Effects of immigration on population growth and structures in Greece – A spatial approach

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Abstract

From the early 1990s, Greece has been experiencing a strong immigration flow consisting of various nationality groups with different demographic profiles and structures. The immigrant population is not uniformly distributed spatially and consists of various nationality groups with different demographic behaviours. Therefore, the examination of the implications of immigration on the population size and structure at a low geographical level, according to the nationality composition of the foreign population, is useful in finding population structures which are impossible to observe otherwise. This paper examines the impact of immigration on the population size, age and sex structure of the population in Greek municipalities. In order to do this, statistical clustering techniques have been utilised to define homogeneous groups of municipalities with respect to the nationality composition of their foreign population as well as the impact of immigration on their size and demographic characteristics.

1 Introduction

Greece is a country with a long migration history. Since the 19th century until the early 1980s, the Greek population exhibited an intensive emigration profile. Towards the end of the 19th century, Greek emigrants moved to urban areas in the Balkan parts of the Ottoman Empire, to Istanbul, to the coastal areas of Asia Minor and to Egypt. By the end of the 19th century a substantial number of Greeks (about 2.5 million), mostly from the rural areas of the central and western parts of the country, emigrated to the United States of America (USA), resulting in a 15% to 20% loss of the native population. After the end of World War II a

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second wave of emigration took place where two major flows could be distinguished. One wave flow was that of political refugees that migrated towards the former Soviet Union (USSR) and other eastern European countries and of the second wave flow consisted of economic emigrants, approximately 1.3 million until the early 1970s, and these emigrants moved towards the USA, Canada, Australia and the highly industrialised countries of western European, specifically West Germany. Throughout the following period, 1980-90, the country experienced an inflow of returning Greeks from both east and west. At the same time, an inflow of immigrants, in addition to the Greek returnees, began. Initially they were Asian and African economic immigrants, and then, followed by immigrants from the ex-socialist countries of eastern Europe, especially from Albania and, to a lesser degree from the other Balkan countries, as well as from the countries of the former USSR. Subsequently, Greece, in a short period of time and very quickly, changed from a traditional sending country to a receiving country. According to the 1981 census, the number of foreigners [1] was approximately 180,000, corresponding to almost 2% of the total counted population; 20 years later, in the 2001 census, the foreign population that was counted, increased to 762,000, 7% of the total population.

The considerable change in the migration profile of Greece has led to a significant amount of literature (e.g. Petronoti and Triandafyllidou 2003 and www.antigone.gr/bibliography.html). In most of these analyses, the demographic and spatial dimension of the phenomenon is often omitted and the foreign population is considered as a single group at the country level. However, some research has been carried out on these aspects, (e.g. Baldwin-Edwards 2008; Kaklamani and Androulaki 2006; Kotzamanis and Alvanides 2005; Kotzamanis et al. 2006; Kotzamanis and Pilidis 2006; Kotzamanis and Kostaki 2007, 2008; Kotzamanis 2009; Tsimbos 2006, 2008).

Since the immigrant population is neither uniformly distributed spatially, nor even proportional to the native population, and consists of various nationality groups with significantly different demographic behaviours, the examination of the implications of immigration on the population size and structure at a low geographical level, according to the nationality composition of the foreign population, might be useful in finding structures which are impossible to observe otherwise. This paper examines the impact of immigration on the population size and the demographic characteristics of the population in Greek municipalities. In order to do this, statistical clustering techniques have been utilised to define homogeneous groups of municipalities by the nationality composition of their foreign population and the impact of immigration on the size, age and sex distribution of the population. Section 2 provides a description of the demographic characteristics of the foreign population in Greece and its spatial dispersion. In Section 3 the implications of immigration on the population size

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[1]   People with other than Greek nationality.

and the demographic characteristics of Greek municipalities are examined. Finally, a summary of the findings of our analysis and some concluding remarks are provided in Section 4.

2 The demographic characteristics of the foreign population in Greece

For the purpose of our analysis foreigners have been classified according to their nationality into four major groups: i) Group 1, individuals originating from more developed countries;[2] ii) Group 2, individuals from Balkan countries; iii) Group 3, individuals from eastern European ex-socialist countries, excluding Balkan countries, including ex-USSR countries; and iv) Group 4,[3] from the less developed countries. As presented in Table 1 in the Appendix, the foreign population in Greece in 1981 was approximately 180,000, corresponding to less than 2% of the total population, while 65% of the foreigners originated from the more developed countries, i.e. 34% from the European Union countries (EU-15 countries, i.e., all the EU members prior to the 2004 enlargement), 11% from the Republic of Cyprus, 13.5% from the USA and 6.5% from Australia and Canada. A decade later, the proportion of foreigners from Group 1 significantly diminished, while foreigners from Groups 2 and 3 exhibited a significant increase (up to 15.8% and 15.1%, respectively). In 2001, foreigners in absolute numbers increased by four times their 1981 count, reaching 762,000 or 7% of the total population which was approximately 11 million. Moreover, their nationality composition also drastically altered. In the 2001 census, the dominance of Group 2 (65.7%) over Group 1 (13.1%) is evident for the total number of foreigners.

2.1 The population structure of foreigners

As expected, the foreign population exhibits a significantly different demographic profile in comparison to the native population. As can be seen from the population pyramids Figure 1the age and sex structure of the foreigners significantly differs from that of the natives, the former exhibiting a much younger age composition than the latter and a sex distribution in favour of males for Groups 2 and 4 and in favour of females for the other two nationality groups. In addition, the differences between the age and sex distribution of Greeks and foreigners according to the 2001 census are striking (see Table 2 in the Appendix).

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2   According to the United Nations (UN) definition.
3   According to the UN definition.

Figure 1:
Population pyramids by nationality group
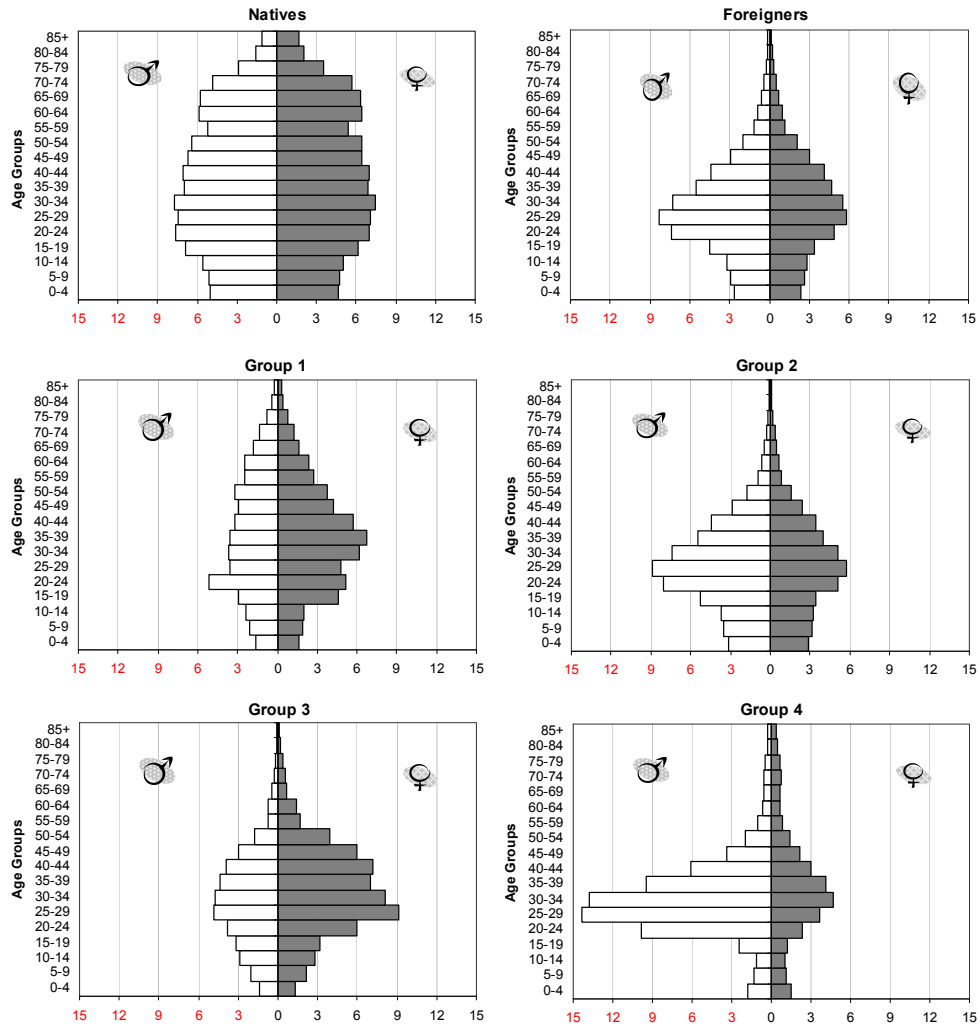
Source: Authors' computations.

