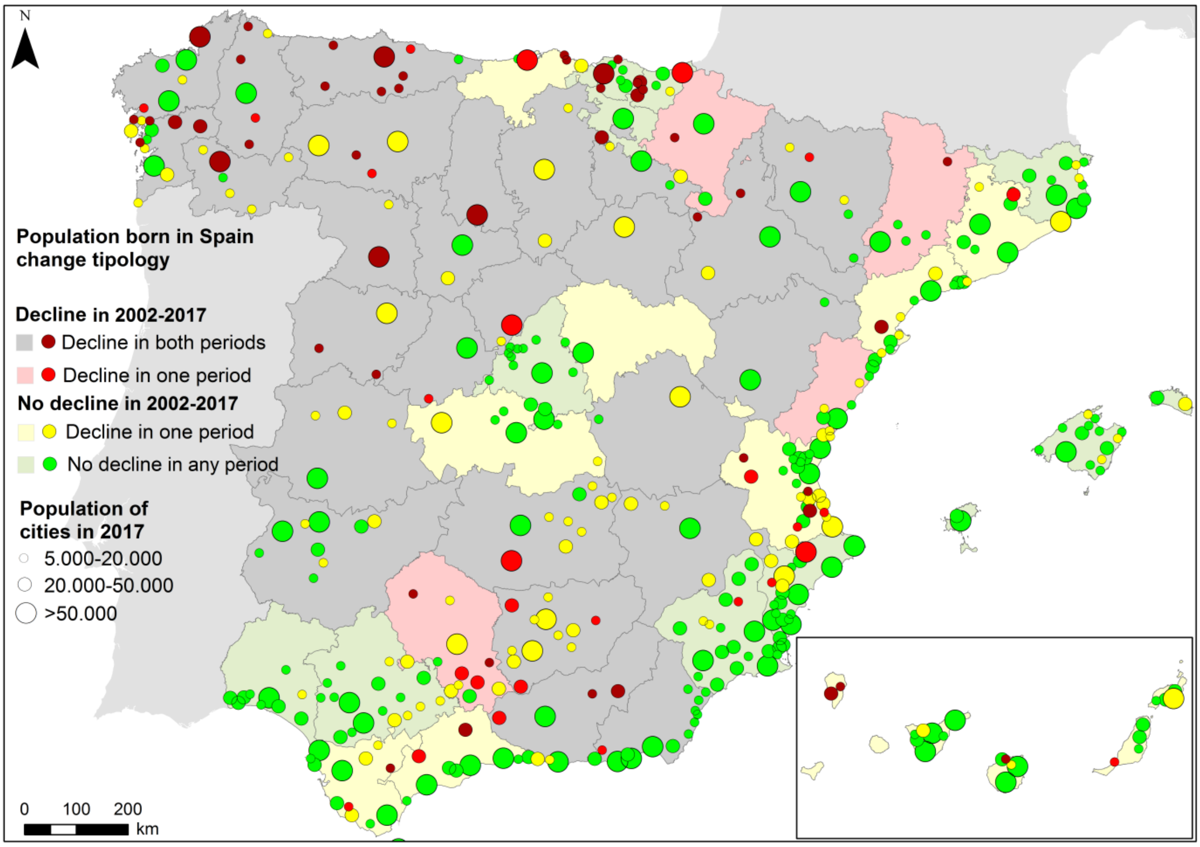

FIGURE 3 Map of cities (circles) and rural areas (colour indicated by squares in the legend) according to whether their population born in Spain decreased or not in 2002–2017, further indicating whether they decline in both partial periods (2002–2012/2012–2017), in one of them, or in none of them.

