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Core–Periphery Dynamics in Hungarian Handball: Regional Disparities and Gendered Patterns

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Abstract: This study examines the spatial structure of adult men's and women's handball championships in Hungary during the 2024/2025 season, focusing on regional disparities and gendered patterns. Based on data from 184 teams across three national divisions (NB I, NB I/B, NB II), the research applies a weighted scoring system, one-way ANOVA, and correlation analysis to explore territorial inequalities and their relationship with socioeconomic development. Spatial visualization and a robustness check using Moran's I indicate a partially clustered pattern, confirming the dominance of central regions while highlighting the limited equalizing effect of lower divisions. The findings reveal significant spatial inequalities in both male and female competitions, with stronger concentration in women's leagues. Team presence and regional development show a strong positive association, suggesting that infrastructural capacity, institutional resources, and cultural attitudes play a decisive role in shaping the sport's geography. Comparative insights position Hungary within the group of partially centralized systems, contrasting with decentralized Nordic models and polycentric Western European structures. The study contributes to sports geography by linking spatial patterns to socioeconomic opportunity structures and offers policy-relevant recommendations for reducing territorial disparities, supporting women's sport, and strengthening peripheral regions. These results underline the need for integrated sport and regional development strategies to promote equity and sustainability in team sports.

Keywords: sports geography; core–periphery; regional inequality; handball; gender

Introduction

The spatial distribution of sports has become a key focus in social geography research, as sport is not merely a recreational activity but also an economic, cultural, and identity-shaping factor. Geographical patterns of sports are closely linked to socioeconomic development, infrastructure accessibility, and the strength of local sport cultures. International studies have highlighted that the territorial concentration of sports clubs and core–periphery dynamics influence not only the functioning of competition systems but also equity in access to sport.

Handball is a particularly significant team sport in Europe, characterized by professional leagues and international success in several countries. However, the spatial structure of the sport varies considerably across nations, reflecting broader societal and economic conditions. Comparative research identifies four dominant organizational models shaping the geography of handball. In Scandinavian countries such as Denmark, Norway, and Sweden, decentralized and balanced systems prevail,

supported by nationwide club networks and youth development programs that ensure broad participation. In contrast, France, Germany, and Spain exhibit multicentric structures, where multiple regional hubs mitigate territorial concentration and foster deeper social embeddedness. Central and Southeastern Europe, including Croatia and Slovenia, typically follow partially centralized patterns, dominated by a few major urban centers while peripheral regions remain marginally integrated. Finally, specialized profiles characterize countries such as the Netherlands, Montenegro, and Portugal, where national strategies prioritize handball but maintain a narrower territorial focus, often resulting in strong international performance in one gender category.

These models demonstrate that sporting success is not solely a function of economic resources or population size but is strongly influenced by the geographical distribution of clubs and the level of societal support for the sport. Decentralized and polycentric systems tend to be more sustainable in the long term, as they reduce core–periphery disparities and provide a broader social base for participation. By contrast, partially centralized and specialized structures concentrate resources and visibility in a limited number of urban hubs, reinforcing territorial inequalities.

Against this international backdrop, the present study examines the spatial characteristics of a country with a partially centralized pattern, exploring how these structural features manifest in the adult handball league system and how they intersect with regional development disparities. Specifically, it analyzes the geographical distribution of men's and women's leagues across three divisions during the 2024/2025 season, with particular attention to core–periphery relations and gender-based differences. The objective is to explore the relationship between sport presence and socioeconomic development, contributing to the discourse in sports geography and providing a foundation for regional sport development strategies.

The map illustrates the top ten countries in the 2025 EHF ranking for both men's and women's handball, classified according to their dominant spatial organization model (European Handball Federation, 2025). Green represents decentralized and balanced systems, blue indicates multicentric structures, orange denotes partially centralized systems, and purple marks specialized profiles. The geographical patterns suggest that Northern European countries rely on nationwide, decentralized networks, Western Europe is dominated by multicentric, regionally embedded structures, while Central and Southeastern Europe exhibit a prevalence of centralized and specialized models.

