Theoretical Approach and Empirical Research of Administrative Catchment Areas on the Example of Petru Maior University of Târgu Mureş

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Abstract: *Based on their functions, out of the different types of settlements, cities are those that are able to provide goods and services to their own population and also can serve the needs of other settlements. The relationship between the cities and their catchment areas a vary depending on the functions of the city. Urban functions are carried out by different institutions, thus their importance also varies based on how often they are solicited. The characteristic functions of a city are the services used the most often both by the inhabitants of the city and by the population of its catchment area. Connections between cities and their catchment settlements are formed by individuals making use of the city's services (homo oeconomicus) in order to satisfy their needs. In this paper we analyze the connections based on higher education services, representing the educational-cultural function; furthermore, we also examine the dynamics of these connections determined by the expansion of higher education.*

Keywords: *catchment area, inter-settlement connections, higher education expansion, central function.*

JEL**:** *O21, R58, I25.*

Introduction

The general education level of work power and the level of professional education in a settlement or town has an important effect on the developmental possibilities of that town. The increased level of intellectual development caused by social development has a stimulating effect on the reinforcement of city-specific functions (Berenyi, 1988, Kozma*et al.*, 2015). Among the most important central factors, education plays a predominant role, serving a double function.

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Firstly, it serves as a tool of prevention, since the lack of educational institutions can have a negative impact on the economic development of the settlement (e.g.: lack of available trained workforce). On the other hand, education can also be an indicator of development level, as urbanization and economic development often result in the establishment of educational institutions (Fresli*et al*., 2014, Ristea *et al*. 2014).

From the educational point of view, towns and cities are settlements where public transportation, railway and bus networks enable students from rural areas to attend the courses daily, or provide accommodation in student hotels (Fórizs*et al.*, 1963, Dávid, 2002, Fresli, 2011; Szabó, 2015).

There is a significant lack of balance between the capacity of secondary schools and the population of catchment areas. The most important factors affecting catchment areas are infrastructure, accessibility, distances to schools, the capacity of higher education institutions and student accommodation facilities, the reputation of educational institutions and that of the settlement itself (Kajati, 2004).

1. Literature overview

Education plays a significant role in studies on catchment areas. Firstly, based on its quantity measures (the number and spatial distribution of students), this function is suitable for delimiting the catchment area of centres. Secondly, the different features of educational institutions, thus their different territorial distribution/frequency provides basis for delimiting catchment areas on these different levels. Thirdly, education is not an isolated area; it is in coexistence with other sectors (e.g.: economy, healthcare etc.), and due to their close interaction they tend to develop in a similar rhythm (Tóth*et al.* 1973).

Since cities themselves are often serve as catchment areas of other cities (for instance, when a certain city doesn't offer the qualification that one is looking for), a very complicated system of catchment areas emerges. The catchment areas and intensity of urban educational institutions is divided and mosaic-like (Papp, 1981).

There have been several attempts for defining catchment areas - specifically educational catchment areas - based on mathematical-statistical methods, simply by modelling statistical data; however, these attempts have not been successful (Cliff *et al*, 1974, Kostubiecz*et al*, 1975).

The core idea of delimiting educational catchment areas is as follows: all educational institutions in a certain area are analyzed in order to determine how many students from each nearby settlement, and how many students from the given city would be interested in attending the courses of the examined institution. The level of the resulted the ratio will indicate the size of the catchment area of the institution (Boros, 1970). The catchment of primary schools is negligible, thus only secondary schools and higher education institutions should be analyzed (Fórizs*et al*, 1963, Dávid 1999).

Since data of students' residency is easy to acquire (institutional statistics), research is relatively simple: by projecting the acquired data to 1000 inhabitants, the intensity of catchment is determined, enabling to delimit relative catchment areas, their proximity and cohesion (Tóth*et al.,* 1973; Beluszky, 1981, Hágen & Kondorosi, 2008, 2009; Tóth & Dávid, 2010).

Further developing this method, since we relate our data to the total population of the settlement (and not only to the number of students), it is important to examine all the students, including students of evening and part-time education.

After the change of regimen in Romania, an increased number of people were interested in higher education; partly due to very limited access to higher education during the communist regime, and also because of the economic rise of the middle class. Of course demographic characteristics play an important role in this process, but on a long term, by becoming a widely spread phenomenon, the role of higher education will reach the level of importance of secondary school education in the 1990's.