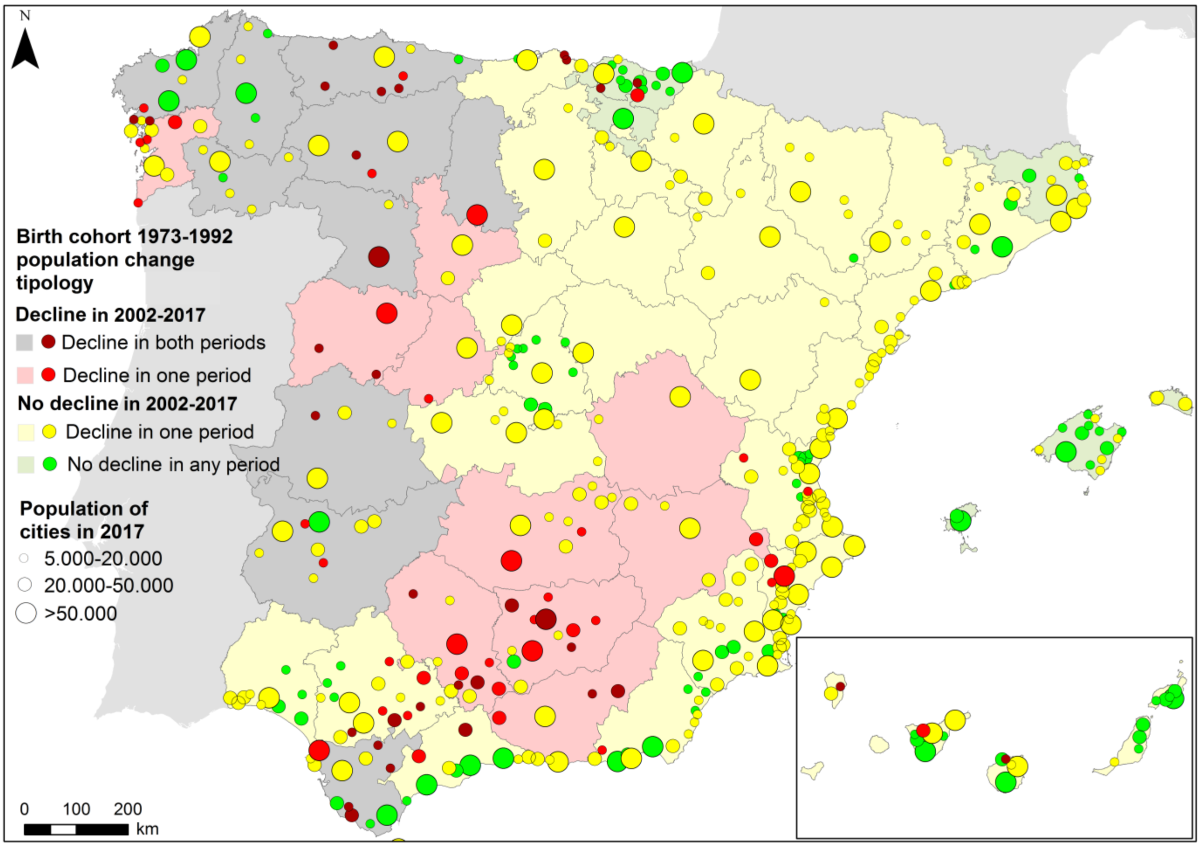

FIGURE 4 Map of cities (circles) and rural areas (colour indicated by squares in the legend) according to whether their population of the birth cohort 1973–1992 decreased in or not 2002–2017, further indicating whether they decline in both partial periods (2002–2012/2012–2017), in one of them, or in none of them.