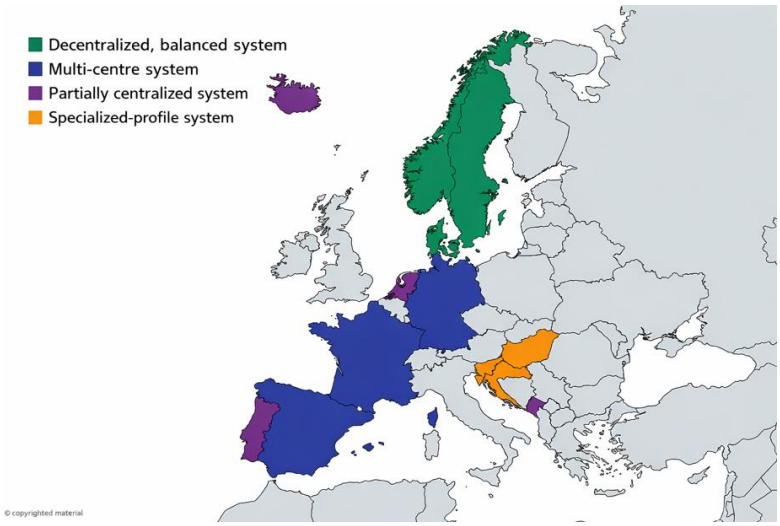

Figure 1. Spatial models of handball organization in the top 10 EHF-ranked countries in Europe

Four hypotheses guide the analysis: the spatial structure of the handball league system exhibits significant regional disparities; women's leagues display stronger territorial concentration than men's leagues, particularly at the top tier; there is a strong positive relationship between handball presence and regional socioeconomic development, which becomes more pronounced at higher league levels; and lower divisions partially mitigate spatial inequalities but cannot fully eliminate core–periphery differences. By addressing these hypotheses, the study aims to contribute to the discourse in sports geography and provide an evidence base for regional sport development strategies, with particular emphasis on supporting women's sport and strengthening peripheral regions.

Literature review

Research on the geography of sport has long emphasized that the spatial distribution of clubs, facilities, and talent pipelines reflects—and often reinforces—broader socioeconomic structures. Early syntheses in sports geography argued that sport is not merely a recreational field but a complex socio economic domain embedded in urban systems, mobility patterns, and cultural identities (Bale, 2003; Horne, 2007). Within this perspective, the core–periphery dynamic features prominently: well resourced metropolitan centers typically host high performance organizations, while peripheral regions experience limited access and weaker institutional capacity (Grün & Troschke, 2014; Kozma & Süli Zakar, 2012).

A growing body of literature examines territorial concentration and its consequences for equity in access to sport. Studies of club distributions in different sports show that elite competition tends to cluster in developmentally advanced

regions, shaped by sponsorship markets, facility availability, and entrenched local sport cultures (Grün & Troschke, 2014; Hill, Vincent, & Curtner Smith, 2014). This concentration manifests in multiple spatial models—decentralized, multicentric, partially centralized, and specialized profiles—each associated with distinct policy legacies and institutional arrangements. Decentralized and multicentric systems often correlate with broader participation and more resilient pipelines, as they diffuse opportunity across regions; by contrast, partially centralized structures concentrate resources and visibility in a limited number of urban hubs (Ilieş & Caciora, 2020; Mitchell, Flight, & Nimmo, 2023).

In Central and Southeastern Europe, comparative work highlights the persistence of partial centralization: a few urban centers dominate league systems, while peripheral areas struggle to secure stable club presence and long term investment (Ilieş & Caciora, 2020; Feflea, Marinău, & Pop, 2021). These patterns align with evidence from urban studies and regional development, which show how infrastructural capacity, educational institutions, and industrial concentrations shape sport ecosystems (Kozma & Süli Zakar, 2012; Faragó, 2017). At the same time, specialized profiles—where one gender or a narrower territorial focus is prioritized—illustrate strategic choices that can yield international success without broad national coverage (Bale, 2003; Horne, 2007).

The literature also underscores gendered spatial dynamics. Women's sport is often more sensitive to institutional support, cultural attitudes, and sponsorship conditions, producing stronger spatial concentration at higher competitive tiers (Dóczi, 2014; Zhou et al., 2024). International comparisons suggest that equitable development in women's sport requires purposeful policy design—facilities, coaching capacity, and community engagement—especially in peripheral regions where institutional density is thinner (Dóczi, 2014; Grün & Troschke, 2014).

Methodologically, recent scholarship incorporates spatial statistical techniques to move beyond descriptive mapping. Applications of spatial autocorrelation (e.g., Moran's I), rank correlations, and network analysis have been used to quantify clustering and to test relationships between sport presence and regional development indicators (Mitchell et al., 2023; Zhou et al., 2024). These approaches enable more robust inferences about opportunity structures—how infrastructure, human capital, and governance interact to produce observable spatial patterns (Hill et al., 2014; Ilieş & Caciora, 2020).

