

## **The dynamics of Europe's economic and demographic centres along trajectories spanning 70 years. Using centrographic measures and dimensions of the potential model (EU-CEN-TRA; EUropean-CENtre-TRAjectory)**

As any change to the boundaries of a study area must affect the location of its midpoint, so Brexit turned Gadheim, a small Bavarian village, into the new midpoint of the European Union in 2020. Along with the area's margins, the exact location of such a midpoint depends on a number of other factors, including the research methodology, the weighting of the "masses" involved and the measure of distance decay adopted. The one topic that seems insufficiently addressed in the published research and therefore demanding more attention, particularly in the long historical perspective, involves trajectories of the economic and demographic midpoints at the scale of both the entire European continent and of the European Union. For the first four decades after the end of the Second World War, Europe developed along two separate parallel tracks. This ended in 1989 with the lifting of the Iron Curtain followed by changes to national borders, several rounds of EU (earlier EEC) expansions, their associated migratory streams both internal and external, the 2008 financial crisis that struck the southern EU members particularly hard, and finally the outbreak of the COVID-19 pandemic in 2020. All of these events resulted in various demographic trajectories and income convergence paths in Europe. Related to this are changes to Europe's economic and demographic centres of gravity calling for measurements to be executed with the use of centrographic and spatial decay measures, and centroid weighting (including using the potential model).

The generally defined midpoint of Europe, as conventionally understood (i.e. scaling by distance, no weighting) (Geographical Midpoint of Europe; the centroid of Europe) based on research led by Jean-George Affholder of the National Geographic Institute of France in 1989 and using a method based on the centre of gravity of the geometrical figure of Europe, was identified to be located in the Lithuanian town of Purnuškės/Girija to the north of Vilnius. Numerous other attempts have been made, both previously and subsequently, to identify the centre of Europe within the territories of various specific countries, often for the purpose of strengthening the case for their European aspirations. These have occurred particularly frequently in central and eastern Europe, as defined politically, such as in Poland (including the oldest official determination of the European midpoint carried out in 1775, which used a calculation of the equal distance from the extreme points of Europe and placed it in the town of Suchowola), Czechia, Slovakia, Hungary and other countries, such as the recent example of Belarus in 2000 (Połock) and Estonia. Some of these attempts employed different methods (not included in this analysis), e.g. without the use of the centroid.

The main objective of the project "The dynamics of Europe's economic and demographic centres along trajectories spanning 70 years. Using centrographic measures and dimensions of the potential model (EU-CEN-TRA; EUropean-CENtre-TRAjectory)" is to determine the trajectory, or path, followed by the economic and demographic centres of Europe and of the European Union, using three independent research methods, including various dimensions of the potential model (spatial extent, decay (distance or time), travel duration and barriers or restrictions on borders), spanning the period from 1950 to 2020 for centres in Europe and, for the centre of the EU, landmark years for the EU (EEC) membership count.

The significance of the project. The key is the multidimensional approach to the identification of the centre of gravity (a value added can be for cartography and geodesy). There is a benefit for the transport, historical and political geography, especially in three aspects: a) network approach (historical approach to the development of the transport infrastructure); b) border waiting times (a model perspective on change in the historical dimension); and c) in the change of potential accessibility. Human geography is the discipline that stands to gain the most from the model's results. The context of the application, due to the GDP centroid and population weighting, the results are likely to benefit economists dealing with income convergence processes and to demographers interested in changes in population distribution. Therefore, the interdisciplinary nature will make the project significant to geographers, economists, demographers, cartographers, historians and geodesists.