When comparing the pyramids of the various country groups, striking differences are observed in their age and sex structures. For Greeks the distribution of the two sexes is relatively balanced (49.1% versus 50.9%), the slight predominance of females being exclusively attributed to differences in the mortality levels between the two sexes. For the foreign population there is a reverse relationship between the two sexes (54.5% males versus 45.5% females).

Moreover, there are striking sex differences among the various nationality groups of foreigners; the percentage of males for Group 4 is more than 69%, while for Group 3 it is as low as 38%. The values of the sex ratio are also indicative, being 83 for the overall foreign population recorded in 2001, 160 for the foreigners of Group 3, 75 for Group 2 and 45 for Group 4. These notable imbalances between the two sexes are directly related to the socio-economic conditions and the differentiated roles of men and women, on the one hand in the countries of origin, and on the other to their migration strategies.

We can therefore deduce that the demographic profiles of Greeks and foreigners are significantly different. Foreigners are characterised by younger age structures, their median age being 10 years younger than that of the Greeks and the proportion of people over the age of 65 being much lower. With regard to their sex distribution, males clearly outnumber females, in contrast with the native population. Nevertheless, the consequences of immigration on the demographic structures of the population in Greece at a national level are not striking, as the overall percentage of foreigners in the total population is low; the presence of foreigners in the population led to a slight increase in the percentage of males (+0,4%), a slight drop in the percentage of people older than 65 (-1%) and the mean age (-0,7 years) as well as to a slight increase in the proportion of the age group 15-64 in the total population (+1%).

2.2   The spatial dispersion of foreigners

At the municipality level, the spatial dispersion of foreigners is slightly different from that of Greeks (Table 1), as the values of Gini coefficients are 0.842 for the former and 0.739 for the latter. However, foreigners from the less developed countries, as well as those coming from the ex-socialist countries exhibit higher concentrations (the Gini index is equal to 0.971 and 0.911, respectively), in contrast to those coming from the Balkan countries (the Gini coefficient is equal to 0.827).

Table 1:
Values of the Gini indices for the various population subgroups

Population Groups	Gini coefficient
Total population	0.744
Natives	0.739
Foreigners	0.842
Group 1: Developed countries	0.889
Group 2: Balkan)	0.827
Group 3: Eastern European countries	0.911
Group 4: Less developed countries	0.971

Source: Author's computations based on data from the 2001 Census, NSSG (2001).

Differences in the concentration of foreigners in municipalities, reflected in the values of Gini indices, are associated with the differences in the percentage of foreigners in their total population.[4] As illustrated in Figure 2, there are very few units, with no foreigners (28 out of 1,034), while, in others, foreigners make up more than 10% of their total population (165 out of 1,034, which is 16.3% of the total population of the country). The latter units are located in the more economically developed areas of the country, i.e. in the major urban centres of continental Greece, in the coastal zone of the Peloponnesus, on islands, which are agricultural and/or have been developed for tourism, and the areas neighbouring Albania.

Figure 2:
Percentage of foreigners in the total population (data from the 2001 census)
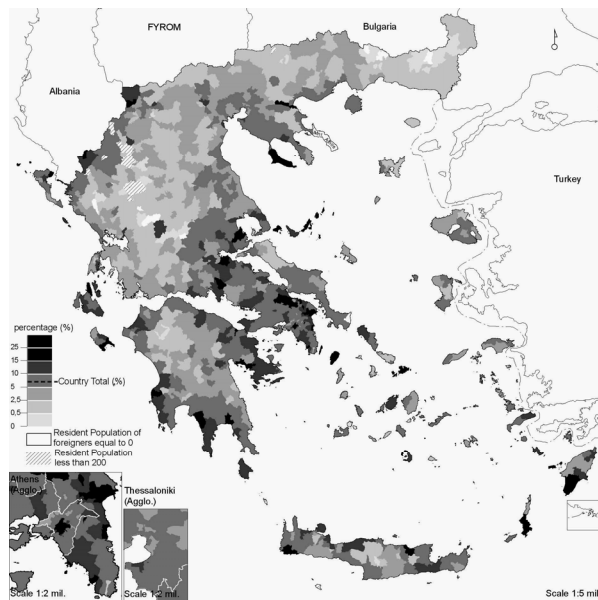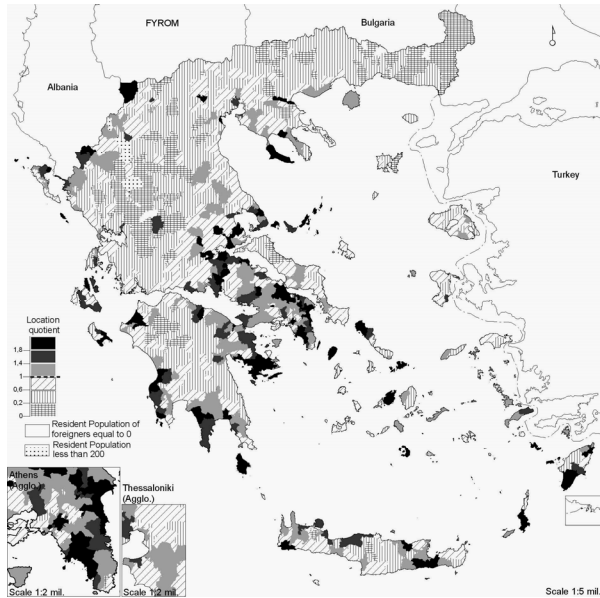

Source: Authors' computations.

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[4]   For the purpose of our analysis we use population data for the 1034 municipalities of Greece provided by the 2001 population census. Municipalities with a population of less than 200 inhabitants (28 units), those without foreigners (10 units), and Mount Athos have been excluded from the analysis. The population of the excluded municipalities does not exceed 12, 000 people, i.e. less than 0.1% of the total counted population of Greece. It should be also noted here that in the 2001 census, the count of foreigners is slightly lower, Lianos et al (2008). However, the failure rates were differentiated by country of origin; the immigrants from Asian and African countries were highly underestimated, and to a lesser degree people from some countries of Eastern Europe especially Poland. More details of the quality of the 2001 census data, are given in Baldwin-Edwards and Kyriakou (2004) and Baldwin-Edwards (2009).

Figure 3, illustrating the values of the location quotient[5] (LQ), highlights differences in the spatial concentration of foreigners. Although Figure 3 provides a similar picture to Figure 2, Figures 3a, 3c and 3d illustrate significantly different patterns. From these figures it can be seen that in a limited number of municipalities, the values of LQ[6] for foreigners coming from the more developed, the ex-socialist and the less developed countries (Groups 1, 2 and 4, respectively) are exceptionally high. Taking as a criterion index values greater than 1.8 (this means that, in municipalities which are characterised by these values, the percentage of foreigners of the examined group of countries in the total population of foreigners of these municipalities is 1.8 times higher than the percentage of foreigners of the same group of countries in the total foreign population of the country), we observe in Figure 3d, that these municipalities are almost exclusively located in places north of the greater metropolitan area of Athens while in contrast, foreigners coming from the ex-socialist countries (Figure 3c), are concentrated in central and eastern Macedonia and in Thrace. Furthermore, people coming from the Balkan countries have a roughly balanced spatial distribution (Figure 3b), with corresponding values of LQ being slightly higher in the eastern part of central Greece and the municipalities neighbouring Albania, while these are almost absent in Thrace (LQ values tending to 0). Finally, by examining Figure 3a, we observe that people from more developed countries are highly concentrated on the islands where tourism is highly developed and in the northern high income suburbs of the Athens agglomeration, as well as in the sparse municipalities of continental Greece characterised, in recent decades, by a high level of development for tourism, which experienced a strong emigration during the early post war years. From all the above it is evident that, as the distribution of the total population of foreigners at municipality level does not significantly differ from that of Greeks, their influx has not changed the pre-existing highly unequal population distribution. It should also be noted that the impact of immigration on the population size and the demographic characteristics in municipalities depends on the one hand on the percentage of foreigners in their total population and on the other hand on the nationality synthesis of the foreigner population in each municipality.