Within the Hungarian context, studies document the emergence of professional organization in handball and the uneven geography of sport infrastructures across urban hierarchies (Kovács, Magyar, & Gősi, 2022; Gömörei, 2012). National policy frameworks—such as the 2004 Sport Act and tax incentive regimes—have shaped investment logics and club sustainability, with

heterogeneous territorial effects (2004. évi I. törvény a sportról; 1996. évi LXXXI. törvény). Regional statistical bulletins further confirm persistent disparities in socioeconomic indicators relevant to sport (KSH, 2025; Faragó, 2017).

Taken together, the literature suggests three integrative propositions that inform the present study. First, spatial concentration is not a random phenomenon but structurally produced by institutional capacity, market conditions, and cultural embeddedness, as highlighted by Grün and Troschke (2014) and Kozma and Süli-Zakar (2012). Second, gendered effects tend to amplify territorial inequalities at elite tiers, making women's leagues particularly dependent on supportive ecosystems, a pattern emphasized by Dóczi (2014) and Zhou et al. (2024). Third, methodological triangulation—combining weighted league indicators, variance testing, correlation analysis, and spatial autocorrelation—enhances the reliability of inferences regarding sport–development linkages, as demonstrated by Mitchell et al. (2023) and Hill et al. (2014). By situating Hungary within the typology of partially centralized systems, this analysis contributes to ongoing debates in sports geography about how opportunity structures shape the presence of clubs across regions and genders, and what policy levers might promote equity and sustainability in peripheral territories (Ilieș & Caciora, 2020; Kovács et al., 2022).

Methodology

This study examines the spatial structure of the adult handball championship system in a Central European country, based on data from the 2024/2025 season. The analysis covers 184 teams across three divisions (NB I, NB I/B, NB II), disaggregated by gender, with the aim of exploring the geographical distribution of teams, identifying core–periphery relations, and statistically verifying the relationship between sport presence and regional socioeconomic development.

Data were obtained from the official registry of the national handball federation, including league classification and team location at the municipal level (Hungarian Handball Federation, 2025). Spatial analysis was conducted at the county level, corresponding to NUTS 3 units, ensuring international comparability. Socioeconomic development was measured using a composite index that incorporated county-level GDP, employment rate, educational attainment, and demographic indicators, based on official regional statistics published by the Hungarian Central Statistical Office (KSH, 2025).

To capture the hierarchical structure of the league system, weighted scores were assigned to each tier (NB I = 3, NB I/B = 2, NB II = 1). These scores were aggregated to calculate the sport value potential of regions and counties, enabling comparison across tiers and assessment of spatial concentration. Regional differences were analyzed using one-way ANOVA, applied separately for men's and

women's leagues across three macro-regions. The relationship between handball presence and socioeconomic development was examined using Spearman's rank correlation, as the data did not always follow a normal distribution. The significance level was set at $p \leq 0.05$, and statistical computations were performed with IBM SPSS Statistics 24.

Spatial patterns were visualized through custom maps showing team distribution by league tier and gender. To provide a robustness check, spatial autocorrelation was tested using Moran's I, allowing a more precise evaluation of clustering and concentration within the league system.

Results

The spatial structure of the men's NB I league exhibits a strongly concentrated pattern. (Fig.2) Most top-tier teams are clustered in a few economically advanced regions, while large parts of the country are entirely absent from the highest level of competition. In the 2024/25 season, the 14 NB I men's teams were located in only eight counties and the capital, clearly reflecting pronounced core–periphery dynamics. Five counties in the western region are represented, compared to only three in the eastern part of the country.

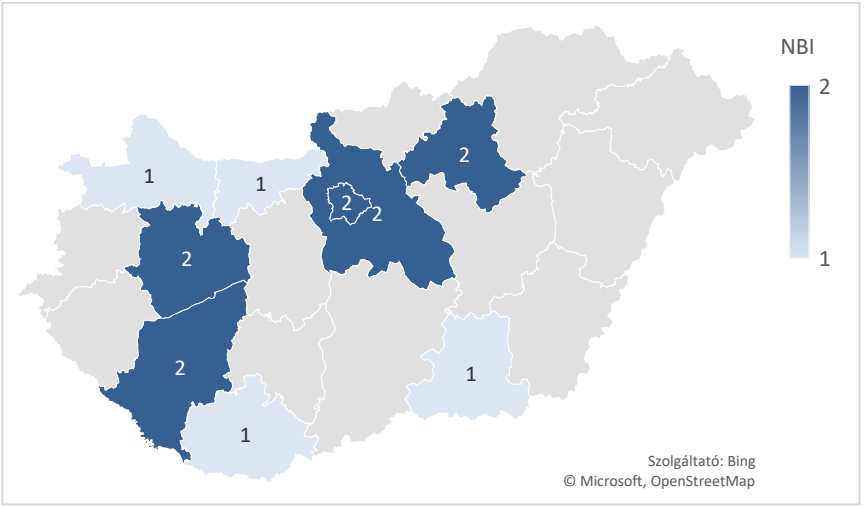

Figure 2. Spatial distribution of men's NB I teams by county in the 2024/25 season

