Extended abstract

Regional typologies of demographic change based on Complex Systems of Demographic Reproduction CSDR). Comparing Spain, Denmark, Sweden and the Netherlands. A cross-country comparison of Spain, Denmark, Sweden and the Netherlands.

Leo van Wissen (NIDI), Marcin Stonawski (DST), Andreu Domingo Valls (CED)

Europe is at a turning point in demographic development. Since 2020 the European population has turned negative. Natural population change (the difference between the number of births and deaths) has reduced in almost all countries in the last decades, and has turned negative for the Europe since 1993, with some flare-ups around 2010 (Figure 1).

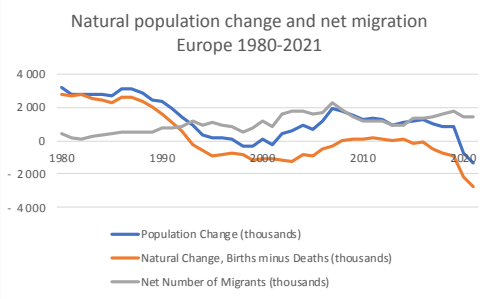

Figure 1 Population growth Europe 1980-2021

This was compensated by increasing net migration numbers ever since the fifties of the 20th century. As a consequence, some countries are still growing in population size, whereas other countries are shrinking. This stage of population decline is sometimes called the fifth stage of the demographic transition. At the regional level the variation in population change is even much larger, due to the additional impact of internal migration, including urbanization, suburbanization, and counter-urbanization. In this paper we explore the impact of the various components of population change on population and societal renewal of spatial areas of different territorial aggregation. We also study the impact of international migration on internal migration, and on natural growth.This entails new typological considerations based on demography, and taking into account the time dimension as well: are these historically immigrant or emigrant regions, or can this be considered a relatively recent phenomenon?

In assessing the role of mobility in regional development, we will distinguish between Complex Systems of Demographic Reproduction (CSDR) based on immigration (when population growth depends on immigration), and Complex Systems of Demographic Reproduction based on emigration (when emigration takes diasporic forms so that the reproduction of the group and the driving force of the region depends predominantly on emigration). Using the mix of dimensions of mobility for all regions, and using standard clustering techniques we arrive at a regional mobility typology in four countries: Spain, Denmark, Sweden and the Netherlands. We look at similarities and discrepancies between the resulting typologies and evaluate the outcomes. We also explore typologies based on different measures of population dynamics: (1) a multidimensional profile based on the components natural growth, internal and external migration; (2) taking into account country of origin; (3) a typology based on the population turnover rate and the migration share of turnover. The population turnover rate is:

$PTR(0,t) = b_j(0,t) + d_j(0,t) + i_j(0,t) + e_j(0,t)$

And an indicator of the speed of population dynamics in region j. The migration share is given as:

$$MST_j(0,t) = \frac{i_j(0,t) + e_j(0,t)}{PTR_j(0,t)}$$

The data used in the analysis are not uniform across the countries. In Spain, Sweden and the Netherlands the municipal level is used, whereas in Denmark the analysis is based on gridcell information.

As an example of the resulting typology, figure 2 shows the typology of Spanish municipalities based on their multidimensional profile of natural growth, internal and external migration. The resulting typology, derived from a hierarchical clustering method based on Ward's criterion, consists of 10 clusters. They are characterized by different mean values of each of the demographic components, as shown in table 1. The clusters are ordered according to their population growth rate, with cluster1 having the highest rate, and cluster 10 the lowest. There is a clear geographical pattern, that strongly resembles the rural-urban division in the country. The total growth rate correlates highly positive with the natural

rate of growth, and the internal migration growth rate, but not very much with the international migration growth rate.