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[5]   LQ is calculated as [(population of foreigners in each municipality/total population of the same municipalities)]/ [(population of foreigners in Greece/total population of Greece)]. If its value equals one it means that the percentage of foreigners in the specific municipality is the same as the percentage of foreigners in the total population of the country. If its value is less than one, the percentage of foreigners in the specific municipality is higher than that of the country and vice versa.

[6]   Here, LQs are calculated as follows: [(population of foreigners from country group x in each municipality/total population of foreigners in the same municipalities)]/[(population of foreigners from country group x in the total population of Greece/total population of foreigners in Greece)].

Figure 3:
Location quotient for immigrants at the municipality level (2001 census)

Source: Authors' computations.

Figure 3a:
Location quotient for country Group 1 immigrants at the municipality level
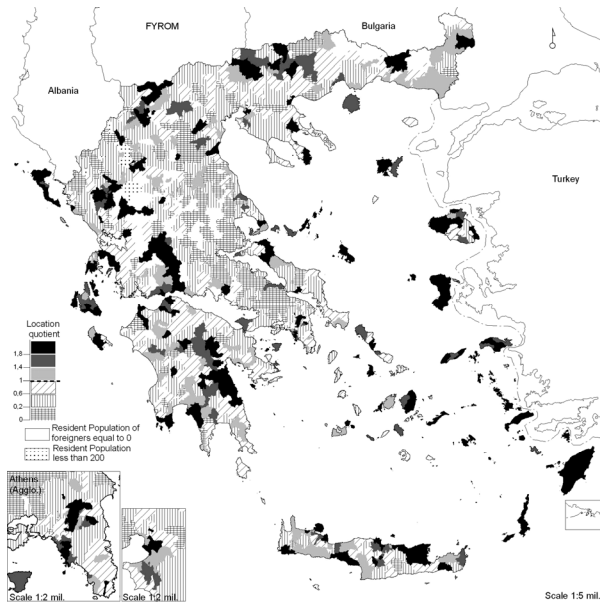
Source: Authors' computations.

Figure 3b:
Location quotient for country Group 2 immigrants at the municipality level

Source: Authors' computations.

Figure 3c:
Location quotient for country Group 3 immigrants at the municipality level
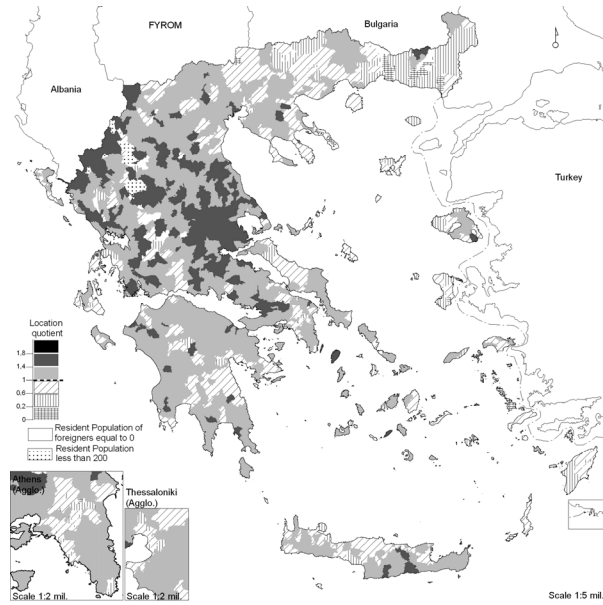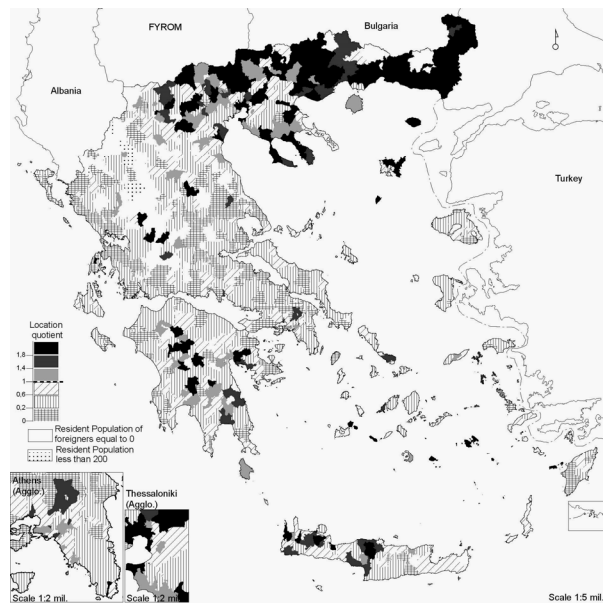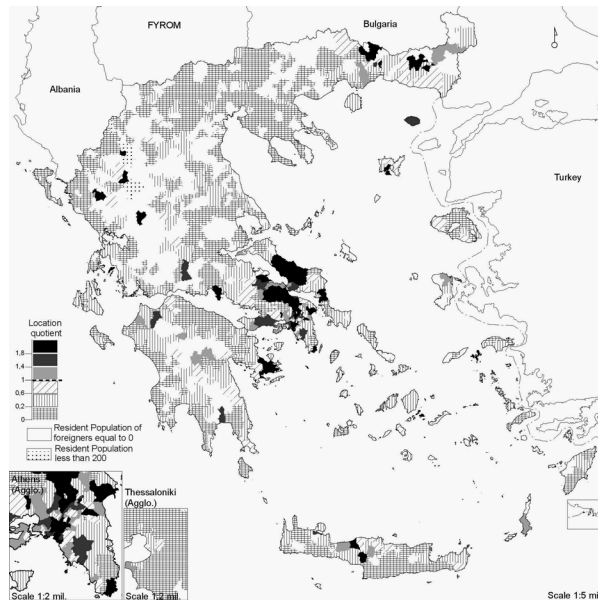

Source: Authors' computations.

Figure 3d:
Location quotient for country Group 4 immigrants at the municipality level

Source: Authors' computations.

3 The implications of immigration on the population size and the demographic characteristics of municipalities in Greece

3.1 Data and methods

As previously mentioned, for the purpose of our analyses, population data are used for the 995 municipalities of Greece provided by the 2001 population census.[7] At first an identification of homogenous groups of municipalities, according to the nationality synthesis of their immigrant populations is attempted. For that we calculate the percentage of immigrants for each of the four nationality groups of foreigners previously defined, and then using the two-step clustering statistical procedure, we classify municipalities into homogenous groups

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[7] In our analyses, census data for the years 2001, for some investigations 1991, were used, conducted by the National Statistical Service of Greece referring to the usual resident population differentiated by sex, age, nationality and place of residence. People who do not have Greek nationality are considered to be foreigners. Foreigners who received Greek nationality during the period 1991 to 2001 (a very limited number, since according to Greek law naturalisation is extremely limited), and people with dual nationality one being Greek, are registered as Greeks in the 2001 census.

according to their foreign population nationality structure. Thereafter, in an attempt to estimate the implications of immigration on the age and sex structure of the population, in each municipality we consider the Greek population, i.e. the population that would be if immigration had never taken place, as well as the total population, i.e. the actual population that is made up of both Greeks and foreigners. Then, for the two populations, in every municipality, we calculate the differences between the values of various characteristics reflecting the sex and age composition of the population. The characteristics examined are the proportion of males, the mean age of the population, the proportion of population in the active age group and the proportion of females of reproductive age. Thereafter, according to the magnitude of the differences of these proportions, we classify the municipalities into homogenous groups using statistical criteria based on the size of these differences. In order to reveal the optimal grouping of the municipalities into homogenous groups according to the alternative characteristics listed above, we utilise the two step statistical clustering procedure[8] that we used before, which is an exploratory statistical tool designed to reveal natural grouping in a dataset that would otherwise not be apparent.

