Patterns of Ethno-Spatial Change in Bosnia and Herzegovina after 1991

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Background and theoretical focus

The breakup of Yugoslavia had particularly severe effects on Bosnia and Herzegovina (B&H) due to its complex ethnic makeup. It was the only republic of the former large country that included more than one "constituent nation" according to the Yugoslav Constitution – Bosniaks (officially declared as Muslims in terms of nationality at the time of Yugoslavia), Serbs, and Croats. According to the UNHCR, the ethnic war in B&H (1992-1995) caused the displacement of about two million people. Of these, 1.2 million (27% of the population according to the 1991 census) applied for refugee status in over 100 countries around the world, while countries in the Yugoslav region accepted 40% of refugees. A small number of them have returned to their homeland, with around one million residents remaining internally displaced in B&H (UNFPA, 2020).

Three decades after the Dayton Peace Agreement (1995), which officially ended the war, unresolved tensions persist among Bosniaks, Serbs, and Croats. Given the post-Dayton political and administrative organization's reliance on ethnic homogeneity and its source of current crises, improving knowledge of B&H's spatial and temporal ethno-demographic processes is crucial. The lack of reliable demographic data, especially on ethnic composition, and uncritical interpretations of demographic and migration processes since 1991 contribute to interethnic confusion. Indeed, the authorities in B&H failed to conduct the census of population at the beginning of the 2000s, which strongly reduced the chance for a more accurate assessment of the impact the war had on the country's population dynamics (Lukić-Tanović, Marinković, 2024). Thus, the 2013 Census remains the first and only population census conducted in B&H since 1991. Despite the absence of a unified methodological approach towards non-permanent residents in the official census count among the three main statistical agencies in the country, the final results published by the Agency for Statistics of B&H were formally approved by the International Monitoring Operation (IMO). Hayden (2021) argues that while the results cannot be reliably used as an official population enumeration, they still hold value for empirical research. In addition, the officially approved approach – the resident population included persons living abroad for longer than a year – is closer to the concept of permanent population valid in the 1991 census, which makes the comparison between the censuses of 1991 and 2013 more reasonable. Moreover, some studies published in the meantime used various methodological adjustments when estimating the population of B&H, but these estimates could not overcome all relevant methodological differences between the two very distant censuses.

The census in B&H around 2020 was not conducted due to a lack of political will. There are no indications that it could be delayed, as was the case with previous censuses and recent ones in the region, such as Montenegro (2023) and Kosovo (2024), which were also delayed for similar reasons. Consequently, the next census is unlikely to be conducted until a new round begins around 2030, resulting in another two-decade intercensus period. However, there were no objective obstacles to postponement. The absence of a comprehensive statistical population register or representative demographic surveys points to the 2013 census as the most up-to-date source for demographic analyses, particularly regarding the change in ethnic composition of the country. Consequently, we based our analysis on the official census results.

While some analyses examining ethno-spatial changes based on the 2013 Census have been published, they primarily rely on descriptive statistical analysis. Moreover, the focus has shifted towards controversies surrounding methodological flaws in the final results and potential political motivations, overshadowing the results themselves. This impression is further compounded by the conclusions of these analyses, which fail to delve into the intricate processes and fundamental shifts that occurred during the war period.

Our aim is to, utilizing existent data, contribute to a better understanding of the spatial patterns of ethnic grouping in B&H, thus reducing the possibility of misinterpretation of census results and

consequently their misuse for political purposes. This research examines changes in spatial homogenization and dispersion of the population in B&H according to ethnicity after Yugoslavia's breakup. Considering ethnicity as a key driver of demographic variations and geographical ethnic concentration provides deeper insights into demographic and socioeconomic processes. Migration usually contributes to increasing ethnic diversity, particularly in contexts of mixed ethnic and racial migration (Coleman, 2009). Yet, contrary to the highly developed countries, the post-socialist societies have been experiencing reduced ethnic diversity as both majority and minority communities face population decline due to low fertility, high mortality, and emigration (Josipovič, 2024). Finally, large-scaled displacements due to the forced character of migration along with war-induced mortality are additional factors to be accounted for in the case of B&H (Lukić, Nikitović, 2004).