The most important - temporal and spatial - result of this phenomenon is the significant densification of the catchment area of higher education institutions (training programs) (Dávid & Baros, 2007; Rechnitzer, 2008, Bodor & Pénzes, 2012, Kincses*et al.*2013, 2014).

The catchment area of secondary school education of Targu Mures was first delimited by Katona P. using empirical methods, examining the academic year of 2005/2006 (Katona, 2008). The data of the research can be effectively used in the organization of education by delimiting areas of education-coordination (fig. 3.).

The catchment areas of higher education institutions show significant differences in case of each institution, but due to their functional characteristics, they usually cover greater areas and extend beyond country borders.

The PetruMaior University of Targu Mures is unique among the higher education institutions in Targu Mures in the sense that its diverse educational programs attract nearly 4000 students from inside and outside the county. Through the diversity of its educational programs, the institution differs from specialized local universities: it offers the greatest variety of higher educational programs. There are 30 different educational programs at bachelor and masters levels. These are the result of differentiation and diversification, an answer to an increasing demand for higher education (Hrubos, 2002, Ristea*et al*. 2014).

After World War II, the communist party graduate gained power in Romania, following the Russian model of planned economy policy. The new regime also had an important effect on the educational system, as it was totally subordinated to the political views of the governing party. One of the most important disadvantages of the system was uniformity, which manifested in the over proportion of technical and agricultural training (Dávid&Szűcs, 2009;

Drăgoescu, 2013, Andronicеanu 2014). The education of human sciences and economy had almost totally disappeared by the 1980's.

The number of students followed the above mentioned trend. The gradual increase of student population came to a halt in the 1980's, when science domains not endorsed by the political regime began to shrink, and limitations were introduced in admission exams. Minority higher education followed the same path.

In the field of education, the main positive results of the communist regime were the eradication of illiteracy and the elaboration of school networks.

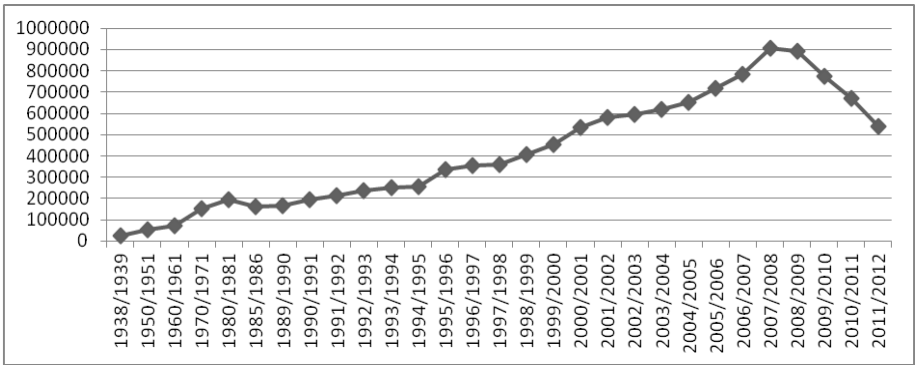

Figure 1. Changes in the number of students in Romania (1938-2013)
Source: National Institute of Statistics, 2012, Rădulescu, 2006. Edited by Katona, 2013.

The decline of the educational system, including that of higher education, is closely related to the collapse of the Romanian economy, which caused discontent among the population and eventually led to the change of regime in 1990.

During this period the possibilities for higher education were so limited that after the change of regime, the educational market became available for private higher education institutions, too. As a result, the number of students attending private higher education institutions increased explosively.

The state reacted to this process by introducing accreditation in 1993, thus temporarily regulating the expansion of private higher education, creating a balance between public and private education (Ianoş *et al.*, 2007).

Due to the lack of flexibility of the state and because of the increasing demand for higher education, a huge pool of student potential was created, eventually exploited by private universities. As far as recruiting and admission procedures are concerned, public universities gradually followed private universities. Educational institutions reacted to the increasing educational needs by differentiation and diversification.