3.2 Municipality profiles according to the nationality synthesis of the immigrants

According to the results of the clustering technique used, the municipalities are classified into five distinct homogenous clusters according to the nationality synthesis of the immigrant population in them. Table 2 presents the results of this classification, while Figure 4 provides an illustration of it.

If we consider the values in Table 2 we conclude that, in the majority of municipalities (Cluster 4, 50.3%), people from the Balkan countries form the overwhelming majority of their immigrant population, their mean percentage in these municipalities being equal to 87.9%, which is significantly higher that their country mean of 71.8%. In these areas, the presence of people from the more developed countries is much lower than their mean presence in the country as a whole (5.5% as compared to the country mean of 14.4%), while the two other groups are also significantly underrepresented. In Figure 4 we observe that these municipalities are located in inland Greece (except central and eastern Macedonia, Thrace, the eastern part of the Peloponnesus and most of the islands).

Furthermore, another group of municipalities (Cluster 1, 8.4%) exhibit a very high number of people from more developed countries and a lower number of people from the Balkan and eastern European countries. These municipalities are mostly located in the eastern Aegean islands and Crete as well as in the northern suburbs of the Athens agglomeration. Another group (Cluster 5, 24.1% of the

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[8] The analysis is implemented in the SPSS statistical package.

total number of Greek municipalities) is characterised by the immigrants from the Balkan and eastern European countries that is slightly smaller compared with their country mean, and a much higher number of people from the more developed countries [9] in comparison again with their country mean. From Figure 4, we can easily observe that these municipalities are located mostly in the eastern part of the Peloponnesus, on Crete, the Ionian Islands and Cyclades, as well as, in the northern and eastern suburbs of Athens.

Table 2:
Nationality composition of the different municipality profiles

| Cluster	No. of municipalities	(%)	% of total population	% of foreigners	Mean percentage			
					Group 1	Group 2	Group 3	Group 4
1	84	8.4	4.0	4.0	51.7	32.9	6.7	8.7
2	53	5.3	7.6	3.8	13.5	31.2	52.1	3.2
3	118	11.9	24.0	33.2	9.2	64.5	22.7	3.6
4	500	50.3	35.0	31.4	5.5	87.9	3.8	2.7
5	240	24.1	29.4	27.5	22.8	64.0	6.2	7.0
Combined	**995**	**100.0**	**100.0**	**100.0**	**14.4**	**71.8**	**9.4**	**4.5**

Note : Means at the end of the last four columns are calculated as the arithmetic means of the percentage of immigrants of each nationality group.
Source: Authors' computations.

A small number of municipalities (Cluster 2, 5.3%) have a much higher number of people from eastern European countries (more than five times their country mean) and a somewhat lower number of people from the Balkans and less developed countries. These municipalities are almost solely in Thrace, which is located nearest to their countries of origin. Finally, 11.9% of the municipalities (Cluster 3) are characterised by people from the Balkan countries which is slightly lower compared with their country mean and also by a high level of immigrants from eastern Europe (more than double their country mean) while the other two nationality groups of immigrants have a lower level than their country mean. These municipalities are mainly located in central and eastern Macedonia, areas that are closer to their countries of origin, and to a lesser degree, in the central Peloponnesus and western Crete.

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[9] In this municipality group, the percentage of those coming from the less developed countries (country Group 4) is also limited (half of their country mean, 7% versus 10%).

Figure 4:
Municipality profiles according to the nationality synthesis of the immigrants
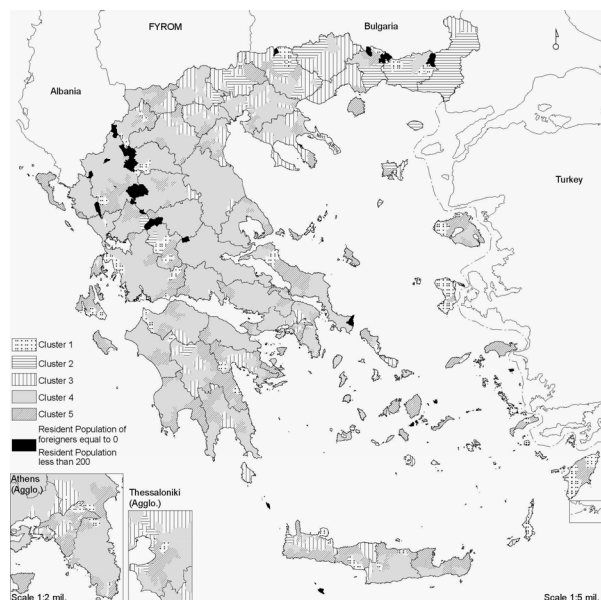
Source: Authors' computations.

## 3.3 The implications of immigration on the population size of municipalities

In order to estimate the impact of immigration on the change of population size in Greek municipalities, we used data from the 1991 and 2001 censuses and classified municipalities according to the magnitude of the differences between the total population change and the corresponding change in the native population only, between 1991 and 2001. Table 3 illustrates the results of this classification. A total of 437 municipalities (43.9% of the Greek municipalities, 44% of the total population) experienced a mean decrease in their population size by 9.8%. If these municipalities had not experienced any immigration during the period 1991 and 2001, this decrease would be equal to 12.9%. For 433 municipalities (43.5% of all municipalities, 59% of the total population) the mean increase in their population size was equal to 24.3%, while without immigrants this increase would be equal to 17.4%. The most striking finding here was that 125 municipalities (126% of the total, and 9.5% of the total population) experienced a population increase of 8%, without immigrants these municipalities would have experienced a population decrease of 4%. Figure 5 provides an illustration of the geographical location of the municipalities in these three groups.

Table 3:
Mean changes in the population size between 1991 and 2001

Impact	Number of muni-cipalities	(%)	% of total popula-tion	% of foreigners	Foreigners in total population (%)	Mean change in native pop. size (%)	Mean change in total pop. size (%)	Differences in mean changes
Negative	437	43.9	32.2	37.6	8.1	-12.9	-9.8	3.1
Positive	433	43.5	58.5	51.1	8.5	17.4	24.3	6.9
Sign alteration	125	12.6	9.4	11.3	6.1	-4.0	8.0	120
Combined	**995**	**100.0**	**100.0**	**100.0**	**7.0**			

Source: Authors' computations.

Figure 5:
The impact of immigration on changes in the population size between 1991 and 2001
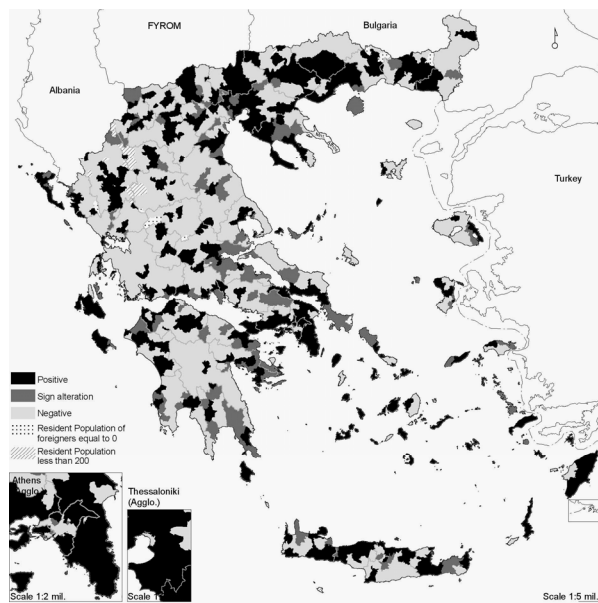
Source: Authors' computations.