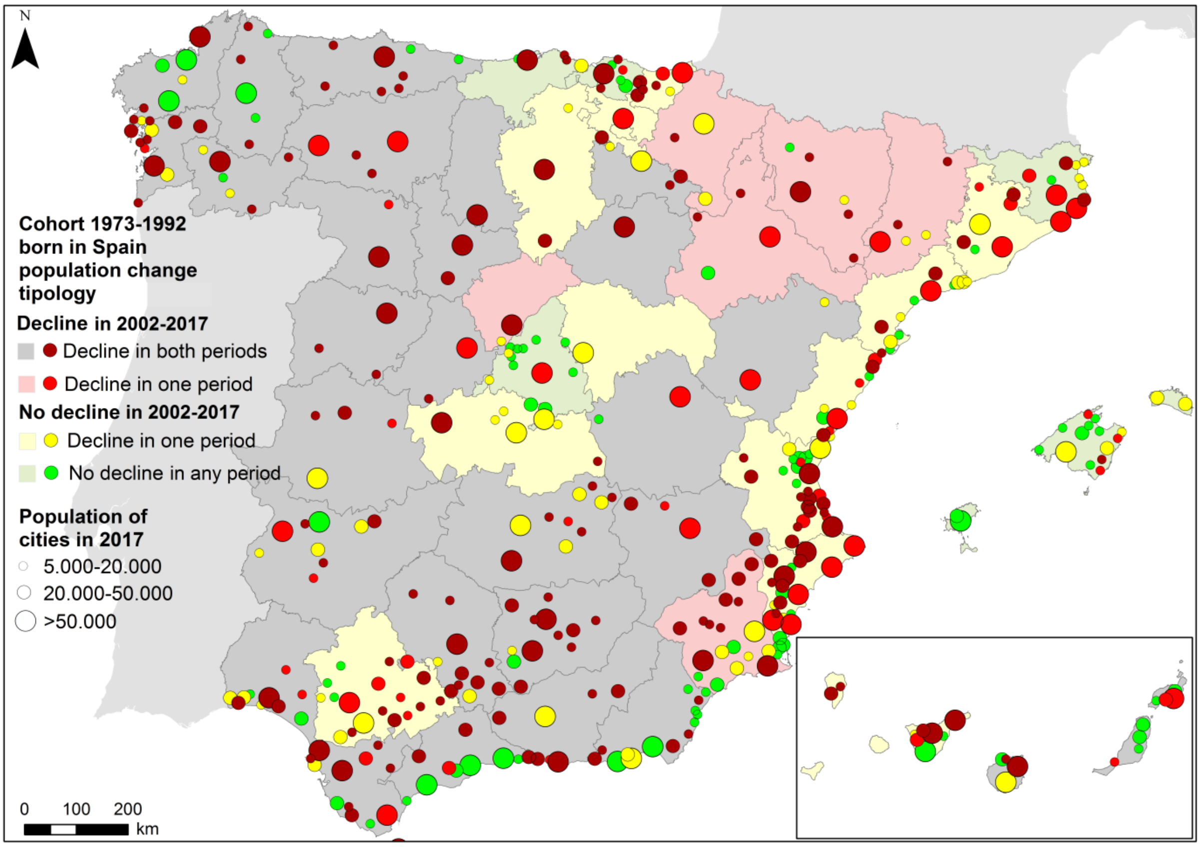

FIGURE 5 Map of cities (circles) and rural areas (colour indicated by squares in the legend) according to whether their population born in 1973–1992 in Spain decreased or not in 2002–2017, further indicating whether they decline in both partial periods (2002–2012/2012–2017), in one of them, or in none of them.