After the change of regime, 27% of students in private universities attend distance learning, while in the public universities this percentage is only 15,4%. In private universities 46% of students study economy, whereas only 32,5% of

students attend similar classes in public universities. A greater number of students (22%) study law in private universities, and only 5 % of students in public universities chose this field (Andrei et al., 2007). On the other hand, technical studies, engineer training and pedagogy are mostly characteristics of public universities (Andrei et al., 2007).

The number of students reached a maximum of almost 1 million students in the academic year 2007/2008. This was a result of the inflation of higher educational needs based of demographic potential.

Opposed to the national trend, the number of students did not decrease in Târgu Mures, which could be a positive feed-back for town management and also for the institutions: the phenomenon suggests that the qualitative tendencies of higher education are moving in a good direction.

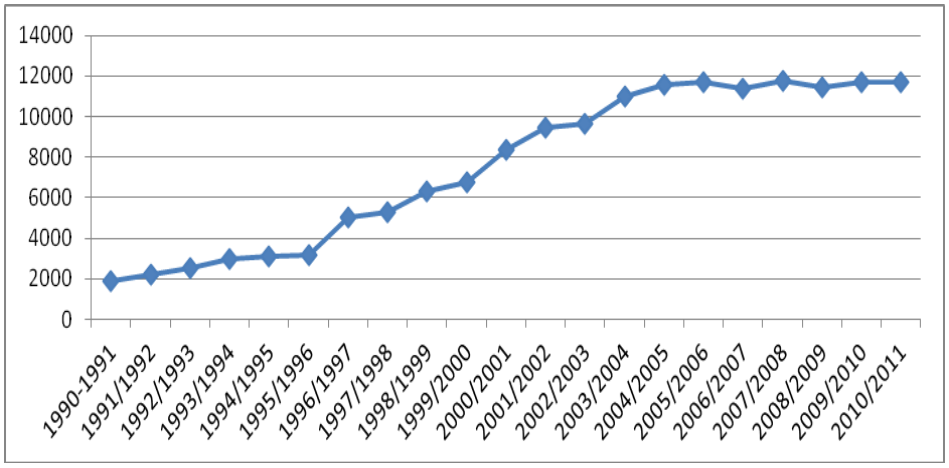

Figure 2. Changes in the number of students in Târgu Mureş 1990-2012.
Source: National Institute of Statistics 2012. Katona, 2013 edition.

2. Research methodology

As already mentioned in the introduction, our research examining catchment areas is based on the measurement of the intensity of connections between centres and their catchment settlements (in this case communes /villages).

Using this method, our study analyses the territorial connections of a higher education institution, the Petru Maior University, which also provides a possibility for delimiting the catchment area. The result of the study can be used directly in education organization both at on institutional and municipal level.

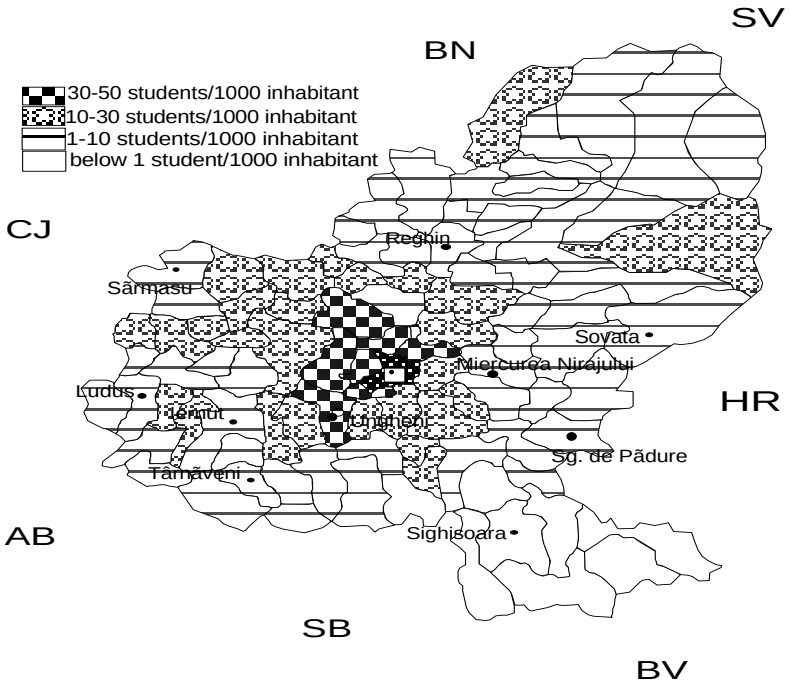

Figure 3. The secondary school catchment area of Târgu Mureş (2005-2006)

Legend: AB=Alba county, BN=Bistriţa-Năsăud county, BV=Braşov county, CJ=Cluj county, HR=Harghita county, SB=Sibiu county, SV=Suceava county.