Obviously, the municipalities that were affected most by immigration with regard to their size were those located in the greater metropolitan areas of Athens and Thessalonica and the surrounding areas, in the coastal areas of Peloponnesus, on Crete and some other islands, as well as, in areas near the Albanian border. Therefore, we conclude that the massive inflow of foreigners into Greece significantly enhanced the human capital of the country and, to a great extent, both the demographic vigour of most municipalities, which experienced positive

changes during the period 1991-2001, and the significant deceleration in population decline in half of the municipalities in which negative changes were recorded throughout that decade. Furthermore, on the one hand, foreigners contributed to a deceleration in population decline in most of the Greek municipalities and on the other hand, they contributed to the demographic enhancement of the most dynamic geographical unities of the country.

3.4   The contribution of foreigners to changes in the sex and age structure of the population in Greek municipalities

In Section 2.1, when we examined the demographic structures of foreigners at the national level and compared them to the corresponding structures of the native population, we highlighted differences between the two groups, as well as among the four nationality groups of foreigners. We also concluded that the demographic impact of immigration has been relatively limited at this overall level. Nevertheless, it should be interesting to examine the immigration impact on the population at a low spatial level, i.e. the municipality level. An analysis at this level allows us to examine the potential differentiated impacts that probably underlie the national averages.

3.4.1   Implications of immigration on the sex structure of the population

In order to estimate the influence of foreigners on the sex distribution of the population, we classified municipalities according to the differences in the percentage of males between the actual and the native population in each municipality. Figure 6 illustrates the results of this classification. The rough picture that emerges in the map is that, in all municipalities, foreigners have contributed to an increase in the percentage of men in their population. Nevertheless, the impact of immigrants on the sex structure of the population in municipalities exhibits significant variations related to the unequal spatial distribution of foreigners as well as to differences in their nationality structure. According to the magnitude of the differences in the proportion of males between the total population and the Greek population, the municipalities can be classified into three homogenous groups. Figure 6a provides an illustration of the 95% confidence intervals for the mean increase of the male proportions in each group. According to the results of our clustering procedure presented in Table 4 in 33 municipalities (Cluster 1, 3.3%) immigration resulted in a statistically highly significant increase in the percentage of males, with a mean increase equal to 3.7

percentage units,[10] while in another group (Cluster 2, 19%) immigration resulted in a lower, although statistically significant, increase in the percentage of males, with a mean increase equal to 1.3 percentage units. However, in 78% of the municipalities (Cluster 3), immigration has not exhibited any statistically significant increase, the mean increase in the percentage of males being equal to 0.2 and their variability, as indicated by the value of the standard deviation, is very high. The municipalities in Clusters 1 and 2 are mainly concentrated on either side of the central road axis linking the south-western part to the northern part of the country and also near the border with Albania. In the majority of these municipalities the percentage of foreigners in the total population is clearly higher than the national mean (13% to 155% versus 7%) and in addition, there is a high concentration of foreigners from the less developed countries which is characterised by a very low number of women.

Figure 6:
Classification of municipalities according to the impact of immigration on the percentage of males
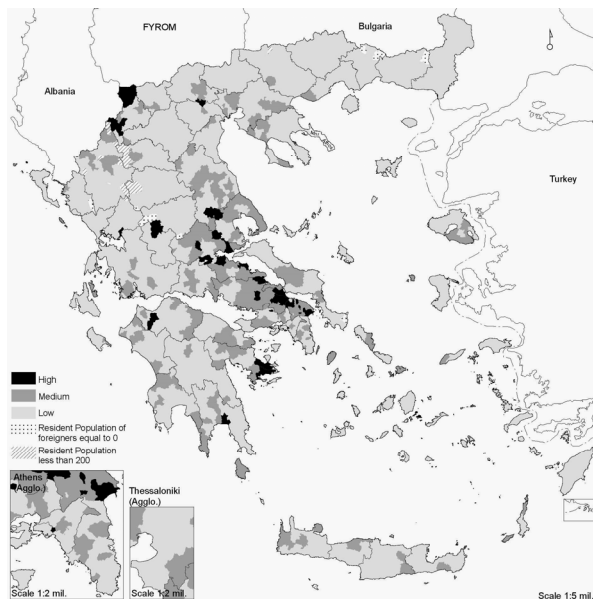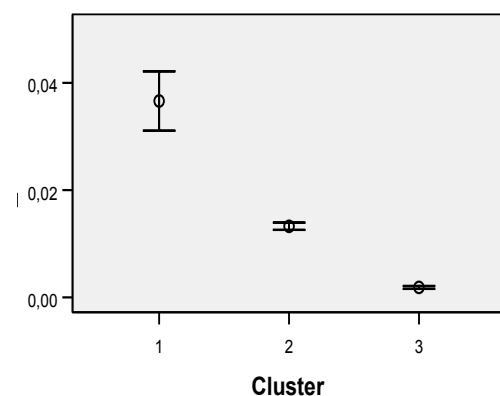

Source: Authors' computations.

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[10]   The significant changes in the sex distribution of this group are dependant on the extremely high percentage (21% versus 10% at the national level) of foreigners from the less developed countries where males represent 70%.

Table 4:
Classification of municipalities according to the impact of immigration on the percentage of males

Cluster	No. of munici- palities	(%)	Mean difference (%)	% of total popula- tion	% of foreign- ers	Foreigners in total population (%)	Percentage			
							Group 1	Group 2	Group 3	Group 4
1 High	33	3.3	3.7	1.4	3.1	15.4	2.8	73.0	3.4	20.8
2 Medium	187	18.8	1.3	17.3	31.6	12.8	8.6	67.7	10.1	13.6
3 Low	775	77.9	0.2	81.4	65.4	5.6	15.8	64.3	12.2	7.6
Combined	**995**	**100.0**	**0.5**	**100.0**	**100.0**	**7.0**	**13.1**	**65.7**	**11.3**	**9.9**

Source: Authors' computations.

Figure 6a:
Simultaneous 95% confidence intervals for the mean percentage of males

Source: Authors' computations.

3.4.2 Implications of immigration on the age structure of the population

Despite the significant differences in the age structure among the four nationality groups of foreigners, their population as a total is notably younger than the Greek population , as the mean age of the former is almost 10 years younger than of the latter (30.9 versus 40.6 years old, see Table 2 in the Appendix). This difference in mean age is mainly attributed to the extremely young age structure (mean age 287 years) of foreigners from the Balkan countries, which make up the majority (66%) of the total foreign population. Given the ageing tendencies of the native population in Greece, it is essential to examine the implications of the massive inflow of young foreigners on the mean age of the population in the municipalities, as well as on the population of the active age group (15-64 years old).

With regard to mean age, the inflow of foreigners, as expected, resulted in a drop of the mean age of the total population in all municipalities (Figure 7). This drop is clearly spatially differentiated. If we look at the magnitude of the differences in the mean age between the native population and the total population in each municipality, the impact of immigration is striking. The municipalities were been classified into three homogenous groups. According to the results of our clustering procedure presented in Table 5, in 427 municipalities (Clusters 1 and 2) or 43% of all municipalities, comprising 36% of the total population and 64% of foreigners, immigration resulted in a statistically significant decrease in the mean age– by 2.10 years for 115 municipalities and by about one year for the other 312. Figure 7a provides an illustration of the 95% confidence intervals of the mean values of these differences. It is clearly observable in Figure 7, which illustrates the geographical distribution of these municipalities, that the most extreme changes in the mean age of the population took place in municipalities located in the central east and the southern parts of continental Greece, on some islands, as well as, in municipalities located near the Albanian border. The municipalities of these two groups are usually characterised by a high percentage of foreigners in their total population and/or by a particularly high number of foreigners from the Balkan countries. However, in the majority of the Greek municipalities (57%), comprising the 64% of the total population but only 28% of foreigners, particularly those of the over-aged municipalities of mountainous continental Greece, immigration has not resulted in any statistically significant decrease of the mean age, as the mean increase has been very low.

