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SEEKING ECONOMIC BALANCE: SPATIAL ANALYSIS OF THE INTERACTION BETWEEN SMART SPECIALISATION AND DIVERSIFICATION IN ROMANIAN MOUNTAIN AREAS

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ABSTRACT. Seeking Economic Balance: Spatial Analysis of the Interaction Between Smart Specialisation and Diversification in Romanian Mountain Areas. This research article delves into the intricate relationship between smart specialisation and economic diversification within the unique context of Romanian mountain regions. As regions characterized by their geographical isolation and distinctive socioeconomic challenges, mountain areas in Romania stand as vital territories where balanced economic development is crucial. In this study, we employ a comprehensive spatial analysis to explore how the European Union's concept of "smart specialisation" and the imperative for diversification intersect within these mountainous areas. The investigation combines both qualitative and quantitative methods, utilizing spatial data and GIS techniques. Findings reveal the intricate interplay between smart specialisation and diversification efforts, highlighting the necessity for adaptable policies that respond to the unique challenges and opportunities present in Romanian mountain areas. The study also offers recommendations for policymakers, emphasizing the importance of custom-tailored approaches that consider the geographic, social, and economic idiosyncrasies of these regions. Ultimately,

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this research article contributes to a deeper understanding of the complex relationship between regional development strategies and the specific needs of mountainous territories. By shedding light on the practical implications of smart specialisation and diversification in Romanian mountain areas, it offers valuable insights for policymakers, researchers, and practitioners working towards sustainable and balanced economic growth in similar regions worldwide.

Keywords: *smart specialisation, diversification, regional development, economic growth, mountain areas*

1. Introduction

Smart specialization and diversification are two crucial concepts that have a pivotal role in regional development and economic growth. Rather than acting as "antagonists" in the grander scheme of regional development, smart specialization and diversification have the ability to be applied in tandem and are able to successfully complement each other despite their apparent defining features.

In response to these challenges, the European Union has introduced smart specialization strategies as a means to stimulate economic growth in the most disadvantaged regions. Smart specialization strategies are designed to encourage regions to identify and invest in their distinctive competitive advantages. These strategies, officially called Research and Innovation Strategies for Smart Specialisation (RIS3) were introduced as a tool to achieve a paradigm shift in the structure of regional innovation policies as reported by Hassink and Gong (2019).

According to Balland et al. (2019, p.1252): "at the core of this development strategy is smart specialization, a vision of regional growth possibilities built around existing place-based capabilities", aspect sustained also by the work of McCann and Ortega-Argilés (2015), Foray, David & Hall (2009, 2011), Barca (2009). Leaving from the assumption that different regions around Europe are confronting themselves with the diversification dilemma, Balland et al. (2019) indicate that it is mandatory to develop innovating, intricate technologies that leverage their existing local capabilities. They also appealed to these insights to establish a policy framework for intelligent specialization, emphasizing the possible advantages and drawbacks for regions when they pursue competing diversification strategies. The concept of smart specialization originated from the notion that European Union regions possess distinct economic and institutional frameworks that influence their potential for future development, as suggested by Kroll (2015).

Primarily formulated by Foray in 2015, smart specialization comprises two distinct connotations: the conceptual and the policy strategy one (Hassink and Gong, 2019) and "represents an explicit, place-based and place-sensitive approach, emphasizing prioritization and selectively through non-neutral, vertical policies aiming at diversified specialization" (Hassink and Gong, 2019, pp. 2058-2059, Boschma, 2014).

Despite the fascinating soaring academic interest in the smart specialization concept which has many positive characteristics (Buyukyazici, 2023; Balland and Boschma, 2021; Balland et al., 2019; Asheim, 2019; Fellnhofer, 2018; Radosevic et al., 2017; Foray, 2015; Aprahamian and Correa, 2015; Boschma, 2014) there is also the reverse side that focuses on seeing things through a critical lens. In this respect, Hassink and Gong (2019, p. 2049) point out, among other things, that "smart specialization is a confusing concept, as what it really means is diversification", is not "a brand-new policy instrument", "structurally weak regions might be less likely to benefit from smart specialization" and "more rigorous measurements of smart specialization are still needed". Some authors, even if overall are sympathetic to most of the elements of smart specialization, indicate that the strategy was formulated within a remarkably brief time frame (Foray, 2015) and consequently, there has been limited time between its conceptualization and actual implementation (Hassink and Gong, 2019). Other findings show that there is an increasing conceptual ambiguity and lack of clarity within the framework of smart specialization because under its umbrella there are a lot of related terms such as: diversification, regional branching, relatedness, variety (Whittle and Kogler, 2020; Balland et al., 2019; Hassink and Gong, 2019; Boschma, 2017; Montresor and Quatraro, 2017; Asheim, Grillitsch and Trippl, 2017), in particular, the failure to distinguish between specialization and diversification has been posing difficulties. Therefore, important critical questions arise, fact highlighted by Hassink and Gong (2019), such as: what unique insights does the smart specialization concept provide when compared to these alternative concepts? What justifies the push for all regional economies to intensify their specialization when, in certain instances, diversification might be the superior strategy? That needs to be addressed in future research.