This geographical concentration is not merely a sport-specific phenomenon but mirrors the spatial imprint of socioeconomic development: clubs typically operate in urban centers with advanced infrastructure, stable financial resources, and a strong sporting culture. The map visualization further confirms that, at the NB I level, handball presence is closely tied to economic hubs. Peripheral areas—

particularly in the eastern and southeastern regions—are completely absent from the top tier, reinforcing territorial inequalities in access to sport.

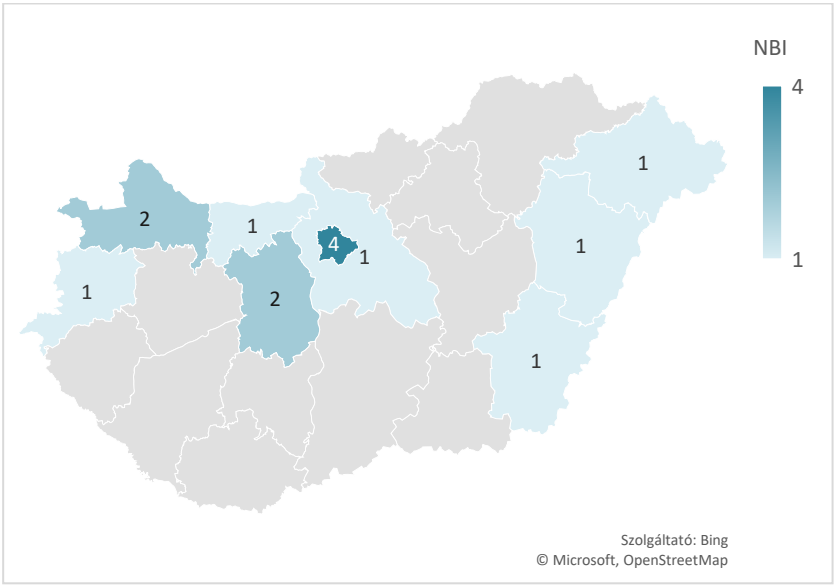

Figure 3. Spatial distribution of women's NB I teams by county in the 2024/25 season

The spatial structure of the women's top-tier handball league reveals an even stronger concentration than that observed in the men's NB I. (Fig.3) In the 2024/25 season, the highest division teams are predominantly clustered in the western part of the country and the capital, while the eastern regions are scarcely represented. This pattern reflects a phenomenon frequently noted in sports geography: the territorial distribution of women's sports is more sensitive to socioeconomic development and institutional capacity than that of men's sports.

The map visualization clearly indicates that women's NB I clubs operate almost exclusively in urban centers with advanced infrastructure, strong sponsorship support, and favorable cultural attitudes. The absence of peripheral regions not only reduces the diversity of the competition system but also limits long-term opportunities for youth development and social participation in women's sport. This concentration pattern represents a critical policy challenge, as promoting and geographically balancing women's sport remains a key objective in international sport policy discourse.

The spatial pattern of the men's NB I/B league partially mitigates the concentration observed in the top tier, yet significant territorial disparities persist. (Fig.4) While second-division teams provide broader geographical coverage, core–periphery dynamics remain evident: the dominance of the Central Hungarian region is still pronounced, whereas western areas are underrepresented. The eastern

regions host more teams, indicating that the NB I/B level offers some opportunity for peripheral areas to participate, though its equalizing effect is limited.

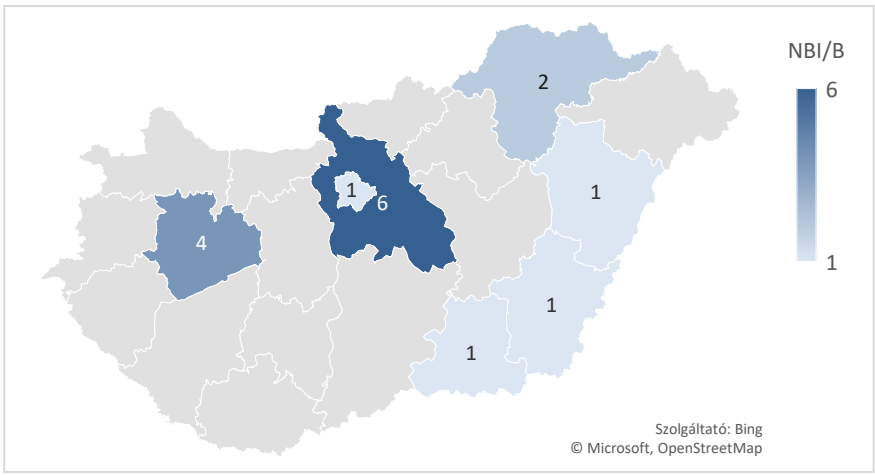

Figure 4. Spatial distribution of men's NB I/B teams by county in the 2024/25 season