Table 5:
Classification of municipalities according to the impact of immigration on the mean age

Cluster	No. of munici-palities	(%)	% of total pop.	% of foreign-ers	Foreig-ners in total pop. (%)	Mean difference in mean age (years)	Percentage			
							Group 1	Group 2	Group 3	Group 4
1 High	115	11.6	11.8	27.7	16.4	-2.1	9.1	66.3	10.0	14.7
2 Medium	312	31.4	24.2	28.6	8.2	-1.0	11.6	72.6	7.7	8.1
3 Low	568	57.1	64.0	43.7	4.8	-0.3	16.7	60.8	14.4	8.1
Combined	**995**	**100.0**	**100.0**	**100.0**	**7.0**	**-0.8**	**13.1**	**65.7**	**11.3**	**9.9**

Source: Authors' computations.

Figure 7:
Clustering of municipalities according to the impact of immigrants on the mean age
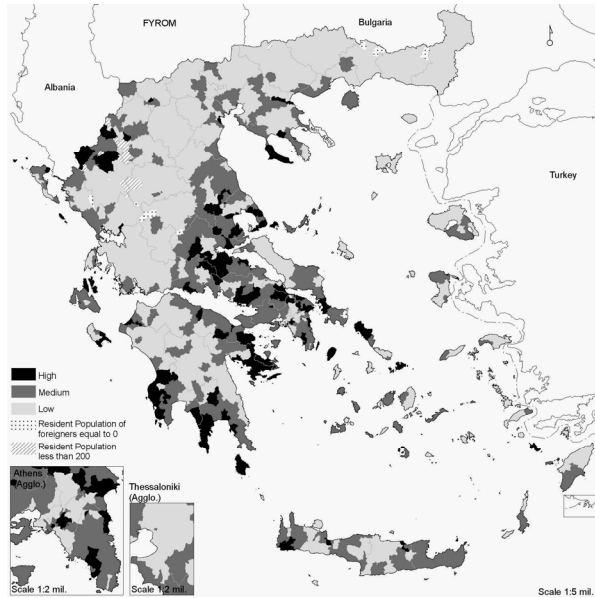
Source: Authors' computations.

Figure 7a:
Simultaneous 95% confidence intervals for the mean age
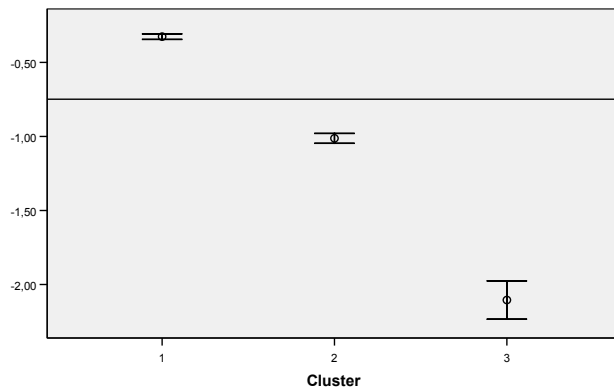
Source: Authors' computations.

If we look at the population in the active age group (Table 6), in half of the municipalities (Cluster 4) or 49% of all municipalities, comprising 57% of the total population and 38% of the total foreign population, the impact of foreigners is insignificant, and in 288 municipalities (Cluster 3) it is relatively limited. In

contrast, in 221 municipalities (Clusters 1 and 2, almost 25% of the total number of municipalities of Greece, containing almost 20% of the total population), the impact of foreigners on the population in the active age group, is relatively strong. In some of them (Cluster 1, 39 units with a population sizes ranging from 2000 to 10,000, which is only 155% of the total population), the impact of immigration is highest, as foreigners were responsible for an increase in the population in the age group 15-64 of an average of 5.5%.

The municipalities of these two clusters are located in the eastern continental part of Greece, on some islands (particularly in the Cyclades, on Rhodes and on Crete), and at the border with Albania. Furthermore, if we compare Figure 8 with Figure 1, which illustrates the level of immigrants in the population of Greek municipalities, we observe that the results are roughly the same. This is because the majority of the municipalities in which foreigners contributed significantly to the increase in the percentage of population in the active age group, are also those in which the percentage of foreigners in the total population are more than double the national mean.

Figure 8:
Impact of immigrants on the percentage of the population in the active ages group

Source: Authors' computations.

Figure 8a:
Simultaneous 95% confidence intervals for the mean percentage of the population in the active ages
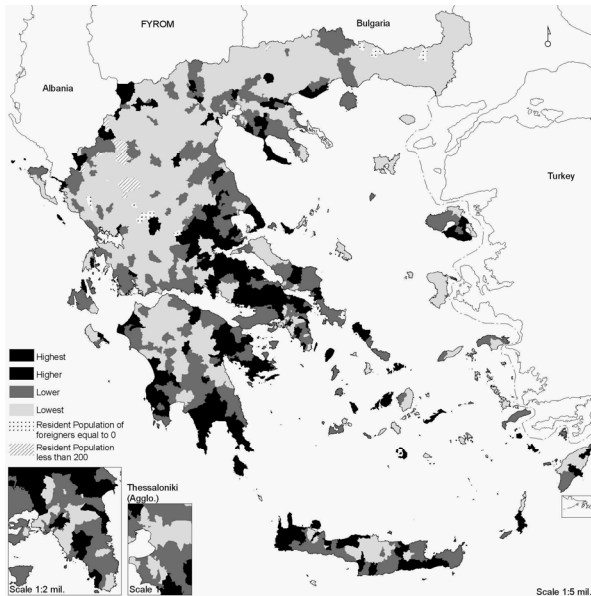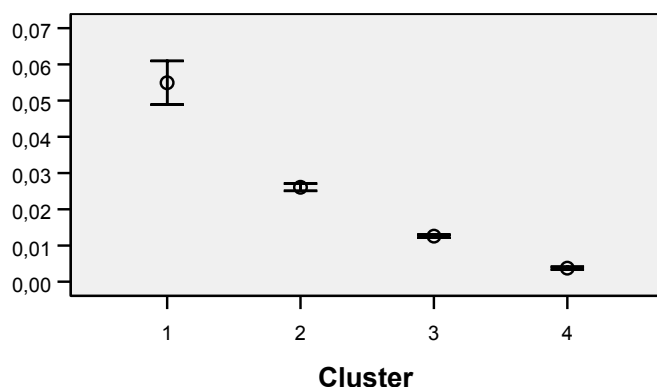

Cluster

Source: Authors' computations.

Table 6:
Classification of municipalities according to the impact of foreigners on the percentage of the population in the active age group

Cluster	No. of munici-palities	(%)	Mean % in cluster	% of total pop.	% of foreigners	% foreigners in total pop.	Percentage			
							Group 1	Group 2	Group 3	Group 4
1 Highest	39	3.9	5.5	1.5	3.5	15.8	5.0	80.2	4.0	10.8
2 Higher	182	18.3	2.6	17.5	33.4	13.3	9.9	65.9	10.5	13.7
3 Lower	288	28.9	1.3	23.8	24.7	7.2	13.2	68.6	9.3	8.9
4 Lowest	486	48.8	0.1	57.2	38.5	4.7	16.6	62.4	13.8	7.3
Combined	**995**	**100.0**	**0.9**	**100.0**	**100.0**	**7.0**	**13.1**	**65.7**	**11.3**	**9.9**

Source: Authors' computations.

3.4.3 Implications of immigration on the population of women of reproductive age

The implications of foreigners on the total population of women of reproductive age (15-49 years old), taking into consideration their disproportional sex distribution, are limited. Given the unequal spatial distribution of foreigners, as well as the high differences among the sex distributions of the four nationality groups (see Table 2 in the Appendix), strong differentiations are expected and recorded at municipality level (Figure 9). Thus, in a small group of municipalities (Clusters 1 and 2, comprising 222 municipalities, which form 22% of the total number of municipalities) the foreign women of reproductive age have contributed to an increase of more than 24%. Those municipalities that are more affected comprise only 17% of the total population and 36% of foreigners

(Table 7). These municipalities (Figure 9) have some common characteristics; the percentage of foreigners in the total population is usually more than double national average and their contribution to the sex distribution is, for the majority, insignificant.