There has been a long debate whether an economy ought to be diversified or highly specialized (Hoover, 1948; Richardson, 1969; Quigley, 1998; Beaudry and Schiffauerova, 2009) as for instance localization economies have been found to be a force for specialization, not diversification, while for an economy to add new activities it needs to be able to draw easily from a shifting array of inputs, a diversified economy being able to do this better than specialized one (Kemeny and Storper, 2015). Jacobs (1969) wrote that our ancestors did not expand their own economies much by doing more of what they had been doing

already. They actually expanded their economies by adding (diversifying) new kinds of work, similarly to what we are currently and should be doing. Half a century later, Crespo et al. (2017) stated that, rural as well as urban areas cannot perform everything and anything at the same time, first they must aim to *specialize* and second they must be *smart* about it in order to focus and promote those economic spheres in which they can develop a unique knowledge base, hence strive towards a *smart specialization*.

However, some suggest that "smart" specialisation should be aimed at preserving some, if not all, existing specialisations in addition to gaining new ones. For instance, Nomaler and Verspagen (2023) declared that countries or even regions should diversify into activities that are related to their current set of activities, thus bringing the concept of diversification to the forefront of regional development research and pairing it with the novel smart diversification frame of reference. Both lines of thought are placed-based and place-oriented and, at the same time, smart specialization does not exclude diversification. It does not reinforce already locally strong activities nor does it engage in blind and baseless diversification into what is "cool" at that moment. In other words, rather than blindly replicating best practices found elsewhere, regions may smartly choose their new domains of specialisation based on their already existing strengths and diversify starting from that point (Crespo et al., 2017). In fact, diversification may be crucial in order to reduce future economic shocks and move economies towards a more sustainable growth, such as the case put forward by Callen et al. (2014) and Al-Roubaie (2018) when discussing oil-based economies.

Our research endeavour focuses on the complex relationship between smart specialization and economic diversification in Romanian mountain regions, which encompass roughly one third of the entire territory of the country and is overwhelmingly represented by the Carpathian range. Because of increased geographical isolation as well as an idiosyncratic social and economic climate, punctuated by moderately troubled urban areas and an expansive yet lagging rural hinterland, this analysis aims to show the duo's relationship with sustainable and balanced regional economic growth as well as their geographical representation and expression in above mentioned areas. The importance of our research approach resides from the fact that "each region should identify transformation priorities that reflect and amplify existing local structures and competences, and thus produce original and unique competitive advantages" (Foray, 2015, p. 2). Also, there is one idea that stands out above all others in this discussion, that is the concept of region, of geographic location, and the scientific literature on regional diversification and specialisation is in need of more geographic wisdom (Boschma, 2017). Thusly, we believe that this makes

our scientific endeavour, our focus on the mountain regions of Romania and the practical implications of smart specialisation and diversification in this heterogenous natural, social and economic system, more pivotal than ever.

2. Smart specialization and diversification: a short introduction and clarification

Smart specialization/specialisation (the scientific literature uses both forms for the same syntagm) was developed in 2008 by a group of experts as a policy instrument rapidly gained popularity on the policy audience, especially within Europe (Foray, David and Hall, 2011). The same authors indicate that the concept is not new at all and the novelty lies in the analytical depiction of the phenomenon, providing a handful of insights and directions for policymaking.

Morgan (2013) and Santoalha (2019) find that smart specialization comprises three distinct challenges: conceptual, operational and political; the first refers to the meaning of the concept; the other encompass translating it into a strategy and applying it to a specific territory.

Balland et al. (2019, p.1252) delved into the topic, scrutinizing it from all angles, and their reference study which gained worldwide acclaim with extensive citations highlighted that: "the goal of smart specialization is not to make the economic structure of regions more specialized (i.e., less diversified), but instead to leverage existing strengths, to identify hidden opportunities and to generate novel platforms upon which regions can build competitive advantage in high value-added activities".

Smart specialization represents arguably the most significant endeavour in the history of orchestrated, supranational innovation strategies aimed at enhancing economic growth through diversification. Therefore, smart specialization embodies a novel industrial policy seeking to foster the development of new pathways and economic diversification, surpassing the confines of a narrowly defined regional innovation strategy (Asheim, Grillitsch and Trippl, 2017).