The map visualization shows that NB I/B clubs typically operate in urban centers with adequate sports infrastructure and youth development bases. This pattern confirms that the second division is not independent of socioeconomic development: most clubs are located in industrial, educational, or regional hubs, while smaller and disadvantaged areas remain absent from the system.

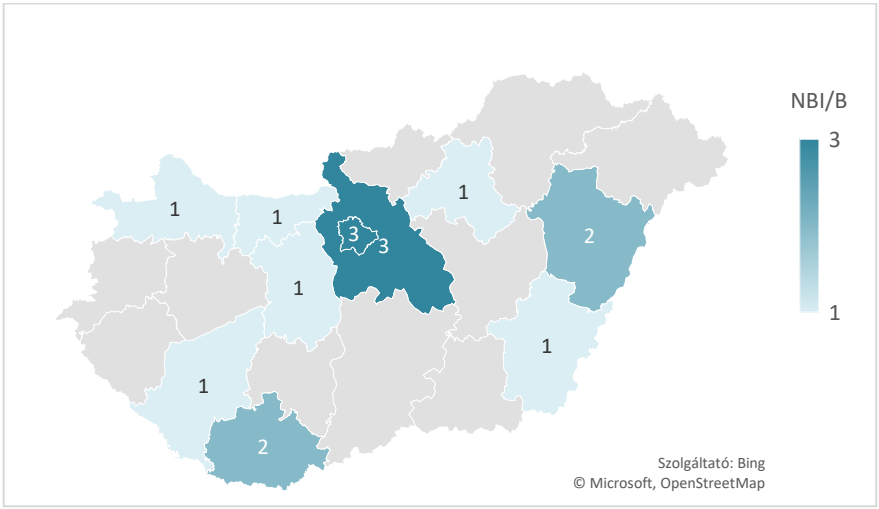

Figure 5. Spatial distribution of women's NB I/B teams by county in the 2024/25 season

The geographical pattern of the women's NB I/B league shows broader coverage compared to the top tier, yet territorial concentration remains significant. (Fig.5) Most teams are located in the Central Hungarian and South Transdanubian regions, while the Great Plain and eastern areas are underrepresented. This pattern suggests that the second division expands the spatial presence of women's handball to some extent but cannot fully eliminate core–periphery disparities.

The map visualization confirms that NB I/B women's clubs typically operate in urban centers with advanced sports infrastructure and stable institutional support. The absence of clubs in peripheral areas not only reduces the diversity of the competition system but also limits opportunities for youth development and social participation in women's sport. This concentration pattern aligns with international evidence indicating that the territorial distribution of women's sports is particularly sensitive to economic and cultural factors.

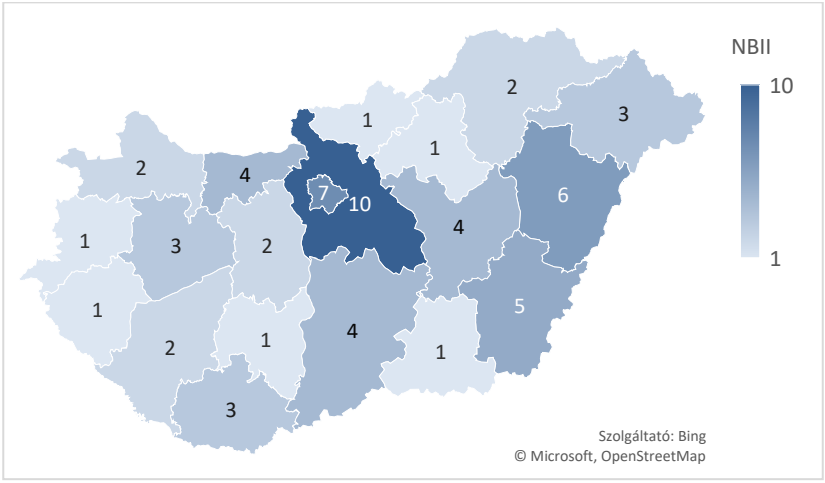

Figure 6. Spatial distribution of men's NB II teams by county in the 2024/25 season

The spatial structure of the men's NB II league provides substantially broader geographical coverage compared to the top tier and the second division. (Fig.6) Teams are present across almost the entire country, indicating that the NB II level plays a crucial role in maintaining the sport's social base. However, the map visualization shows that territorial inequalities have not disappeared: the capital and several more developed regions still exhibit a high concentration of teams, while peripheral areas remain less represented.