Figure 9:
The impact of immigrants on the percentage of females of reproductive age
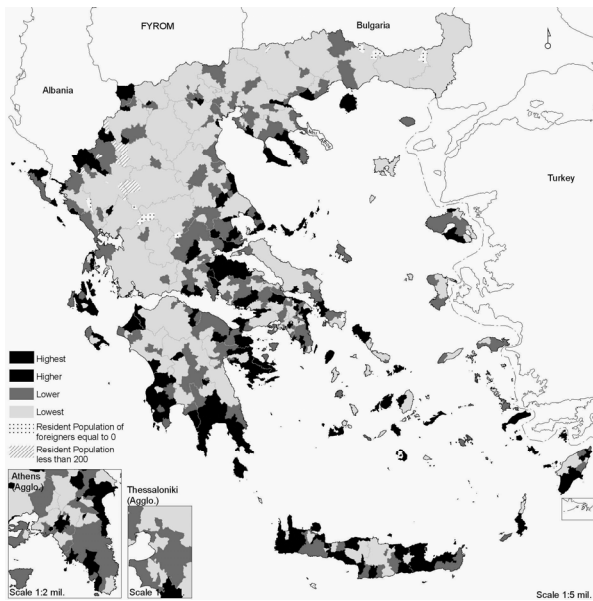
Source: Authors' computations.

Figure 9a:
Simultaneous 95% confidence intervals for the mean percentage of females of reproductive age
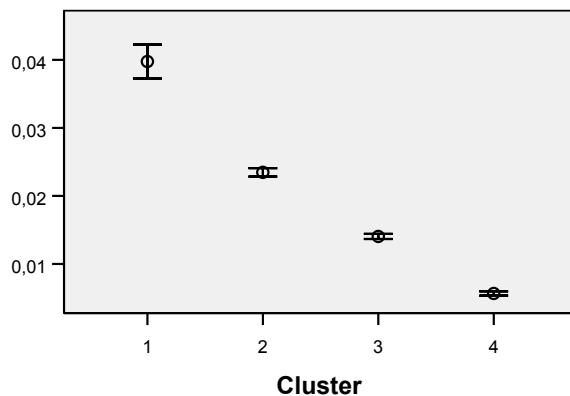
Source: author's computations

Table 7:
Classification of municipalities according to the impact to women of reproductive age

| Cluster	No. of munici- palities	(%)	Mean % in cluster	% of total pop.	% of foreign- ers	Foreigners in total pop. (%)	Percentage			
							Group 1	Group 2	Group 3	Group 4
1 Highest	69	6.9	4.0	10.2	24.2	16.5	10.8	63.4	11.2	14.5
2 Higher	153	15.4	2.4	7.6	11.9	10.8	14.7	70.9	6.6	7.9
3 Lower	236	23.7	1.4	25.7	27.8	7.6	14.5	65.2	12.5	7.8
4 Lowest	537	54.0	0.6	56.5	36.2	4.5	13.1	65.9	11.9	9.1
Combined	**995**	**100.0**	**1.3**	**100.0**	**100.0**	**7.0**	**13.1**	**65.7**	**11.3**	**9.9**

Source: Authors' computations.

3.4.4 The contribution of foreigners to changes in the demographic structures of Greek municipalities

Finally, after considering the unequal concentration of foreigners in municipalities and the examination of their impact on the size, sex and age structure of the population of municipalities, we now provide a synthesis taking into consideration the simultaneous impact of immigration on all the population characteristics previously considered, in order to highlight areas throughout the country where immigration had the most simultaneous influence on the population structure. According to the results of the multivariate clustering technique used (Table 8), the municipalities were classified into four clusters. We initially observed that in a large cluster of municipalities (446 out of 995) the implications were insignificant while in another large group (302 out of 995) these were low. These two clusters contain 81% of the total population. However, in 138 municipalities (7% of the total population), the implications of immigration were statistically significant, and in 109 municipalities (12% of the total population of the country), these implications were very significant. Figure 10 illustrates this classification. It is obvious that the municipalities strongly affected are concentrated mostly in the eastern lowland part of central Greece, in the eastern and south-western part of the Peloponnesus and at the border with Albania. The high percentage of foreigners in these municipalities can to some extent, explain the significance of the impact of immigration on them. However, this is not the sole reason as reflected in the fact that Figures 1 and 10 do not give exactly the same picture. Another factor associated with the significance of the immigration impact is the nationality synthesis of the foreign population in these municipalities.

Figure 10:

Clustering of municipalities according to the simultaneous impact of immigrants on the percentage of males, the mean age, the percentage of the population in the active age group and the percentage of females of reproductive age
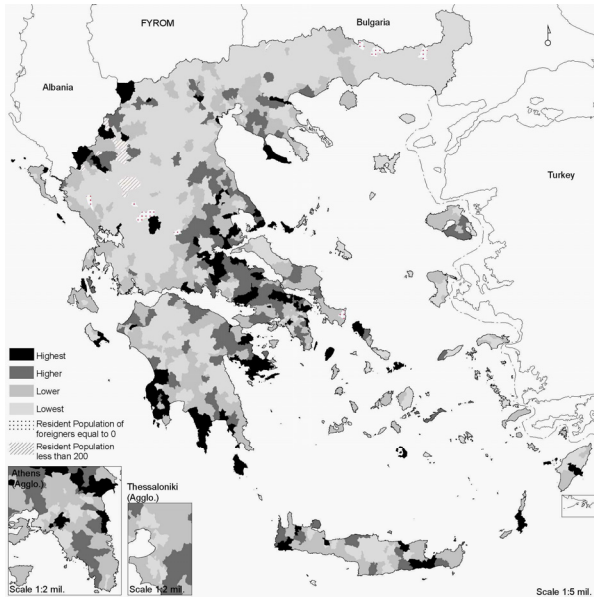
Source: Authors' computations.

Figure 10a:

Simultaneous 95% confidence intervals for the mean, of the percentage of males, the mean age, the percentage of the population in the active age group and the percentage of females of reproductive age
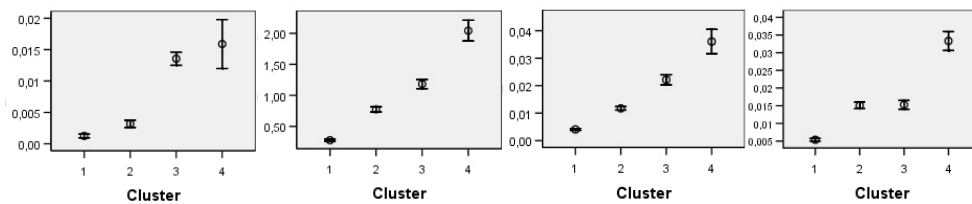
Source: Authors' computations.

Table 8:
Clustering of municipalities according to the simultaneous impact of immigrants on the percentage of males, the mean age, the percentage of population in active ages and the percentage of females of reproductive age

Cluster	No. of munici- palities	(%)	% of Males	Mean Age	% active age group	% F of repr. age	% of total pop.	% of fo- reign	% fo- reigners in total pop.	Percentage by groups			
										G 1	G 2	G 3	G 4
1 Highest	109	11.0	1.5	-2.1	3.6	3.4	11.7	27.8	16.5	17.1	62.8	13.3	6.8
2 Higher	138	13.9	1.4	-1.2	2.3	1.6	7.1	9.2	9.0	14.5	64.5	11.8	9.1
3 Lower	302	30.4	0.3	-0.8	1.2	1.5	33.3	35.5	7.4	7.1	78.2	6.4	8.0
4 Lowest	446	44.8	0.1	-0.3	0.1	0.1	47.9	27.5	4.0	9.4	65.9	10.1	14.6
Combined	**995**	**100.0**	**0.1**	**-0.8**	**1.3**	**1.3**	**100.0**	**100.0**	**7.0**	**13.1**	**65.7**	**11.3**	9.9

Source: Authors' computations.