In the smart specialization approach, the term "smart" pertains to the method of identifying domains of competitive advantage, known as "entrepreneurial discovery". However, the focus is not solely on the role of traditional entrepreneurs, leading to a policy that goes beyond individual entrepreneurial projects such as firm formation. As highlighted in discussions on smart specialization, the term "entrepreneurial" is broadly defined to encompass all actors, including individual entrepreneurs, organizations (such as firms and universities engaged in intrapreneurship, knowledge-based entrepreneurship, and spin-offs), and agencies

(such as technology transfer offices and public development agencies) that possess the capability to discover domains ensuring both existing and future competitiveness (Asheim, Grillitsch and Trippl, 2017).

McCann and Ortega-Argilés (2015, p.1292) have the opinion that: "the original smart specialization concept assumes that context matters for the potential technological evolution of innovation systems (knowledge ecology)", Weidenfeld (2018, p. 2) noting that: "the smart specialisation agenda tends to focus on science and high technology-related industries, it has neglected low-tech industries such as tourism".

It is obvious by now that one cannot talk about smart specialization without bringing the diversification concept to the front, even if the literature indicates that there is a lacking distinction between the two concepts (Hassink and Gong, 2019; Hassink and Lagendijk, 2001).

Weidenfeld (2018) refers to diversification as being an economic growth strategy, alongside with innovation, and means the expansion of a product or a sector into a new market instead of specializing in a single product.

The literature on regional diversification asserts that regions expand into new activities that are connected to their existing endeavours, leveraging and combining local capabilities in the process (Boschma, 2017; Rigby, 2015; Neffke, Henning and Boschma, 2011).

The concept that new technology emerges from pre-existing ideas has revived discussions regarding the advantages and disadvantages of regional diversity (Balland, Rigby and Boschma, 2015; Essletzbichler, 2015). Frenken, Van Oort, & Verburg (2007), propose that the crucial factor is not just the overall diversity of sectors across regions but rather the degree to which elements of that diversity are interconnected. Balland et al. (2019) observed that the relatedness has a positive impact on technological diversification within regions. While diversifying into intricate technologies poses challenges for numerous regions, it becomes more feasible when these technologies are closely related to the existing knowledge base of the region. Moreover, regions tend to experience more growth when they specialize in complex technologies that are linked to the existing technologies in that region.

Boschma (2017) mentions some critical aspects that led to ongoing debates concerning diversification with focus on: capabilities, related and unrelated diversification, geographical wisdom, identifying the agents that propel the process of regional diversification. In this respect, Tanner (2014) agrees that it is very important to know what capabilities matter most in regional diversification, Isaksen and Trippl (2014) stress about examining the factors that facilitate both the regional diversification of a more related and a

more unrelated type, Xiao, Boschma and Andersson (2016) reflect upon the uncertainty of what type of diversification prevails in certain regions as compared to other regions, Binz, Truffer and Coenen (2014) call out for a multi-scalar approach when assessing the importance of local and non-local capabilities.

Table 1. Smart Specialisation vs Diversification in scientific literature

Literature highlights	
Smart specialization means	Diversification means
o An influential policy strategy (Hassink and Gong, 2019); o "...the deployment and variation of innovative ideas in a specialised area, that generate knowledge about the future economic value of a possible direction of change" (Foray, 2015, p. 25); o It is grounded in existing structures and associated potential diversification opportunities, with a focus on strengthening local connections (a place-based approach), fostering the development of innovative ideas, and promoting entrepreneurial initiatives (McCann and Ortega-Argilés, 2013); o Diversified specialization (Asheim, Grillitsch and Trippl, 2017) or smart diversification (Balland et al., 2019; Piirainen, Tanner and Alkærsig, 2017; Boschma and Gianelle, 2014); o Diversified specialization involves focusing on areas of existing or potential competitive advantage, thereby distinguishing a region or nation from others (Asheim, Grillitsch and Trippl, 2017).	o An economic growth stratregy (Weidenfeld, 2018); o "…the expansion of a product or a sector into a new market rather than specialising in a single-product" (Weidenfeld, 2018, p. 4); o Developing new growth ways "... whereby new activities develop out of existing ones, but the scope and outcome are fundamentally affected by technological and cognitive constraints" (Boschma and Gianelle, 2014 p. 1); o "…process whereby new industries emerge from technologically related or unrelated industries in regions, where existing competences are recombined as new economic activities" (Weidenfeld, 2018, p. 9);

Even if smart specialization is described as a process of related diversification, Santoalha (2019), Asheim, Grillitsch and Trippl (2017) notice that smart specialization can lead to either related or unrelated diversification, contingent on the regional strategy employed. Additionally, Fagerberg & Shrolec (2016) express scepticism regarding a smart specialization strategy exclusively focused on pursuing a related diversification path. Nevertheless, consensus exists among several authors that smart specialization fundamentally involves diversification.