Data issues and methods

The comparison of the results of the 1991 and 2013 Censuses at lower territorial levels than the state level presents a significant challenge. This is due to the substantial alterations in the administrative-territorial organization of the network of settlements and municipalities that transpired after the war, primarily attributed to ethnic demarcation. In B&H, the Dayton Peace Agreement established an entity demarcation line that delineated over 300 settlements, which constituted 5% of the total settlements within the country. Furthermore, out of the 109 municipalities as per the administrative division in 1991, only 47 retained their boundaries as per the 2013 Census. Notably, the 2013 Census witnessed an increase of 30% in the number of municipalities – from 109 to 142 (Lukić-Tanović, Marinković, 2024).

In this analysis, comparisons were conducted between 1991 and 2013 based on the territorial division at the time of the 2013 Census, as reported by the official calculations of the Agency for Statistics of Bosnia and Herzegovina.

We used spatial autocorrelation indicators – global and local Moran's I indices – to measure and test how local administrative units (municipalities) cluster or disperse in space with respect to the percentage distribution of the three major ethnic groups (Bosniaks, Serbs, and Croats) in the 1991 and 2013 Censuses of population.

Global Moran's I statistic is a cross-product statistic between a variable and its spatial lag, with the variable expressed in deviations from its mean. The global spatial autocorrelation indices, such as Moran I, are designed to reject the null hypothesis of spatial randomness in favor of an alternative of clustering. Such clustering is a characteristic of the complete spatial pattern and does not provide an indication of the location of the clusters. The Local Moran statistic is a way to identify local clusters and local spatial outliers. It provides a statistic for each location with an assessment of significance and establishes a proportional relationship between the sum of the local statistics and a corresponding global statistic. It allows for a classification of the significant locations as High-High and Low-Low spatial clusters, and High-Low and Low-High spatial outliers. The reference to high and low is relative to the mean of the variable, thus it is not interpreted in an absolute sense. We also used bivariate spatial autocorrelation, which measures the variable at two points in time. The statistic then pertains to the extent to which the value observed at a location at a given time is correlated with its value at neighboring locations at a different point in time (Anselin, 2024).

All these statistics were calculated in GeoDa, a free and open-source software tool developed by Luc Anselin and his team from the University of Chicago.

Preliminary results

According to the global Moran I index, all three major ethnic groups in B&H show significant spatial homogenization at the state level in both time points, with Croats having the highest and Bosniaks the lowest levels. This index was 0.566 for Croats and 0.421 for Bosniaks in 1991. Contrary to popular belief, global spatial homogenization declined among all three ethnicities between 1991 and 2013, with the largest decline among Bosniaks (9.3%) and the smallest among Serbs (2.6%). Thus, the global Moran index dropped to 0.382 for Bosniaks, 0.433 for Serbs, and 0.533 for Croats in 2013.

The bivariate Moran I index shows the extent to which the percentage share of a particular ethnic group in a municipality in 2013 correlates with the percentage share of that group in neighboring municipalities in 1991. The values of this index are also very high for all three ethnic groups at the country level.

The global Moran l spatial autocorrelation indices reject the null hypothesis of the random spatial distribution of the three largest ethnic groups in B&H, pointing to the grouping of each of them as a spatial pattern at the state level. In order to identify the location of statistically significant clusters, as well as outliers, we used univariate and bivariant local Moran statistics, which also allow visualization on thematic maps.

A comparison of the thematic maps of local Moran statistics for the population of Bosniaks shows that the most obvious change between the two censuses is the disappearance of the cluster of high concentration of Bosniaks in eastern Herzegovina, near the border with Serbia, while the cluster of the same type in northeastern Bosnia has doubled in the number of municipalities it includes (Figure 1).