Source: data bases of secondary schools – Katona, 2008 edition

The most difficult phase of the research was data collection because we needed a specific database that cannot be found in official statistics. The focus of our research was the based on the home settlements of the students. This meant that we needed to gain access to the students' personal data. The data were gradually obtained from the management of the institution. We analysed two time segments: the academic years of 2002/2003 and the 2012/2013. The database of the first time segment had to be copied manually from the institutional database and then introduced in electronic format. The data of the second time segment was available in electronic format.

Our goal was to create a map of catchment intensity in the two examined time segments. We could illustrate our results on maps of communes/villages, since the smallest administration unit in Romania is the commune/village. In order to do so, we had to group the settlements around communes/villages with laborious work. After summing up the result, we calculated a coefficient of the intensity of catchment using the following formula:

$$Ai = \frac{Sn \times 1000}{Pc}$$

where: *Ai-catchment intensity, Sn-student number, Pm-population of commune*

Maps were created using the Map Info 11.0 software.

3. Results

In the 2002/2003 academic year, 23 of the total of 3838 students came from foreign countries (Moldavia and Ukraine); these students received special scholarship from the Romanian state. 88,51% of students were from Mures county, with 54,16% of theme from Târgu Mures, which indicates the local importance of the university. 6,33% of students came from the neighboring Harghita county, with Toplita leading with the highest number of 145 students. Almost 2 % of the students came from Bistrita-Nasaud county, with 53 students from the county capital, Bistrita.

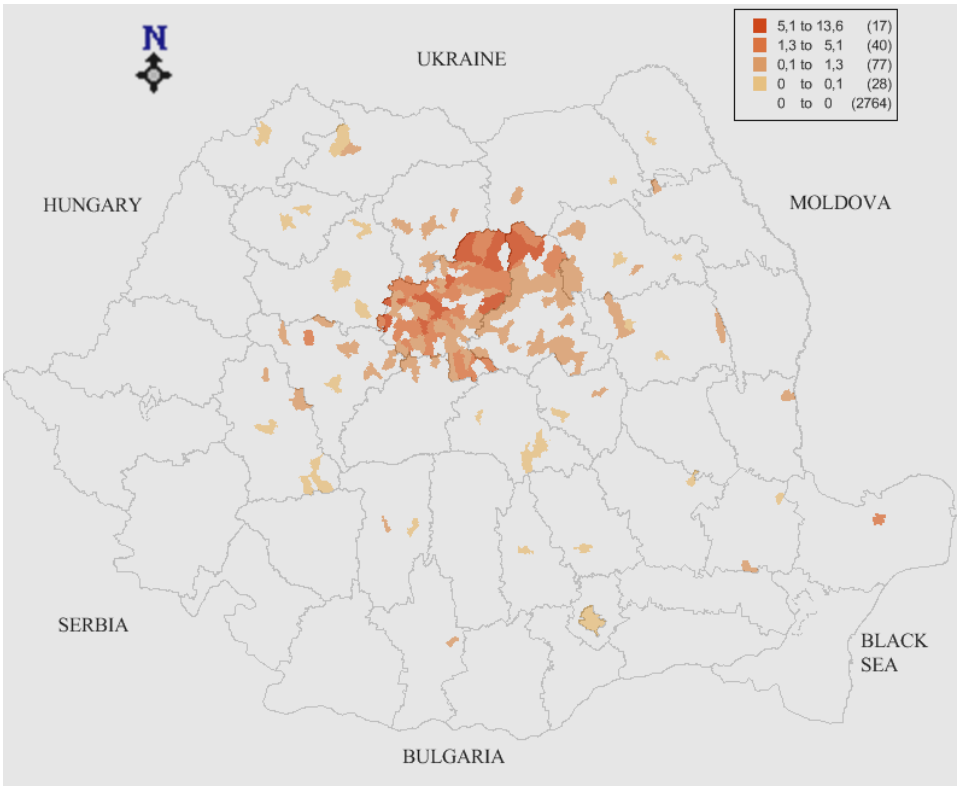

Figure 4. The catchment area of Petru Maior University – Târgu Mures (Academic year2002/2003)
Source: institutional data, edited by P. Katona, 2013