4 Concluding remarks and discussion

Immigration in Greece is an ongoing process that has implications for the demographic, economic, political and social profile of the country. One would expect that the massive influx of immigrants since the early 1990s and given their heterogeneous nationality synthesis and their significantly different demographic profiles would have significantly influenced the demographic structure of the population of Greece. In this paper, using data from the last two population censuses, an analysis of the implications of immigration on the population structure in Greece is discussed. Initially, the basic demographic characteristics of the foreign population, as a total and also differentiated according to nationality, are considered at the national level. It is evident that the massive inflow of foreigners, with a different demographic profile from that of the native population and their unequal spatial distribution throughout country, has affected both the population size as well as the sex and age distribution of the total population.

However, the impact of immigration at the national level is limited; the massive inflow has not significantly changed the demographic structure overall. Immigration has led to a very slight change in the sex distribution of the population in favour of males, in a decrease in the percentage of the population older than 64 years by 1%, as well as a lowering in the mean age by 0.7 years, a slight increase in the percentage of population in the active age group by 0.9% and of women of reproductive age by 1.3%. Foreigners show a significantly different geographical concentration and their nationality composition also significantly differs spatially. Therefore, we considered the impact of immigration on the population size and structure and examined it on a smaller spatial scale. The analysis throughout the municipalities, given the significant variations in the concentrations and the nationality synthesis of the foreign population in them, has highlighted patterns of their impact on the population size and structure in neither

municipalities nor overall. Thus the consideration at this low spatial level led us to conclude that foreigners have determinatively contributed to both the slowing down of population depletion in a large part of the Greek countryside, as well as, to the demographic enhancement of the most dynamic geographic areas of the country.

In addition, given the relatively young male profile of foreigners, their impact to the age distribution of the population of municipalities has been significant, especially in some areas with specific characteristics. In particular in increasing the percentage of males in 220 out of 995 of the municipalities, decreasing the mean age of the population in almost half (427 out of 995), increasing the percentage of the population in the active age group in 221, as well as the percentage of women of reproductive age in 222, Finally, according to the results of our multivariate analysis, a total of 237 municipalities have experienced a statistically significant simultaneous influence on the characteristics examined. Almost all of the affected municipalities are located in the economically developed areas of the eastern part of lowland central continental Greece, in parts of eastern and southwest Peloponnesus and Crete that have been developed for agriculture and tourism, as well as on some Aegean and Ionian islands highly specialised in tourism, and finally at the border with Albania.

We conclude from the findings of the analysis that the massive inflow of foreigners into Greece has brought significant changes in the demographic map of the country. However, these changes are highly differentiated as the dispersion of foreigners according to their nationality characteristics (the various nationality groups of foreigners show great differences in their demographic characteristics) shows significant spatial deviations. Moreover, the findings of this analysis emphasise the necessity for a study of the dimensions of this rather 'new' migration on a small spatial scale, and also highlight the inefficiency of the current approaches at the country level or at greater region levels, since foreigners do not form a homogenous group with common characteristics and concentrations and therefore significant differences in their nationality synthesis and their geographical dispersion should be considered by policy makers in migration policies.

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Appendix

Table A1:
Population distribution according to nationality in different census years (1981, 1991 and 2001)

Nationality	1981 Total	(%)	1991 Total	(%)	2001 Total	(%)
Total	9 739 589	100.00	10 259 900	100.00	10 934 097	100.00
Greek	9 558 994	98.15**	10 092 624	98.37**	10 171 906	93.03**
Other	180 595	1.85**	167 276	1.63**	761 813	6.97**
Not declared	4 476	0.05**	1 245	0.01**	430	0.00**
Developed countries (Group 1)	**115 431**	*65.54****	**76 275**	*45.94****	**99 901**	*13.12****
EU-15	59 488	*51.54*	35 304	*46.29*	46 869	*46.92*
Republic of Cyprus	19 337	*16.75*	14 651	*19.21*	17 426	*17.44*
Australia	7 041	*6.10*	6 313	*8.28*	8 767	*8.78*
USA	23 659	*20.50*	13 927	*18.26*	18 140	*18.16*
Canada	4 136	*3.58*	4 717	*6.18*	6 049	*6.05*
Rest of the developed countries	1 770	*1.53*	1 363	*1.79*	2 650	*2.65*
Balkan countries (Group 2)	**5 821**	*3.31****	**26 226**	*15.80****	**500 226**	*65.70****
Albania	3 563	*61.21*	20 556	*78.38*	438 036	*87.57*
Bulgaria	807	*13.86*	2 413	*9.20*	35 104	*7.02*
Romania	606	*10.41*	1 923	*7.33*	21 994	*4.40*
Ex-Yugoslavia (Rep. of Serbia and Montenegro in 2001)	845	*14.52*	1 334	*5.09*	3 832	*0.77*
The former Yugoslav Republic. of Macedonia	0	*0,00*	0	*0.00*	747	*0.15*
Croatia	0	*0.00*	0	*0.00*	219	*0.04*
Bosnia-Herzegovina	0	*0.00*	0	*0.00*	294	*0.06*
Ex-socialist countries (except the Balkan countries) (Group 3)	**3 630**	*2.06****	**25 022**	*15.07****	**85 715**	*11.26****
Poland	522	*14.38*	9 624	*38.46*	12 831	*14.97*
Hungary	237	*6.53*	291	*1.16*	538	*0.63*
Ex-Czechoslovakia (Czech Republic and Slovakia in 2001)	247	*6.80*	738	*2.95*	1 009	*1.18*
Ex-USSR	1 515	*41.74*	12 918	*51.63*	71 337	*83.23*
Other European ex-socialist countries	1 109	*30.55*	1 451	*5.80*	-	-
Less developed countries (Group 4)	**51 237**	*29 .09****	**38 508**	*23.19****	**75 541**	*9.92****
Asia	41 954	*81.88*	27 567	*71.59*	56 680	*75.03*
Africa	6 671	*13.02*	8 726	*22.66*	15 607	*20.66*
America	2 195	*4.28*	2 022	*5.25*	3 138	*4.15*
Oceania	417	*0.81*	193	*0.50*	116	*0.15*

Notes:
*Those who declared an additional nationality (Greek and another country were included in the Greek group).
**Percentage in the total population.
***Percentage of the population that declared their nationality.
In italic – percentage of individuals of a given nationality to the total of the group.
Source: Kotzamanis et al. (2006).

Table A2:
Demographic characteristics within population groups, according to the 2001 Census

	Total	(%)	Males	Males (%)	Females	Females (%)	Sex ratio	0-14	0-14 (%)	15-64	15-64 (%)	65+	65+ (%)	Females (15-49)	Females (15-49) (%)	Mean age (years)
Total	10 934 097	100	5 413 426	49.51	5 520 671	50.49	101.98	1 660 899	15.19	7 445 965	68.10	1 827 233	16.71	2 726 150	49.38	39.93
Natives	10 172 284	93.03	4 998 058	49.13	5 174 226	50.87	103.52	1 534 088	15.08	6 837 640	67.22	1 800 556	17.70	2 487 445	48.07	40.60
Foreigners	761 813	6.97	415 368	54.52	346 445	45.48	83.41	126 811	16.65	608 325	79.85	26 677	3.50	238 705	68.90	30.90
D				0.38					0.11		0.88		-0.99		1.31	-0.67
Group 1	99 901	13.11	43 840	43.88	56 061	56.12	127.88	11 455	11.47	79 422	79.50	9 024	9.03	37 360	66.64	37.45
Group 2	500 226	65.66	285 941	57.16	214 285	42.84	74.94	98 530	19.70	390 296	78.02	11 400	2.28	146 198	68.23	28.72
Group 3	85 715	11.25	32 979	38.48	52 736	61.52	159.91	10 794	12.59	72 437	84.51	2 484	2.90	39 839	75.54	33.42
Group 4	75 541	9.92	52 285	69.21	23 256	30.79	44.48	5 990	7.93	65 790	87.09	3 761	4.98	16 045	68.99	33.86

Note: D is calcuted by substracting the indices of the total population from that of the natives,
under the hypothesis that if no foreigners were present then the two indices (total and native) would be equal.
Source: Kotzamanis (2009).