After diving deep into scientific literature about the two concepts the general conclusion is that smart specialisation is intricately linked and strongly associated to the idea of diversification and it is basically a strategy for economic diversification.

3. Data and Methods

To identify smart specialisation or diversification we used two indicators: the main company economic activity, represented by its main NACE code (Nomenclature of Economic Activities) and the number of employees. NACE is the European standard classification of productive economic activities. NACE presents the universe of economic activities partitioned in such a way that a NACE code can be associated with a statistical unit carrying them out (European Commission, 2023). Like most European countries, Romania uses a NACE code consisting of four digits, each representing a different level of specificity. Each digit progressively narrows down the classification of economic activities, from broad sections to specific classes. This hierarchical structure allows for standardized and detailed categorization of economic data depending on the study scope.

To identify the main economic activities and indicators for our study, we used company data published on the Ministry of Finance website. According to order no. 1420/2021 regarding the publication of public information on the server of the Ministry of Finance (Ministry of Finance, 2021), registration data about all companies can be found on the ministry website. Along with these data, the balance sheets from the last 6 years can be seen or downloaded. Each company has the balance sheets available on the web with the following information: Current Assets, Stocks, Claims, Prepayments, Debts, Advance Income, Provisions, Capital, Paid-Up Subscribed Capital, Heritage of Royalty, Net Turnover, Total Turnover, Total Expenditure, Profit, Loss, Average Number of Employees, Type of Activity.

There is no integrated freely accessible database with Romanian company data at the moment, so we had to use web scraping techniques to gather these data. Web scraping involves using computer software to extract information from websites, mimicking human browsing behaviour and enabling faster and more accurate data gathering compared to manual methods (Lawson, 2015). We used a Python script to access these freely available data, gather the relevant entries and organize it. For this study, we only used the balance sheet for year 2021 because we do not focus on the evolution of the economy at the moment but on its distribution over different sectors. Using automated web scraping we downloaded 138114 companies in the mountain area and we used these as the main data for our study. We got the Name, Address, NACE, City, County, Fiscal code, Turnover, Profit and Employee numbers for each of these companies in the study area and stored it in a SQL table for easy processing, filtering and querying.

According to Modral (2021) the key areas to consider when it comes to measuring growth are Turnover growth, Employee growth and Market share. We used two ways to analyse the significance of a business in the economic landscape, based on turnover and the number of employees. This data may be enough to draw some conclusions regarding economy diversity or specialization but we need each company's location to be able to identify diversified or concentrated zones.

However, the study area has some geographic specificity that makes location very important to the economic development. In the digital era, spatial information holds significant value and is considered crucial in various contexts. Among the different methods to obtain spatial data, interpreting addresses stands out as the simplest approach since addresses serve as the primary means for location description. The process of converting addresses into geographic coordinates is known as geocoding, which represents a fundamental operation in geographic information systems (GISs) (Longley et al., 2005). Geocoding plays a vital role in enabling the integration and analysis of spatial data.

For this study, we geocoded the locality from the address of each company to link the companies to their corresponding administrative divisions. Once all the companies are located, we can use this location data along with the NACE code and the metrics from the balance sheet to examine economic characteristics in the area. The whole process of gathering and processing the data can be seen in the figure 1.

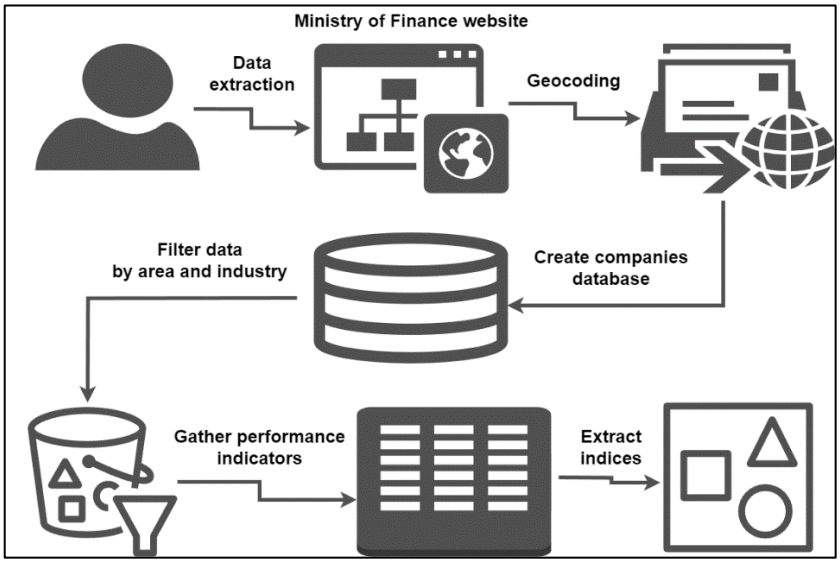

Fig. 1. Data workflow.
Source: the authors

The approach to identify specialization is the Herfindahl-Hirschman Index (HHI), which is a commonly accepted measure of market concentration. HHI is a mathematical concept which represents the sum of the squared ratio of market share of each firm competing in a market. The formula can be seen in the following figure (US Dept Justice, 2023):