We found a significant number of students of Hungarian minority (763 students – 19,88%).According to the institutional database, in 2012/2013, the number of students was 3794, with 29 student arriving from the Republic of Moldavia. These students also came within the frameworks of the above mentioned yearly Romanian state scholarship program.

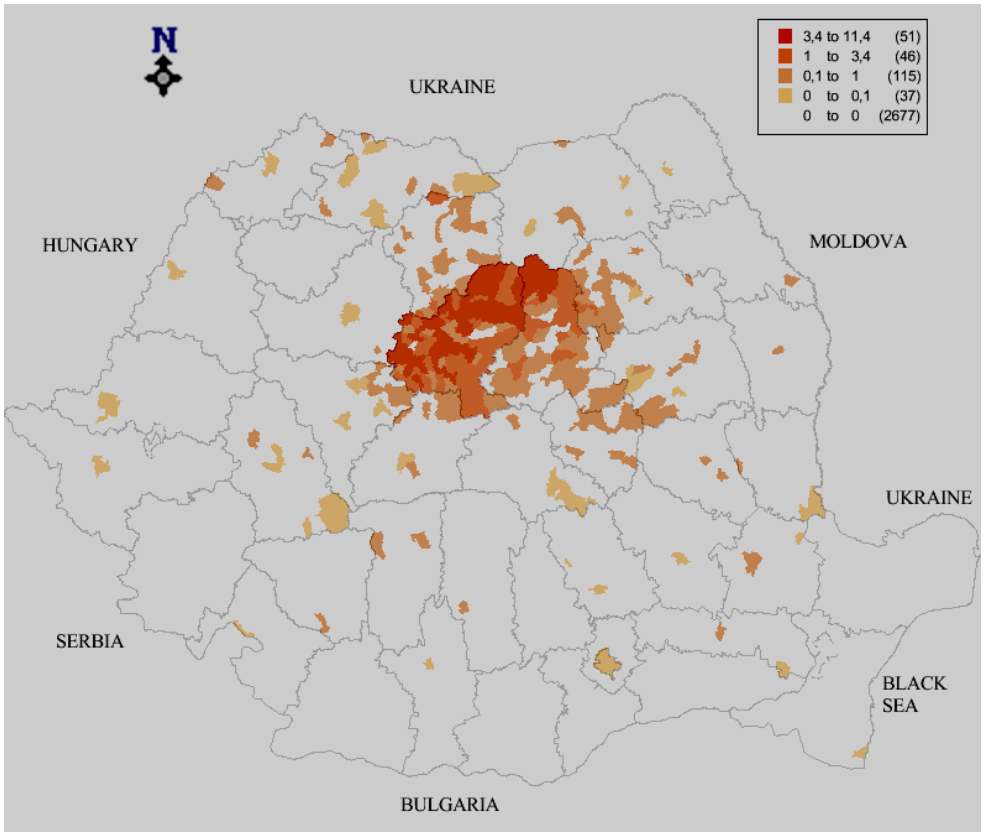

Figure 5. The catchment area of Petru Maior University – Târgu Mureş (2012-2013 academic year)
Source: institutional data, edited by P. Katona, 2013

85,13% of students came from Mures county; 40,35% of these students are inhabitants of TarguMures. This coefficient slightly decreased during the last 10 years. The number of students originating from Harghita county is 7,59%, a more than 1 % increase compared to the 2002/2003 academic year. An outstanding catchment is seen towards the settlements in the northern part of Harghita county: Bilbor, Toplita, Sarmas and Borsec. On the other hand, the number of students coming from Bistrita-Nasaud County decreased by almost 1 %. The number of students from other counties is under 1 %.