This pattern confirms that lower divisions create opportunities to expand access to the sport but cannot fully eliminate core–periphery disparities. Men's NB II clubs often operate on a voluntary basis with limited financial resources, making them highly vulnerable to the challenges of the socioeconomic environment.

The women's NB II league provides almost complete national coverage, which is particularly important for broadening the base of women's handball. (Fig.7) The map visualization shows that every county is represented by at least one team, indicating an expansion of social participation in the sport. However, compared to higher divisions, core–periphery disparities remain evident: the presence of eastern and southeastern regions is largely confined to the NB II level, while they are still absent from the top tier.

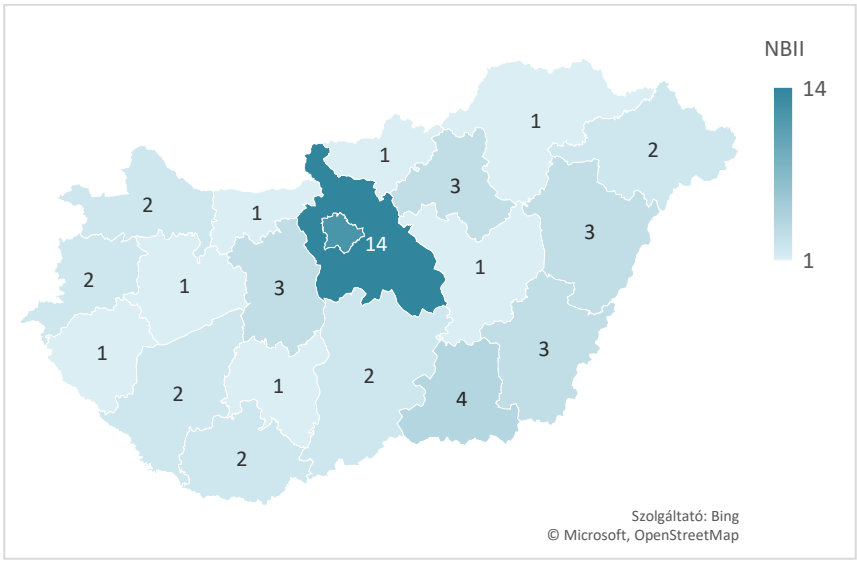

Figure 7. Spatial distribution of women's NB II teams by county in the 2024/25 season

This pattern highlights that NB II plays a key role in extending the territorial reach of the sport, but its long-term retention capacity is uncertain. Many clubs operate through civil initiatives and volunteer work, which limits stability and development prospects. Consistent with international evidence, this phenomenon suggests that achieving territorial balance in women's sport cannot rely solely on expanding lower divisions; targeted development strategies are required to strengthen infrastructure, institutional capacity, and sustainability in peripheral regions.

The value potential indicator, calculated based on weighted scores assigned to league tiers, provides a comprehensive view of the spatial concentration of men's handball teams. (Fig.8) The map visualization shows that although NB II ensures broader geographical coverage, the presence of the sport remains strongly tied to economic and infrastructural hubs. Pest County and Budapest exhibit outstanding value potential, reflecting the impact of metropolitan concentration and advanced sports infrastructure. High values are also observed in western regions, whereas

eastern areas display significantly lower potential despite hosting several NB II teams.