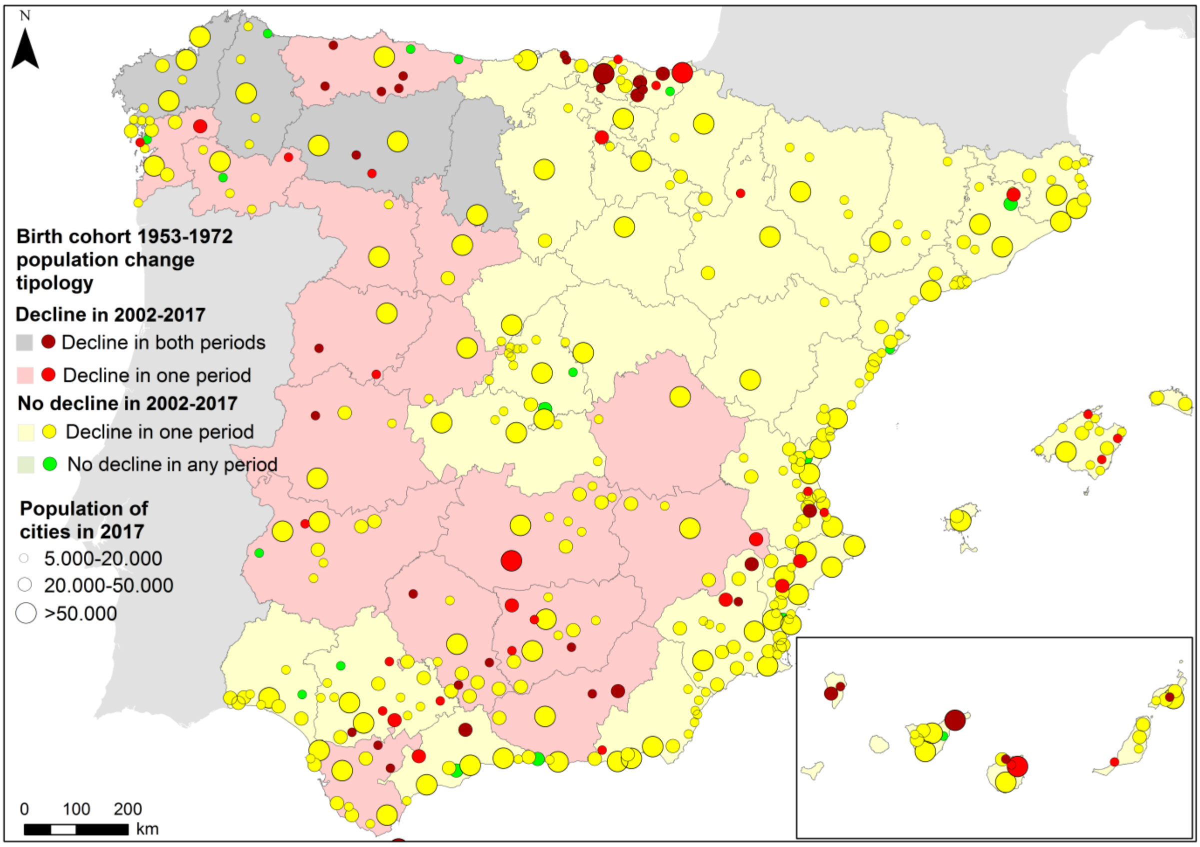

FIGURE 6 Map of cities (circles) and rural areas (colour indicated by squares in the legend) according to whether their population of the birth cohort 1953–1972 decreased or not in 2002–2017, further indicating whether they decline in both partial periods (2002–2012/2012–2017), in one of them, or in none of them.