The catchment of communes to cities analyzed in the two time segments shows a visible development during 10 years. Analyzing the catchment-intensity segments (figure 1,2) we can see development in every section. This increase can be regarded as a natural development, since the effect of expansion of higher education is visible in this case also: the number of home settlements and communes of students is higher in 2013 than in 2003. Over the same period, the number of settlements with 0 catchment decreases from 2764 in 2003 to 2677 in 2013, with 87 more settlements in 2013. In the segment with the greatest catchment we find 51 communes in 2013. This number was 17 in 2003. The most important result is that the catchment area of the university became increasingly consolidated while the number of "white spots" has decreased in time, due to the development of territorial connections. In the territorial connections of the university related to the county area, we found a strong relation with the territorial connections of secondary education institutions of the city. This leads us to the conclusion that the effect of expansion of higher education is seen in the sense that the expansion of higher education is based on generalized secondary education. This can be observed also in the spatial structure created by territorial connections at county level.

Conclusions

Based on the analysis of the chosen time segments, the catchment area of Petru Maior University developed mostly in concordance with the higher education training programs. Connections are results of economic factors and also of emotionally influenced decisions.

The development of the catchment area can be observed on the catchment intensity maps. Following the different catchment intensity segments, we can even represent the increasing trend of higher education expansion in the examined time segment.

The main factors affecting the development of the catchment area are: the accessibility of the city (time/expense factor), the reputation of the institution, the quality of the institutions' services (language training), the living expenses (rent), the cultural programs offered by the city (entertainment), possibilities for settling, the services offered by the city on economic and administrative levels (internet bandwidth, sports facilities, etc.).

Conclusions regarding the structure of the catchment area: in time, students tend to chose a higher education institution located closer to their home settlements; the catchment area becomes more homogenous, also indicated by the structure of student population. During the analyzed time segment, the catchment area had expanded.

Institutions of higher education should take these changes of demographic coefficients into consideration and include them whilst planning their recruitment activities in the future.

As for city development, the expansion and upgrade of student-friendly services provided by the institutions is a trend to follow in the near future.
After the 2007/2008 academic year, there is a halt/decrease in the national trend of higher education expansion. Interestingly, this trend is not reflected at local level, which can be considered as a proof of quality of the educational services in the examined institution.

Maintaining and increasing quality in the near future is a growing challenge for the institution on the path of adapting to the changes of the globalizing world's economy- defined labor market.

Another good direction could be the institutional program development based on local economy which has proven to be effective in the past. In order to maintain this trend it is advisory to formulate prognosis based on regional factors and successfully carry out developments based on these prognosis. The success of this process is determined by the mutual consultation between city management and the leaders of the institutions functioning on its perimeter.

References

1. **ANDREI, F. S**. (2011). *The evolution of qualifications in the romanian higher education in 1968-2011*. DOCIS-ANC, p. 92. Download: 20.12.2013.
2. **ANDREI, T., STANCU, S. & ISAIC-MANIU, I. M**. (2007). “Tendencies in the University System in Romania”|. *JAQM, Quantitative Methods Inquires*, vol. 2, no. 4/2007, 494-506. Download: 25.04.2013.
3. **ANDRONICEANU, A** (2014). “Particularities of the human resources policies in an international organization”. *Administration and Public Management Review*, vol. 22, pp. 41-47.
4. **BERÉNYI, I.** (1988). “A határmentitérségekkutatásánakszociálgeográfiaiaspektusai (Socio-geographical aspects of research of border regions – in Hungarian)” In: Erdősi, F. and Tóth, J. editors. A *területéstelepülésfejlődéstársadalmi-gazdaságifolyamataiMagyarországon,* c. program MTA RKK Pécs- Ts-2/2 Program Iroda, pp. 58-61
5. **BODOR, N.& PÉNZES, J**. (2012). “Eger komplexvonzáskörzeténekdinamikaivizsgálata. (Dynamic research of the complex catchment zone of Eger – in Hungarian)” *Téréstársadalom/Space and society*. vol. 26. no. 3: 30-47.
6. **BOUSTEDT, O.** (1962). “Die Zentralen Orte und ihre Einflussberichte (The central places and their catchment areas, In German)”. *Lund Studies in Geography*, Ser. B, vol. 24 no. 24: 25-42
7. **CICEA, C. & DOBRIN, C**. (2005). „Contribuţia educaţiei la dezvoltarea economică (The contribution of education to economical development. In Romanian)”. *Economia seria Management*, 1/2005, 44-53. Download: 09.03.2013.

