Passenger Flows Between Romania and the Republic of Moldova as a Determining Factor in Cross-Border Cooperation: A Statistical and Econometric Approach

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Extended Abstract

In the current European context, dominated by uncertainty, instability, military conflicts, economic crises, and climate-related challenges, achieving the established objectives regarding the resilience and sustainability of the EU is proving increasingly difficult. Even more so at the level of non-EU countries, which are more vulnerable to external risks and pressures. The Republic of Moldova is an Eastern European country that falls into this category of states, whose vulnerability is intended to be minimized through the initiation of accession negotiations with the European Union, as well as with the help and support of neighboring states, both financially, logistically, and humanitarianly, among other aspects. Among the main countries that have come to the aid of the Republic of Moldova is Romania, by virtue of the close and long-standing relations between the two neighboring countries, from a historical, linguistic, and cultural perspective.

Trying to narrow the scope of the presented information, through this article, we aim to analyze the phenomenon of cross-border cooperation as it is present and manifested in the relationship between the two aforementioned states, using a highly relevant indicator for their economic, social, and cultural interaction, namely the air passenger flows recorded between the two countries over the past decades.

Thus, in this scientific paper, secondary data are presented, collected, systematized, processed, and interpreted, originating from official statistical databases at the national level in Romania (TEMPO ONLINE, National Institute of Statistics), the Republic of Moldova (National Bureau of Statistics of the Republic of Moldova), the European level (Eurostat), as well as the non-EU level (World Bank), concerning the annual number of flights and passengers between the two destinations. Through this analysis, it can be determined with certainty whether fluctuations in these figures related to population mobility can influence the phenomenon of cooperation. However, contrary to expectations, the causes of the current level of flights and passengers may also indicate relevant aspects, contributing to a better understanding of the dynamics

of cross-border cooperation and to the subsequent development of policies aimed at facilitating mobility and regional development.

The developed topic in this paper is not frequently explored in the specialized literature, as the study presents various aspects of cross-border mobility, particularly from the perspective of statistical and econometric models. A brief review of the specialized literature reveals that such analyses have been previously approached by other researchers, such as Anderson and Van Wincoop (2003), who highlighted the importance of the gravity model in analyzing international trade. The applicability of this research methodology was later tested for the phenomenon of cross-border mobility by Head and Mayer (2014), a decade later. Additionally, concerning passenger flows, scientific interest in the topic dates back to 1998, when Rietveld and Bruinsma (1998) analyzed the impact of transport infrastructure on cross-border flows.

In the specific case of Romania and the Republic of Moldova, existing research is limited, but some studies published over the years have emphasized the influence of visa procedures on passenger flows (Horváth, 2007) or the economic effects in the Republic of Moldova due to labor migration and the movement of young students toward Romania (Ciutacu et al., 2017). However, a detailed statistical analysis of passenger flows, viewed as a factor in cross-border cooperation, remains insufficiently explored, justifying the necessity of this study.

A key bibliographic resource for this research is the scientific article by Anghelache et al. (2019), which rigorously presents the methodology for applying the gravity model to international trade flows. The authors explain that the model originates from Newton's law of universal gravitation proposed in the 1600s, drawing a parallel between the possible direct proportionality of the analyzed variables and the gravitational force between two bodies—a factor directly proportional to the product of their masses and inversely proportional to the square of the distance between them. Thus, by applying this analogy and the principles of gravitational physics, numerous empirical studies have demonstrated that the volume of trade flows between countries underpins the level of bilateral trade between them and can significantly impact economic activity and income levels.

In order to achieve the proposed final goal, the authors have established the following main objectives as key points in the research process:

- Identifying the determinants of cross-border mobility using the gravity model and other statistical techniques.
- Assessing the impact of passenger flows on economic, social, and cultural cooperation between Romania and the Republic of Moldova.
- Conducting a comparative analysis of different types of mobility (regular flights, charter flights, tourism-related travel or for business purposes) and their influence on bilateral relations.

- Proposing recommendations to optimize cross-border mobility and stimulate cooperation between the two states.

Recent studies on migration, cross-border mobility, and the economic impact of passenger flows highlight the importance of advanced analytical models for quantifying and interpreting these phenomena. The simultaneous application of the gravity model, statistical methods, and econometric techniques in the research process introduces an innovative research methodology, providing relevant insights into the analyzed field. This approach is characterized by a well-documented and structured perspective, accounting for all factors influencing mobility between the two states.

To achieve the research objectives, this study involved a combination of quantitative, parametric, and non-parametric methods, with an emphasis on the gravity model, which is frequently used in analyzing trade and passenger flows between regions. This model allows for the estimation of cross-border flow volumes based on factors such as economic development levels and the distance between regions.

Additionally, to ensure rigorous validation of results, multiple methods and techniques were used, including: Multifactorial linear regression, to determine the existence and direction of a causal relationship between socio-economic factors and passenger flows, Pearson's linear correlation coefficient or non-parametric methods, such as Yule's coefficient (for binary variables), Kendall's and Spearman's rank correlation coefficients, and time series analysis to examine the evolution of the phenomenon and forecast future trends using both mechanical and analytical prediction methods, but also Clustering analysis, a method used to identify common characteristics among analyzed objects. This technique was similarly employed by Piermartini and Rousová (2008), who examined the impact of air service liberalization on the aviation industry by integrating the gravity model and clustering, as also proposed in the present analysis.

Following the proposed and described analysis above, the authors anticipate identifying how the evolution of passenger flows influences changes in the phenomenon of cross-border cooperation between Romania and the Republic of Moldova. Among the main expected results of this research are:

- Identifying the factors influencing mobility between the two analyzed states.
- Determining the effects of passenger flow levels on cooperation between Romania and the Republic of Moldova.
- Proposing data-driven policy recommendations to enhance cross-border cooperation, including infrastructure development, labor mobility facilitation, and strengthening tourism, cultural, and academic relations.

The analysis of passenger flows between Romania and the Republic of Moldova provides an innovative perspective on how cross-border mobility can contribute to strengthening relations between two

states. This is particularly relevant in today's context, where data analysis skills rank among the top five most in-demand competencies for young professionals entering the labor market. The study proposes a rigorous methodological approach based on the gravity model and other statistical techniques, offering a valuable reference framework for developing effective public policy measures to stimulate cross-border cooperation, especially in a the dynamic geopolitical environment, in which understanding mobility flows becomes crucial for promoting sustainable and mutually beneficial cooperation between all involved states.