Similar to the Bosniaks, a comparison of the thematic maps of the local Moran statistics for the population of Croats in two time cross-sections shows that one larger High-High cluster has disappeared, while both Low-Low clusters have remained in a slightly changed form, primarily when it comes to the smaller cluster in northwestern Bosnia.

The key difference between 1991 and 2013 for this indicator of the Serb population is that in 2013 a new High-High cluster emerged in eastern Herzegovina along the border with Serbia, primarily due to a marked decrease in the number of Bosniaks in the area around Srebrenica and Rogatica. At the same time, the cluster of the same type in northwestern Bosnia has been reduced in its western part around the municipalities of Sanski Most and Bosanski Petrovac, as the number and proportion of Serbs in the area decreased significantly between the two censuses (Figure 2).

Finally, the analysis included three thematic maps of bivariate local Moran l statistics – each for one ethnic group, showing the degree to which the percentage share of a particular ethnic group in a municipality in 2013 correlates with the percentage share of that group in neighboring municipalities in 1991. These maps confirm that the biggest changes have taken place among Bosniaks, and then among Serbs – in the former the Low-High spatial outliers (five municipalities) in eastern Herzegovina are conspicuous, and in the latter in western Bosnia (two municipalities). These findings suggest that pronounced changes have taken place in areas affected by forced migration and mortality due to ethnic cleansing.

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Appendix

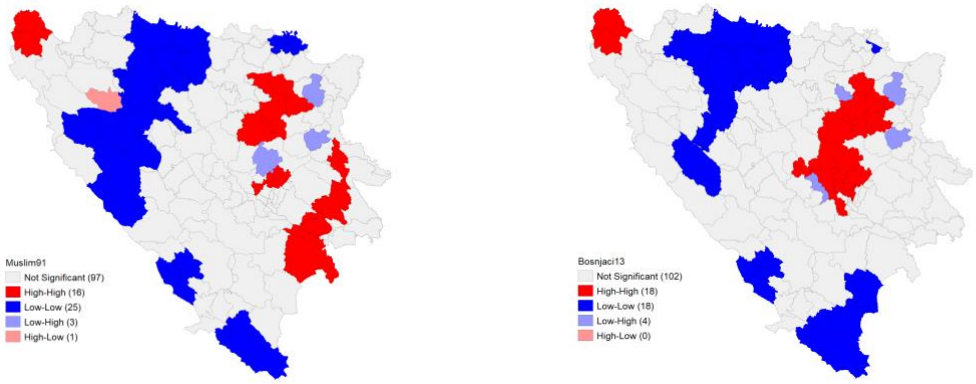

Figure 1 Univariate Local Moran's I: cluster maps for Bosniaks in 1991 (left) and 2013 (right)

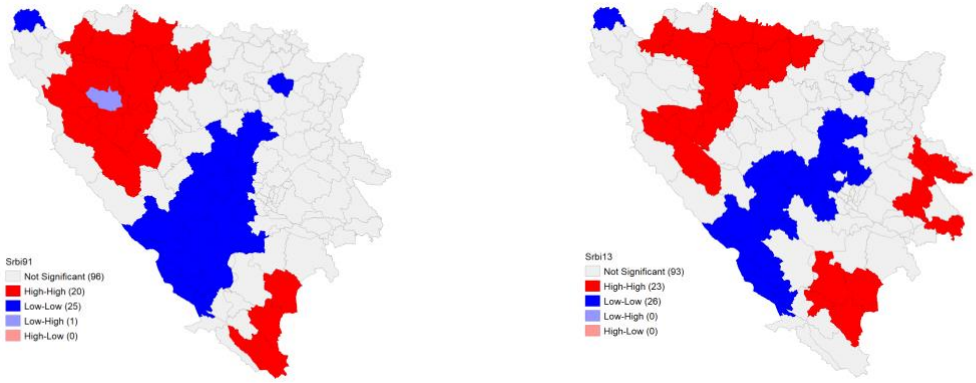

Figure 2 Univariate Local Moran's I: cluster maps for Serbs in 1991 (left) and 2013 (right)