$$\mathrm{HHI} = \sum_{i=1}^{n} (\mathrm{Si})^2$$

where:
$\mathrm{HHI} = \mathrm{Herfindahl} - \mathrm{Hirschman\ Index}$
$\mathrm{Si} = \mathrm{Market\ share\ of\ the\ i} - \mathrm{th\ industry\ in\ the\ economy}$

The HHI takes into account the relative size distribution of the firms in a market. It approaches zero when a market is occupied by a large number of different activities of relatively equal size and reaches its maximum of 10,000 points when a market is controlled by a single firm. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases (US Dept Justice, 2023). The U.S. Department of Justice considers a market with an HHI of less than 1,500 to be a competitive

marketplace, a HHI of 1,500 to 2,500 to be a moderately concentrated marketplace, and a HHI of 2,500 or greater to be a highly concentrated marketplace. We extrapolated the calculation of the HHI on whole economic branches (NACE codes) instead of firms. The formula applies to any metric that can define the market share. One of the main metrics that defines a company size is turnover and we decided to use this metric for calculation. Using turnover, the market share can be defined as (U.S.Department of Justice, 2023):

$$S_i = T_{ij}/T_i$$

where:
T_{ij} is Turnover for the jth NACE code of the economy within the territorial unit i
T_i is the total turnover within the territorial unit i

The turnover for each specialization was calculated by summing the turnovers of all companies having the same NACE code. The turnover for a territorial unit was calculated by summing all the turnovers of all companies in that territorial unit. The other metric that defines a company is the number of employees and we decided to use this metric for a parallel calculation. Using number of employees, the market share can be defined as (U.S. Department of Justice, 2023):

$$S_i = E_{ij}/E_i$$

where:
E_{ij} is the number of employees for the jth NACE code of the economy within the territorial unit i
E_i is the total number of employees within the territorial unit i

The number of employees for each specialization was calculated by summing the number of employees from all companies having the same NACE code. The turnover for a territorial unit was calculated by summing the number of employees from all companies in that territorial unit. The results of these calculations can be seen in the next section. A specialized economy refers to an economic structure predominantly focused on a single industry or a limited range of interconnected industries. Such economies often exhibit a high level of concentration and specialization within specific sectors. The specialization may be based on natural resource endowments, comparative advantages, or deliberate policy choices.

4. Results and Discussions

The markets of the vast majority of the administrative-territorial units located in the mountain areas of Romania, both rural and urban, appear to be moderately concentrated when it comes to the Herfindahl-Hirschman Index, especially in terms of turnover, and to a lesser extent, employees. It also becomes clear that there is a higher concentration, both in manpower and certain industries, in the western sectors of the Romanian Carpathians, as clusters of administrative-territorial units which share such a characteristic emerge in the Apuseni heartland and outlying regions as well as Haţeg Basin, Banat (mountain region part) and Poiana Ruscă Mountains. Such areas encompass former logging, mining and heavy industries, which have long concentrated the workforce in that area. Concentration also seems to dominate those urban and rural areas with easy access and lower altitudes such as basins or river valleys penetrating mountain ranges.

Based on turnover we notice that the specialized and diversified localities are relatively even distributed with some small concentrations of specialized economies. We can take into account an entire county as an area of discussion because Romania used to have counties dedicated to a single economic branch (industrial, agricultural, extractive, complex product production). There are some concentrated economy areas, in counties where the main economy is focused on industry or agriculture (see Table 2). The most concentrated economies are in the Mehedinţi, Tulcea, Caraş-Severin, Covasna and Vrancea counties with a HH Index over 3000.

The most diversified economies are in the Vâlcea, Cluj, Neamţ, Harghita and Prahova counties. These fall into the middle range (neither diversified nor specialized) so we cannot talk about a significant diversification. What we notice here is that diversification increases with the size of the economy in the main counties as the top 5 most diversified counties are the most developed from the list.

Based on the number of employees we notice that the specialized and diversified localities are relatively even distributed with some small concentrations of specialized economies (see Table 2). The most concentrated economies are in the Mehedinţi, Timiş, Caraş-Severin, Hunedoara and Vrancea counties with a HH Index over 2500. The most diversified economies are in the Harghita, Bacău, Prahova, Bihor and Cluj counties. These fall into the middle range (neither diversified nor specialized) so we cannot talk about a significant diversification. Cluj is the only county which falls into the specialized economy category. However, all these counties are at the edge of the mountainous area and the localities taken into account do not reflect the entire county economy as lots of localities from these counties fall outside the mountain area.