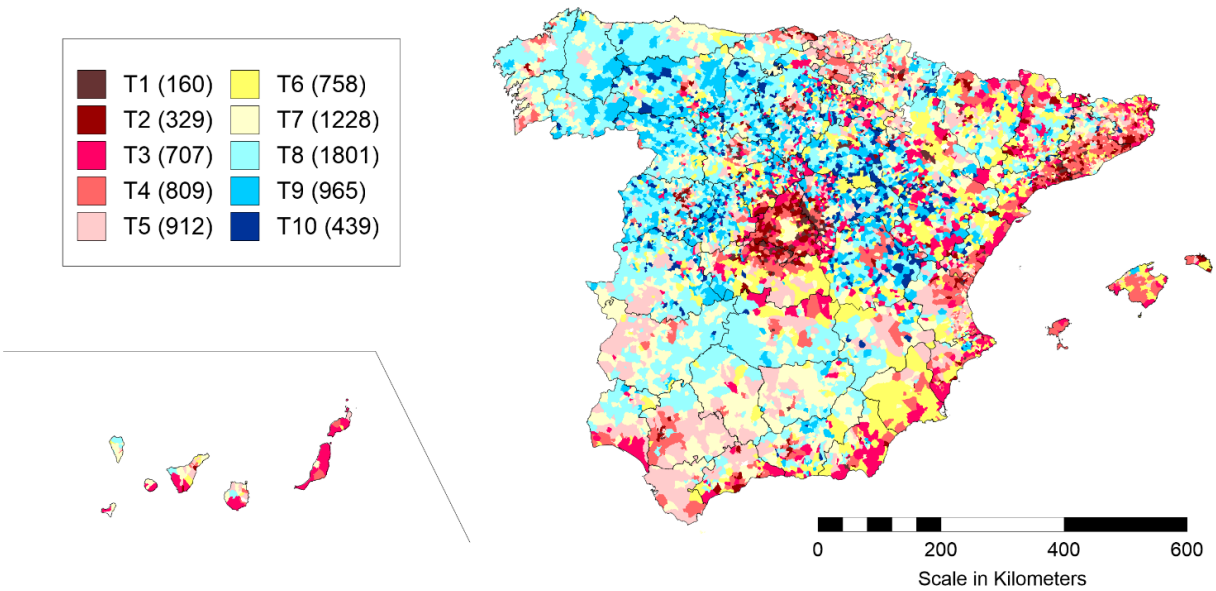

Figure 2 Typology of Spanish Municipalities according to their demographic growth profile, 2003-2008, distinguishing between internal and international migration

Table 1 Chacterization of clusters of typology 2003-2008

Tip.	n	Pop. 2003	Pop. 2008	Pop. Growth	Births	Deads	Natural G.	Migratory G.	Growth rate	Nat. Growth rate	Mig. Growth rate (internal)	Mig. Growth rate (international)	Average size
1	160	314,597	558,946	244,349	35,929	10,771	25,158	219,191	118.4	5.7	95.5	17.2	1966.2
2	329	1,095,612	1,514,919	419,307	89,342	41,805	47,537	371,770	64.2	2.3	44.4	17.5	3330.1
3	707	3,094,329	3,841,603	747,274	194,731	123,894	70,837	676,437	40.4	-3.9	1.3	42.9	4376.7
4	809	5,667,909	6,631,112	963,203	377,566	224,824	152,742	810,461	32.3	2.9	18.4	11	7006.1
5	912	6,386,601	6,775,639	389,038	349,006	273,284	75,722	313,316	12.1	-4.1	11.2	5	7002.9
6	758	6,579,048	7,149,248	570,200	387,109	272,850	114,259	455,941	11.4	-4.9	-5.3	21.6	8679.5
7	1228	14,525,607	14,856,516	330,909	716,512	661,769	54,743	276,166	1.1	-5.5	-0.5	7.1	11828.7
8	1801	4,598,541	4,433,893	-164,648	172,817	247,324	-74,507	-90,141	-13.3	-9.7	-7.5	3.8	2553.3
9	965	378,126	334,615	-43,511	6,907	27,637	-20,730	-22,781	-26.4	-13.5	-20.2	7.2	391.8
10	439	76,694	61,331	-15,363	1,028	5,557	-4,529	-10,834	-51	-14.4	-40.2	3.6	174.7
	8108	**42,717,064**	**46,157,822**	**3,440,758**	**2,330,947**	**1,889,715**	**441,232**	**2,999,526**	**15.5**	**2.00**	**0**	**13.5**	**5268.5**

This project is part of the Horizon Europe project PREMIUM_EU (EU (Policy REcommendations to Maximise the beneficial Impact of Unexplored Mobilities in and beyond the European Union, grant agreement 101094345 - AMD-101094345-3).