## 1. Introduction

In order to examine the pace of population ageing among regions, a second typology for the whole period (1981-2001) based upon the aforementioned yearly profiles was devised. The 50-year pyramid was split into five sections: i) 1961-1980; ii) 1981-1991; iii) 1992-2002; iv) 2001-2011; v) 2011-2021. Each of these sections was characterized by the number of population above 65 years, expressed as a percentage of the total population. The resulting five clusters are described in Table 1.

- **Cluster 1**: Old, shrinking base, 2 out of 10 belonging to 0-14 age group, 2 out of 10 belonging to 65-69 age group, and 4 out of 10 belonging to 70-74 age group. These regions are characterized by a high percentage of the elderly population and a low percentage of the young population, indicating a strong decline in the birth rate.
- **Cluster 2**: Old, shrinking base, 2 out of 10 belonging to 0-14 age group, and 4 out of 10 belonging to 70-74 age group. These regions have a similar pattern to Cluster 1 but with a slightly lower percentage of the elderly population.
- **Cluster 3**: Old, shrinking base, 2 out of 10 belonging to 0-14 age group, and 4 out of 10 belonging to 70-74 age group. These regions have a similar pattern to Cluster 1 but with a slightly lower percentage of the elderly population.
- **Cluster 4**: Old, shrinking base, 2 out of 10 belonging to 0-14 age group, and 4 out of 10 belonging to 70-74 age group. These regions have a similar pattern to Cluster 1 but with a slightly lower percentage of the elderly population.
- **Cluster 5**: Old, shrinking base, 2 out of 10 belonging to 0-14 age group, and 4 out of 10 belonging to 70-74 age group. These regions have a similar pattern to Cluster 1 but with a slightly lower percentage of the elderly population.

### 2. Data and Methods

Population censuses data by sex and 5-year age groups were provided by the National Statistical Service of Greece (ELSTAT) for 1981, 1991, and 2001, corresponding to two main stages: i) a total and ii) 51 regions (departments, NUTS level 3). Before proceeding to the methodological part of this paper, issues regarding data quality and peculiarities engineering, focusing on census data are and, secondly, from the ability of certain regions to attract individuals of specific age group and sex (among selectivity effect), should be addressed.

### 3. Geographic variations of population ageing

In order to study the level and geographic variations of population ageing within each census year typologies through classification of the relative size age groups population structures (in percent population pyramid) of the 51 departments were derived. The classification of a department’s population structure was carried out by applying a cluster analysis using Ward’s method additional variables with the population pyramid of each department as follows: i) the average number of males and females per 1000 inhabitants; ii) the number of births and deaths per 1000 inhabitants. The resulting clusters represent a division of departments into groups with similar demographic profiles.

### 4. Discussion

By reviewing our results, we identify the successive stages in the process of population ageing. Each stage represents a particular period of demographic transition, characterized by specific trends and patterns. These stages are defined based on the age distribution and the relative size of each age group in the population pyramid.