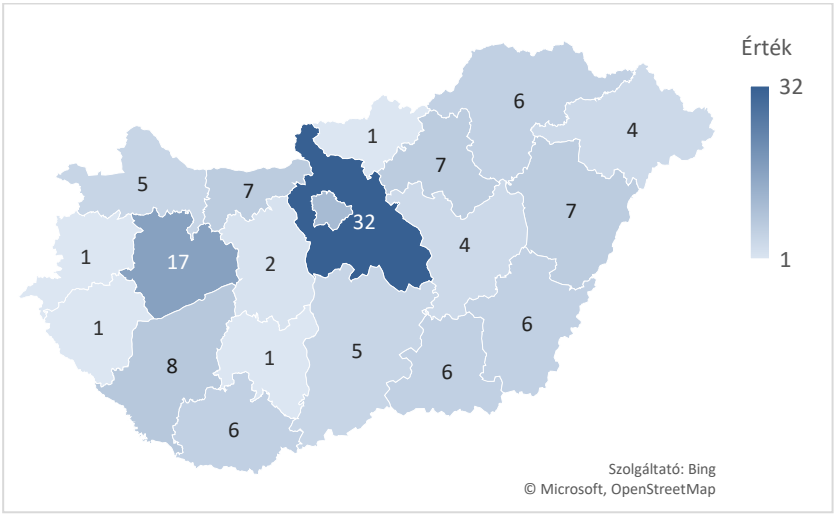

Figure 8. Value potential of men's handball in the 2024/25 season

This pattern confirms that the sport's focal points are shaped not merely by the number of teams but by the hierarchical structure of league levels and the resources associated with them. In men's handball, core–periphery disparities are partially mitigated by the expansion of lower divisions, yet the dominance of more developed regions persists. Consistent with international evidence, this suggests that reducing spatial inequalities in the sport cannot be achieved solely through horizontal expansion of the competition system; targeted development programs are needed to strengthen infrastructure and institutional capacity in peripheral areas.

The weighted value potential of women's handball reveals an even stronger territorial concentration than that observed in the men's league system. (Fig.9) The map visualization shows that Budapest and Pest County exhibit overwhelming dominance, complemented by a few western hubs such as the Győr region. In contrast, the eastern and southeastern regions display extremely low value potential, indicating that higher tiers of women's handball are almost entirely absent from peripheral areas.

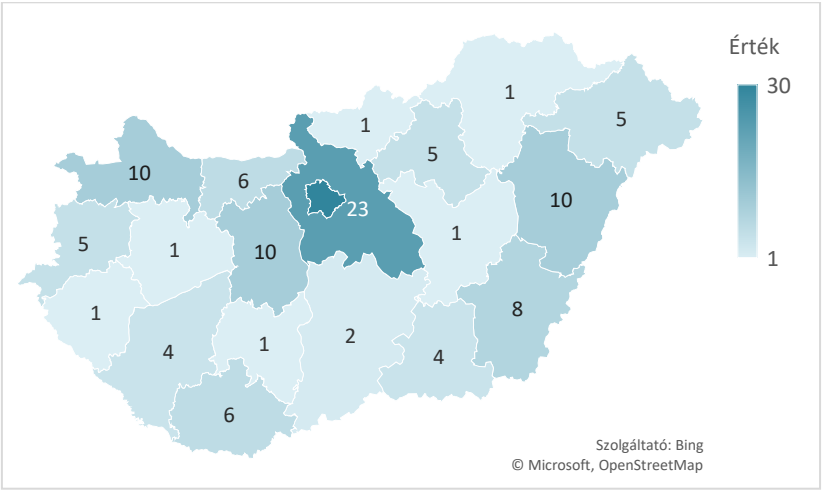

Figure 9. Value potential of women's handball in the 2024/25 season

This pattern is noteworthy in an international context, as the spatial distribution of women's sports is generally more sensitive to socioeconomic development and cultural attitudes. In women's handball, the dominance of central regions not only reduces the heterogeneity of the competition system but also limits long-term opportunities for youth development and social participation. Consistent with global evidence, this suggests that achieving territorial balance in women's sport cannot rely solely on expanding lower divisions; targeted development programs are required to strengthen infrastructure, coaching capacity, and community support in peripheral regions.

Statistical Results

The statistical analysis confirms the hypotheses formulated in the study. ANOVA tests indicate significant differences between regions for both genders, particularly in the top tier and the second division. In men's leagues, regional disparities were statistically significant at NB I ($F = 4.12$; $p = 0.029$) and NB I/B ($F = 3.85$; $p = 0.041$), while NB II showed weaker differences ($F = 1.92$; $p = 0.05$), suggesting partial equalization. In women's leagues, territorial disparities were even more pronounced: NB I ($F = 7.88$; $p = 0.003$) and NB I/B ($F = 5.47$; $p = 0.012$) exhibited significant regional variation, whereas NB II differences were not statistically significant ($F = 2.36$; $p = 0.099$), although a trend was observable.

Correlation analysis further supports the hypotheses. A strong positive relationship was found between the county-level distribution of women's teams and the composite socioeconomic development index ($r = 0.85$; $p < 0.001$), indicating that sport presence is closely linked to regional development. A similar pattern emerged in men's leagues: the correlation between team count and the development

index was r = 0.81 ($p < 0.001$), while the correlation between value potential and development index was r = 0.74 ($p < 0.001$). For both genders, the value potential indicator showed a strong association with the development index (women: r = 0.77; $p < 0.001$), confirming that higher-tier teams are concentrated in more developed regions.