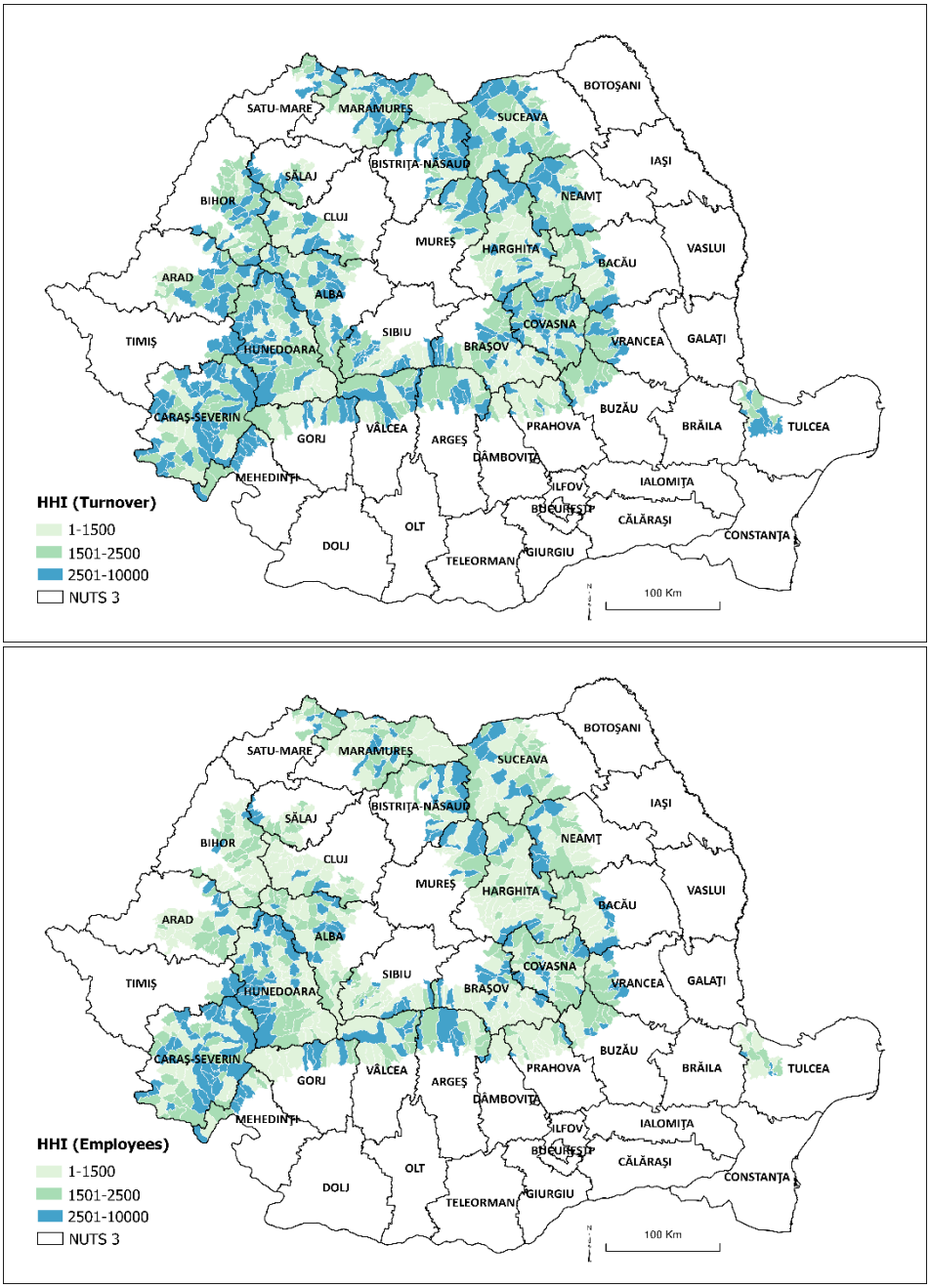

Fig. 2. HH Index based on turnover (up) and employees (down) in mountainous LAU 2 units.
Data source: Ministry of Finance (2021)

Table 2. Mean HH Index for turnover and employees in counties (from most concentrated to most diversified)