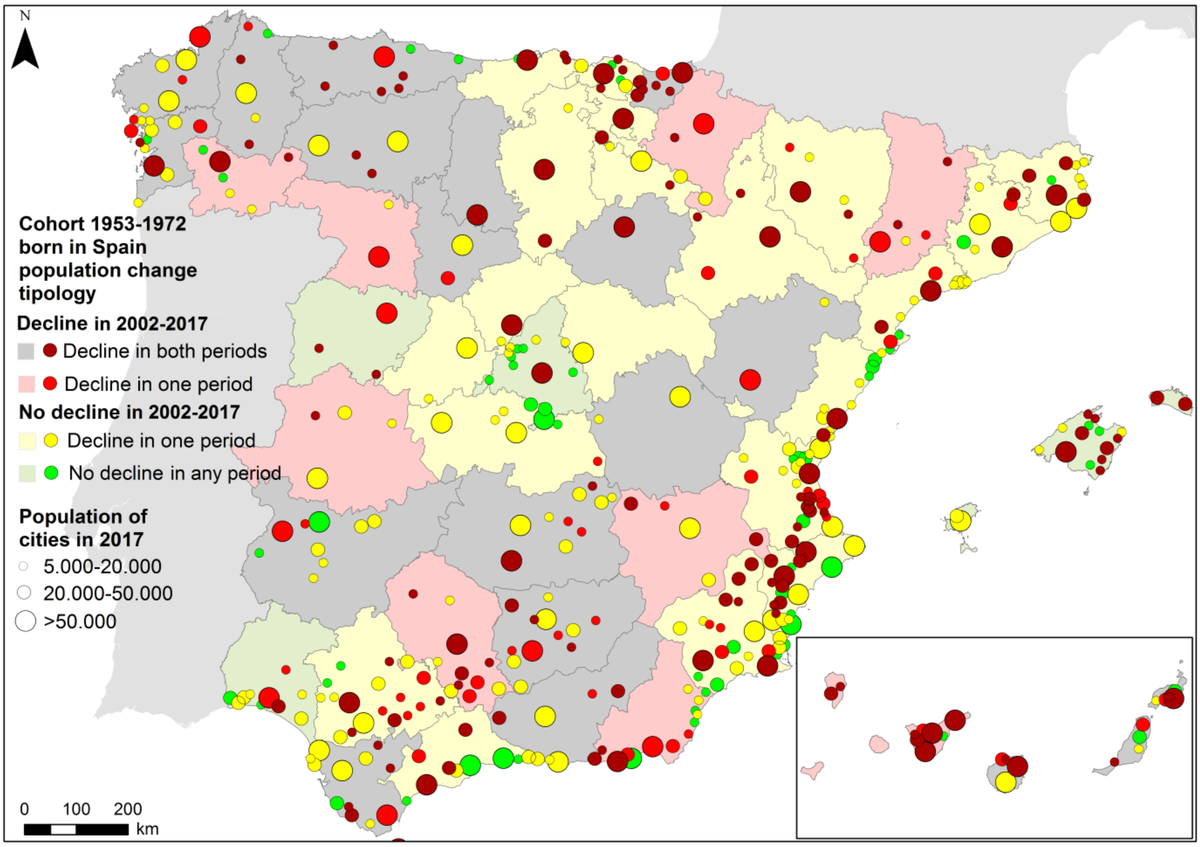

FIGURE 7 Map of cities (circles) and rural areas (colour indicated by squares in the legend) according to whether their population born in 1953–1972 in Spain decreased or not in 2002–2017, further indicating whether they decline in both partial periods (2002–2012/2012–2017), in one of them, or in none of them.

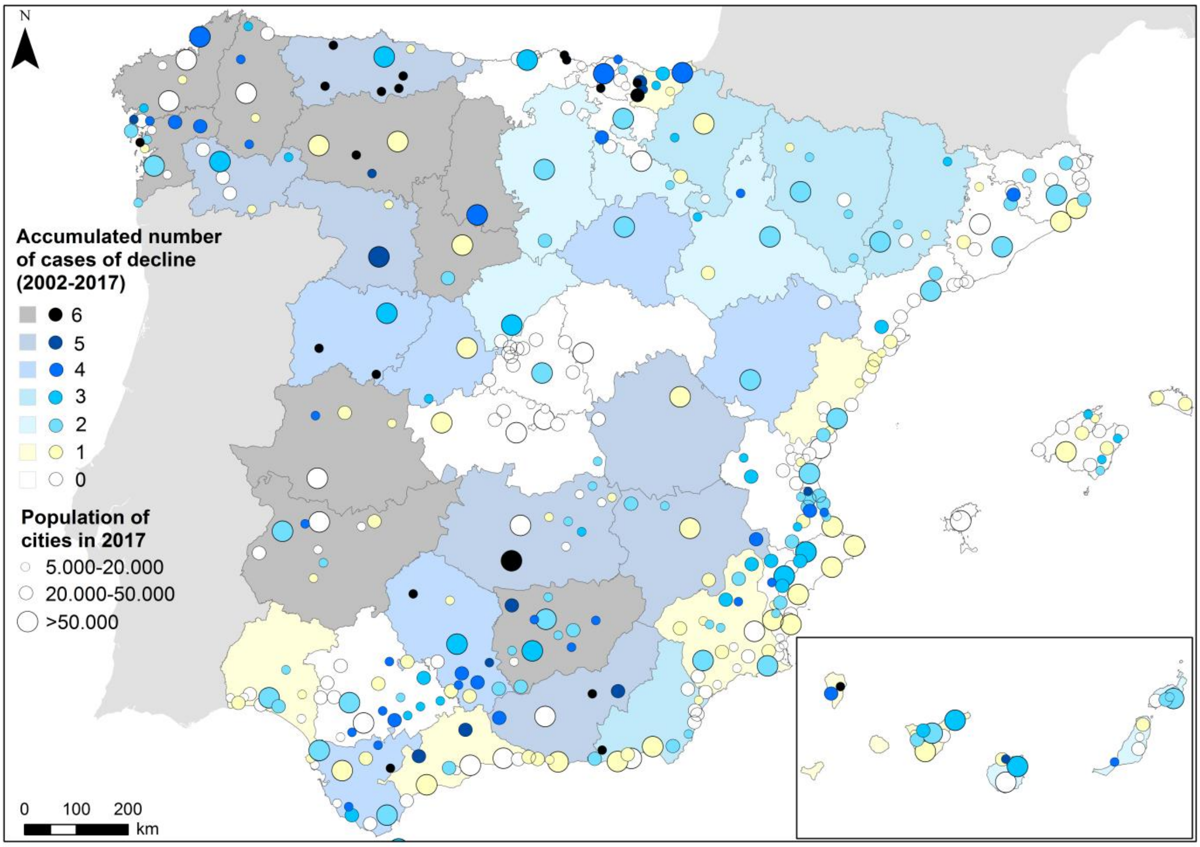

FIGURE 8 Map of the accumulated number of cases of population decline in cities and rural areas taking into account the six population groups analyzed (2002–2017).

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