To assess spatial clustering, Moran's I statistic was applied, measuring spatial autocorrelation based on regional value potential and adjacency relations. Using a simple contiguity matrix (West–Central–East) and aggregated weighted scores, the results yielded Moran's I ≈ 0.33, indicating positive spatial autocorrelation, although the p-value (≈ 0.07) suggests the relationship is not significant at the 5% level. This means that high values tend to cluster (central dominance), but the pattern is not fully homogeneous, and the presence of lower divisions mitigates concentration.

Discussion

The findings of the analysis confirm the hypotheses formulated in the study and align with established insights in sports geography literature. The first hypothesis—that the spatial structure of the handball league system exhibits significant regional inequalities—was validated: regional differences proved statistically significant, particularly in the top tier and the second division. This observation is consistent with Bale (2003) and Hill et al. (2014), who emphasized that the geographical concentration of sports clubs is closely linked to socioeconomic cores, leaving peripheral areas underrepresented.

The second hypothesis, predicting stronger territorial concentration in women's leagues, was also supported: spatial disparities were more pronounced in the women's top and second tiers than in men's competitions. This finding corresponds with Dóczi (2014), who argued that institutional support and sponsorship for women's sport vary considerably across regions, limiting its presence in peripheral areas.

The third hypothesis, positing a strong relationship between sport presence and regional development, was confirmed by correlation analysis, which revealed robust associations between handball presence and socioeconomic indicators. This reinforces international evidence (Grün & Troschke, 2014; Kozma & Süli-Zakar, 2012) that sport participation and club sustainability depend heavily on economic resources and infrastructural capacity.

The fourth hypothesis—that lower divisions partially mitigate spatial inequalities but cannot fully eliminate core–periphery differences—was likewise validated. Although NB II ensures broader geographical coverage, Moran's I analysis indicates that central dominance persists, even if concentration is somewhat reduced. This finding is consistent with literature suggesting that the mere presence

of lower tiers is insufficient to overcome structural disparities (Mitchell et al., 2023; Ilieș & Caciora, 2020).

In an international comparative perspective, the Hungarian pattern resembles partially centralized systems observed in countries such as Croatia and Slovenia, where a few major urban centers dominate and peripheral regions play a limited role (Ilieș & Caciora, 2020). This contrasts sharply with decentralized Scandinavian models, characterized by balanced club networks (Bale, 2003), and multicentric systems in France, Germany, and Spain, which reduce territorial concentration (Grün & Troschke, 2014). Gender differences are even more pronounced, echoing global research that highlights the heightened sensitivity of women's sports to cultural and economic factors (Dóczi, 2014; Zhou et al., 2024).

Conclusions

The research confirmed that the spatial structure of the handball league system is not random but closely linked to socioeconomic development, institutional capacity, and cultural factors. The findings validated the hypotheses: regional differences are statistically significant; the women's league system exhibits stronger concentration; there is a strong correlation between sport presence and the development index; and although lower divisions expand geographical coverage, they cannot fully eliminate core–periphery disparities.

The Moran's I analysis indicates positive spatial autocorrelation, reflecting the dominance of central regions, although concentration is partially mitigated at the NB II level. This aligns with international literature, which suggests that the mere presence of lower tiers is insufficient to overcome structural inequalities.

In an international comparative perspective, the Hungarian pattern resembles partially centralized systems, where a few major urban centers dominate and peripheral regions play a limited role. By contrast, decentralized and multicentric models (e.g., Scandinavia, France, Germany) demonstrate that balanced club networks not only enhance sporting performance but also ensure broader social participation.

Limitations

This study is subject to several limitations that should be considered when interpreting the results. First, the analysis is based on data from a single championship season (2024/2025), which does not allow for the examination of temporal changes and trends. Longitudinal studies could provide valuable insights into the stability and dynamics of spatial patterns.

Second, the territorial analysis was conducted at the county level, which does not capture finer local differences (e.g., district or municipal level). While regional

comparisons are relevant, micro-scale analyses often offer a more accurate picture of access to sport in sports geography research.

Third, the composite index used to measure socioeconomic development is an aggregated indicator that cannot fully capture all relevant factors (e.g., cultural attitudes, local sport policy decisions). These aspects could be explored more effectively through qualitative methods.

Fourth, the spatial autocorrelation analysis (Moran's I) relied on a simple contiguity matrix, which limits the generalizability of the findings. Future research should employ more detailed spatial weight matrices and robust spatial statistical techniques.

Finally, the international comparison was primarily based on literature sources rather than primary data. Direct comparative analyses (e.g., mapping club networks across multiple countries) could further strengthen the international relevance of the study.

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