County	HH Index Turnover	County	HH Index Employees
Mehedinți	4617.74	**Mehedinți**	3385.84
Tulcea	3424.66	**Timiș**	2958.74
Caraș-Severin	3216.76	**Caraș-Severin**	2778.59
Covasna	3118.94	**Vrancea**	2769.40
Vrancea	3014.92	**Hunedoara**	2667.93
Timiș	2960.53	**Covasna**	2487.36
Arad	2902.49	**Mureș**	2412.62
Bistrița-Năsăud	2835.05	**Argeș**	2300.45
Hunedoara	2834.39	**Gorj**	2263.80
Argeș	2818.29	**Tulcea**	2234.40
Gorj	2739.26	**Arad**	2222.71
Buzău	2734.22	**Bistrița-Năsăud**	2122.64
Satu Mare	2700.92	**Vâlcea**	2098.19
Alba	2609.96	**Sibiu**	2077.56
Mureș	2601.28	**Satu Mare**	2033.83
Sălaj	2571.10	**Buzău**	1945.43
Dâmbovița	2528.95	**Brașov**	1935.35
Sibiu	2520.28	**Alba**	1922.56
Suceava	2499.40	**Dâmbovița**	1872.78
Bacău	2403.48	**Sălaj**	1800.52
Brașov	2386.17	**Maramureș**	1787.27
Maramureș	2327.66	**Suceava**	1755.95
Bihor	2261.64	**Neamț**	1744.41
Vâlcea	2250.24	**Harghita**	1716.73
Cluj	2198.49	**Bacău**	1652.81
Neamț	2159.29	**Prahova**	1569.09
Harghita	2139.31	**Bihor**	1509.71
Prahova	2128.83	**Cluj**	1315.91

Table 3. Smart specialisation and diversification according to turnover and number of employees in selected local administrative units

TURNOVER	**SMART SPECIALISATION**	**DIVERSIFICATION**
2500 – 10,000	Ciudanoviţa (CS), Igneşti (AR), Lelese (HD), Tomeşti (AR), Bulzeştii de Sus (HD), Sviniţa (MH), Podeni (MH), Bârsăneşti (BC), Tureni (CJ), Reci (CV)	Ştefeşti (PH), Pestişu Mic (HD), Vârfurile (AR), Corbu (Harghita), Chişindia (AR), Mărişel (CJ), Conop (AR), Bughea de Sus (AG), Şuncuiuş (BH), Bogdan Vodă (MM)
1500 – 2500	Ciclova Română (CS), Jijila (Tulcea), Orşova (MH), Romuli (BN), Bătrâni (PH), Bucureşci (HD), Sălişte (SB), Bicaz-Chei (NT), Vatra Moldoviţei (SV), Bicazu Ardelean (NT)	Băile Tuşnad (HR), Meteş (AB), Baia de Criş (HD), Gilău (CJ), Vălişoara (HD), Crasna (GJ), Tulnici (VN), Valea Mare Pravăţ (AG), Racşa (SM), Sălişte a (AB)
1 – 1500	Berzasca (CS), Porumbacu de Jos (SB), Măgeşti (BH), Ghimbav (BV), Boroşneu Mare (CV), Slănic-Moldova (BC), Veţel (HD), Mihăileni (HR), Sasca Montană (CS), Uricani (HD)	Bătrâna (HD), Piatra-Neamţ (NT), Sibiu (SB), Alba Iulia (AB), Săcele (BV), Petroşani (HD), Baia Mare (MM), Sfântu Gheorghe (CV), Reşiţa (CS), Floreşti (CJ), Câmpulung Moldovenesc (SV)
EMPLOYEES	**SMART SPECIALISATION**	**DIVERSIFICATION**
Less than 1500	Vaţa de Jos (HD), Micfalău (CV), Drajna (PH), Lazuri de Beiuş (BH), Chiojdu (BZ), Voineasa (VL), Mărtiniş (HR), Marga (CS), Leordina (MM), Păltinoasa (SV)	Ponor (AB), Piatra-Neamţ (NT), Reşiţa (CS), Sibiu (SB), Floreşti (CJ), Odorheiu Secuiesc (HR), Săcele (BV), Sfântu Gheorghe (CV), Braşov (BV), Deva (HD)
1500,1 – 2500	Băiuţ (MM), Dalboşeţ (CS), Chichiş (CV), Vintileasca (VR), Valea Ierii (CJ), Roşia (BH), Negrileşti (VR), Rebrişoara (BN), Corbu (HR), Bistra (MM)	Corbeni (AG), Şuncuiuş (BH), Archiş (AR), Bratca (BH), Racoş (BV), Baia de Arieş (AB), Asău (BC), Brăduţ (CV), Sarasău (MM), Sânzieni (CV)
2500,1 – 10,000	Ciudanoviţa (CS), Bulzeştii de Sus (HD), Bătrâna (HD), Cireşu (MH), Blandiana (AB), Igneşti (AR), Lelese (HD), Tomeşti (HD), Buchin (CS), Reci (CV)	Mărişel (CJ), Lupac (CS), Ribiţa (HD), Lisa (BV), Remeţi (MM), Ciuruleasa (AB), Şanţ (BN), Poian (CV), Sărmaş (HR), Bicazu Ardelean (NT)