8. **CHABOT, G.** (1962). "Présentation d'une carte des zones d'influence des Grandes villes francoises (Map of the catchent zones of the french cites, in French)". *Lund Studios in Geography*. Seria B, vol. 23. no 24 : 43-59.
9. **CHRISTALLER, W**., (1933). "Die Hierarchie der Städte (Hierarchyoftowns, in German)". In: *Lund Studies in Geography*, Ser. B, vol. 1. no. 24: 60-82.
10. **CLIFF, A.D., MARTIN, R.L. & ORD, J.K.** (1974). "Evaluating the Friction of Distance Parameter in Gravity Models". In: *Regional Studies*, vol. 8, no. ¾: 41-67.
11. **CLOKE, P.** (1979) *Key Settlements in Rural Areas*. Methuen: University Press Cambridge, p. 259.
12. **DÁVID L.** (1999). "Geográfusképzés - quo vadis?" *TÉR*, JATE vol. 4.no. 1:7-10
13. **DÁVID, L. & SZŰCS, CS.** (2009). "Building of networking, clusters and regions for tourism in the Carpathian Basin via information and communication technologies" *Netcom – Networks and Communications Studies* vol. 23 no. 1-2:63-74.
14. **DÁVID, L. & BAROS, Z.** (2007). "A possible use of indicators for sustainable development in tourism" *Anatolia: An International Journal of Tourism and Hospitality Research* vol. 18. no. 2: 349-355.
15. **DRĂGOESCU, R. M.** (2013). "Transformări în sistemul de învăţământ superior din România după 1990 (Transfrmations in the Higher Education System in Romania after 1990 In Romanian)". *Revista Română de Statistică*, vol. 5, no. 3:19-27.
16. **FÓRIZS M. & ORLICSEK J.** (1963): Vidékivárosainkfunkcionálistípusai (Functional Types of Our Rural Towns, In Hungarian) FöldrajziÉrtesítő vol. 12, no 12:167-199.
17. **FRESLI, M.** (2011). Kultúraéstradíció (Culture and tradition), Szombathely
18. **FRESLI, M., HARITONOVA, L. & BAHSALIJEV E.** (2014). "A transzcendenstér. (The transcendence place in Hungarian)". *NFA Füzetek* Vol. 4 no. 1: 21-29.
19. **HÁGEN, I.. & MAGYARY, I.** (2008). "A biobrikettmezőgazdaságielőállításaésfelhasználásánaklehetőségei (Possibilities of production and utilization of biobrikett, In Hungarian)" *Gazdálkodás* vol. 52. No 1.: 83 – 86.
20. **HÁGEN, I&KONDOROSI.** (2009). *Üzletitervezés (Business planning In Hungarian)* Controll 2003 KFT, Debrecen.
21. **HRUBOS, I.** (2002). "|Differenciálódás, diverzifikációéshomogenizáció a felsőoktatásban (Differentiaiton, deversification and homogenization in higher education, in Hungarian)". *Educatio*vol. 4. no 1: 96-106.
22. **HUFF, D.L.** (1973). "The Delineation of a National System of Planning Regions on the Basis of Urban Spheres of Influence". *Regional Studies*, vol. 7, no. 1:49-63.