Source: the authors

5. Limitations of the study

The first limitation that we must consider is the HH index's sensitivity to scale. As explained, the HHI's increase is characterized by an inverse correlation with the quantity of enterprises in a specific area and is significantly influenced by the magnitude discrepancy among these enterprises. Due to the fact that mountainous areas are mainly rural and rural areas don't usually have a large number of companies, a more specific analysis should consider the economic context and factors influencing each locality. A second noteworthy constraint is the HHI's disregard for non-market activities. All the conclusions above are based on the premise that market activities and for-profit entities constitute the principal catalysts propelling the economy. However, in some rural regions the economy is often characterized by the prevalence of non-market or informal economic activities of considerable significance. These activities include various forms of subsistence agriculture and sale of agricultural products - a very common practice in rural areas. They also include manual labor or different unregistered home-based businesses that may have an important contribution to the local economy given the small dimensions of these rural economies.

Another limitation that applies in areas where the economy is more complex is the fact that the HHI assumes homogeneity of products within industries. In reality, industries may produce a variety of goods or services with differing characteristics, and the index may oversimplify the diversity within an industry.

6. Conclusions

The research results regarding the economies in the mountainous areas of Romania bring to the forefront a series of relevant findings regarding economic concentration and diversification in these specific regions. The study focuses on analysing economic data (NACE rev.2, turnover and number of employees) from the administrative-territorial units in the mountainous areas and highlights several key aspects. The conclusions emphasize a moderate economic concentration in most administrative-territorial units in these mountainous zones, concerning both turnover and the number of employees, in accordance with the Herfindahl-Hirschman Index. Additionally, a higher concentration is observed in both labour force and certain industries in the western sectors of the Romanian Carpathians. These areas previously hosted centres for logging, mining, and heavy industries, significantly influencing the labour force concentration in those regions. Furthermore, it is noted that urban and rural areas situated in

easily accessible areas and at lower altitudes, such as basins or river valleys penetrating the mountain ranges, also exhibit a higher degree of economic concentration. A detailed analysis of economies across different counties reveals diverse patterns. Specialized and diversified economies appear relatively evenly distributed, with some small concentrations of specialized economies. Counties with the most concentrated economies are Mehedinți, Tulcea, Caraș-Severin, Covasna, and Vrancea, while those with more diversified economies are Vâlcea, Cluj, Neamț, Harghita, and Prahova. However, the most diversified counties do not indicate significant diversification, and one remarks that diversification increases with the size of the primary economies in these counties, which also happen to be the most developed on the list.

These findings underscore the importance of understanding economic patterns in mountainous areas and suggest that policies tailored to the geographic, social, and economic specifics of these regions could be more effective in promoting balanced and sustainable economic development. Integrating these findings into regional development strategies could provide a stronger framework for guiding economic policies and promoting economic diversification and sustainability in mountainous areas, not only in Romania but also in similar regions globally.

7. Final remarks

- **Interconnectedness of Smart Specialisation and Diversification**: The study reveals the intricate relationship between the European Union's smart specialisation strategies and the necessity for economic diversification within Romanian mountain areas. It emphasizes the need for a coordinated approach to achieve balanced economic growth.
- **Significance of Spatial Analysis**: Utilizing qualitative, quantitative methods, and GIS techniques, the study highlights the importance of spatial analysis in comprehending the economic landscape of mountainous regions. It underscores the integration of geographical data into economic development strategies.
- **Need for Tailored Policies**: Findings stress the requirement for adaptable policies that cater to the unique challenges and opportunities in Romanian mountain areas. The study suggests that uniform policies are inadequate and urges policymakers to consider the specific geographic, social, and economic characteristics of these regions.
- **Policy Recommendations**: Policymaker guidance focuses on tailored approaches addressing the distinct features of mountainous territories.

Recommendations likely encompass targeted initiatives, infrastructure development, skill-building programs, and fostering local industries and resources.

❖ **Contributions to Regional Development Understanding**: This research contributes to a deeper understanding of the complex relationship between regional development strategies, such as smart specialisation, and the specific needs of regions like Romanian mountain areas. This understanding is vital for global policymakers, researchers, and practitioners striving for sustainable economic growth in similar regions.

❖ **Stakeholder Value**: The study's insights hold significance for various stakeholders involved in regional development, including policymakers, researchers, and practitioners. It provides practical implications for implementing smart specialisation and diversification strategies in similar mountainous regions worldwide.

In essence, this study establishes a foundational understanding of how regional development strategies intersect with the distinctive challenges and opportunities found in Romanian mountain areas. It emphasizes the necessity for adaptable policies tailored to specific regions and offers valuable guidance for sustainable economic growth in similar territories across the globe.

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