23. **IANOŞ, I., BRAGHINĂ, C. & SÂRODOEV, I.** (2007). "Geographical Considerations Regarding the Romanian Higher Education". *Human Geographies-Journal of Studies and Research in Human Geography*, vol. 1, no. 1: 15-35. Download: 10.01.2013.
24. **KAJATI, GY. (2004). "**Külföldihallgatókaz Eszterházy Károly Főiskolán. (Foreigner students at Eszterhazy Karoly College. Development of human resources and the borders, in Hungarian.)" In. Süli-Zakar (Ed.) *Humánerőforrás-fejlesztésés a határok*. Debrecen, 354-359.
25. **KATONA, P.** (2008). "The catchment Area of Secondary Education of TârguMureş". *StudiaUniversitatisBabeş-Bolyai*, series Geographia, vol. 23 no. 1: 169-174.
26. **KINCSES, A., NAGY, Z. & TÓTH, G.** (2013). "The Spatial Structures Of Europe: ProstorskeStrukture V Evropi" *Acta Geographica Slovenica* vol. 53 no. 1: 43-70.
27. **KINCSES, A., NAGY, Z. & TÓTH, G.** (2014). "The changing economic spatial structure of Europe" *Norsk Geografisk Tidsskrift - Norwegian Journal Of Geography* vol. 68, no. 5: 301-309.
28. **KISS, A.** (1986): "Dunaújváros, mint ipari centrum vonzásihatásai (The catchment Effects of Dunaujvaros, as an Industrial Center, in Hungarian)" *AlföldiTanulmányok X*. – MTA RKK ATI, Békéscsaba, pp. 307-323.
29. **KOSTUBIECZ, B., ŁOBODA, J., ZAGOŻDŻON, A. & ZIPSER, T**. (1975). Application of Mathematical Models in Analyzing and Forecasting Development of a Settlement System, presented at the *RSA Seminar* in Zakopane, p. 125.
30. **KOZMA, G., SZABÓ, G Y., MOLNÁR, E. & PÉNZES, J.** (2015) "The position of environmental protection in the municipal council committees of local governments in Hungary". *Administration and Public Management Review,* vol. 24. no.2: 44-55.
31. **PAPP, A.** (1981). "Debrecen vonzáskörzete (The catchment Area of Debrecen, in Hungarian)". *AlföldiTanulmányok*, V. – MTA RKK ATI, Békéscsaba, 177-281.
32. **PÉNZES, J.** (2013)."The dimensions of peripheral areas and their restructuring in Central Europe". *Hungarian Geographical Bulletin,* vol. 62. no. 4: 373-386.
33. **RĂDULESCU, D. C.** (2006). "Învăţământul românesc 1948-1989 - între derivă şi recuperare instituţional-funcţională (The Romanian Education 1948-1989 – Between Drifting and Institutional-Functional Recovering. Quality of Life Magazine, in Romanian)". *Revista Calitatea Vieţii,* vol. 11 no. 3-4: 307-318. Download: 08.11.2012.
34. **RECHNITZER, J.** (2009). "A felsőoktatástérszerkezeténekváltozásaéskap csolata a regionálisszerkezettel (The transformation of spacial structure of higher education and it's connection to regional structures, in Hungarian)". *Educatio,* vol. 6 no. 1:50-63.

35. **RECHNITZER, J. & SMAHÓ, M.** (edit.) (2007). "Unirégió – Egyetemek a határmentiegyüttműködésben. (Uniregio – Universities in collaboration along the border line, in Hungarian)" *MTA RKK*, Pécs-Győr, p. 312.
36. **RISTEA, B., CIOBANU, A. & IVAN, M**. (2014). "Manager profile in the decentralized educational system – comparative research in the European countries" *Administration and public management,* vol. 23. no.1:60-75.
37. România în cifre (2012). "Breviar Statistic". *Institutul Naţional de Statistică*, (Statistical ..... National Institute of Statistics, in Romanian) p. 86.
38. SZABÓ, L. (2015). *Azagroturizmusföldrajza (Geography of agrotourism, in Hungarian*) SZIENonprofitKft, Gödöllő, 328p.
39. **TÓTH, J., PÉNZES, I. &BÉLA, D**. (1973). "A Dél-Alföldoktatásiköz pontjainakhierarchiájaésvonzáskörzetei. (Hierarchy and cachment area of education cenres in the South Great Plain, in Hungarian)" *Földrajzi Értesítő*, vol. 23, no. 2: 289-297.
40. TÓTH, G. & DÁVID, L. (2010). "Tourism and Accessibility: An Integrated Approach" *Applied Geography* vol. 30 no.4:666-677
41. **TUDOSOIU, SILVIA – NICOLETA**. (2010). *Educaţia în sistemul comunist din România (anii 1965-1989).* Rezumatul tezei de doctorat. Universitatea Bucureşti, p. 33. Download: 10.01.2013.
42. **VADÁSZ, I.** (1986). "Kunhegyesvonzáskörzete (catchment zone of Kunhegyes – in Hungarian)". *AlföldiTanulmányok*, XI, Békéscsaba: MTA RKK ATI, 279-306.