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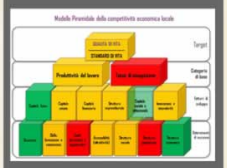





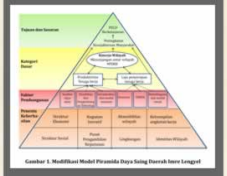

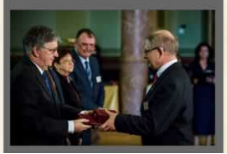

Lengyel Imre

A régiók versenyképességének piramismodellje és alkalmazásai: az eredeti koncepciótól a 22 nyelvre lefordított változatokig

The pyramid model of regional competitiveness and its applications: From the original concept to the versions translated into 22 languages

JATE Press
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Szegedi Tudományegyetem
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Imre LENGYEL

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Bevezető

A piramismodell 1999-ben készült a Dél-alföldi régió gazdaságfejlesztési stratégiájának megalapozásához, amely kutatási projektet az EU PHARE előcsatlakozási alapja támogatta. A gazdaságfejlesztés céljaként a régió versenyképességének javítása lett kitűzve. Az előkészítő munkák során áttekintett szakirodalom alapján az alábbi kulcskérdéseket tettük fel:

1. Mi a célja a versenyképesség javításának?
2. Hogyan definiáljuk a regionális versenyképességet és milyen mutatókkal mérjük?
3. Milyen gazdaságfejlesztési programokkal javítható középtávon a régió versenyképessége, figyelembe véve az EU programozási időszakát (7 évet)?
4. Milyen hosszú távon módosítható háttérfeltételek befolyásolják a régió versenyképességét, amely háttérfeltételek színvonalán több esetben gazdaságon kívüli, inkább társadalompolitikai és területfejlesztési programokkal javíthatunk?

A piramismodell ezekre a kérdésekre próbál választ adni. Tudományos publikációban először 2000-ben jelent meg magyar nyelven, majd 2002-ben lett elküldve angol nyelven az *Acta Oeconomica* folyóiratnak, ahol átdolgozás után 2004-ben közölték, közben 2003-ban a Regional Studies Association Pisa-ban rendezett konferenciájának egyik szekciójában megtartott előadás tanulmányában is szerepelt. Ezt követően a regionális versenyképességgel, régiók gazdaságfejlesztésével foglalkozó kutatók közül sokan átvették a modellt, több esetben módosítva rajta. 2019-ig kb. 30 ország kutatói alkalmazták a modellt és 22 idegen nyelven vált ismertté.

Egy kiadványt 2017-ben összeállítottam kollégáim ösztönzésére, akik felhívták a figyelmemet a modell nemzetközi népszerűségére. Ez a könyv a korábbi kiadvány kibővítésével a modell 2019-ig publikált, 50-nél többféle változatát mutatja be. Először a kiinduló gondolatokat, az eredeti piramismodellt és szerkezetét ismertetjük röviden, majd a szerző által időközben végrehajtott módosításokat. Ezt követően a nemzetközi alkalmazásokat tekintjük át és a különböző nyelvekre lefordított modelleket mutatjuk be, amelyek néhány esetben jelentős átalakításon estek át. A könyv utolsó része a modellről és empirikus teszteléséről szóló alapvető tanulmányokat tartalmazza. A modell kidolgozásában és alkalmazásaiban sokan segítettek, ezúton is köszönetet mondok családomnak, kollégáimnak, szerzőtársaimnak és barátaimnak.

22 éven át vezettem az 1997-ben általam alapított Regionális és Alkalmazott Gazdaságtani Tanszéket, illetve jogutódját, a Közgazdaságtani és Gazdaságfejlesztési Intézetet a Szegedi Tudományegyetemen. A több mint két évtized alatt sok kollégával dolgoztam együtt az intézetben, a karon, az egyetemen és különböző bizottságokban és tudományos kutatásokban, az aktív oktatásból és oktatásszervezésből visszavonulva ezzel a kötettel köszönöm támogató együttműködésüket.

Introduction

The pyramid model was created as a basis for the economic development strategy of the Southern Great Plain region in 1999, the research project of which was financed by the PHARE pre-accession funds of the EU. This economic development targeted at improving the competitiveness of the region. Based on the literature reviewed during the preparatory work, we asked the following key questions:

1. What is the target of improving competitiveness?
2. How is regional competitiveness defined and what indicators is it measured with?
3. What economic development programmes can improve the competitiveness of a region in the medium term, considering the programming period (7 years) of the EU?
4. What background conditions that can be changed in the long term affect the competitiveness of the region, the standard of which conditions can be increased with programmes from outside the economy, such as social policy and regional development in several cases?

The pyramid model attempted to provide answers to these questions. It was first published in a scientific publication in 2000 in Hungarian, and then it was sent in English to the *Acta Oeconomica* journal in 2002, where it was published after revision in 2004, and meanwhile it was included in a presentation held in one of the sections of the conference organised by the Regional Studies Association in Pisa in 2003. Subsequently, several researchers engaged in regional competitiveness and the economic development of regions have adopted the model, making occasional modifications. By 2019, researchers from about 30 countries have applied the model, and it has become known in 22 foreign languages.

I compiled a booklet in 2017 to encourage my colleagues, who drew my attention to the international popularity of the model. This book expands on more than 50 versions of the model published until 2019, extending the previous booklet. First, we briefly describe the initial ideas, the original pyramid model and its structure, followed by the modifications made by the author in the meantime. Then we review the international applications and present the models translated into various languages, which have gone through considerable changes in some cases. The final part of the book contains basic studies on modeling and empirical testing. Many people have contributed to the elaboration and applications of the model; I would also like to use this opportunity to thank my family, colleagues, co-authors and friends.

For 22 years I was the head of the Department of Regional and Applied Economics, which I founded in 1997, and its successor, the Institute of Economics and Economic Development at the University of Szeged. Over the past two decades, I have worked with many colleagues on various committees and scientific researches, retiring from active education and management with this volume thanks for their supportive cooperation.

I. Az eredeti piramismodell és különböző változatai / The original pyramid model and its various versions

A piramismodell és időbeli módosulásai /

The pyramid model and its temporal changes

Az első kérdés, hogy mi a célja a versenyképesség javításának? A szakirodalomban az 1990-es évek végére általánosan elfogadottá vált, hogy a régióban élők életminőségének, életszínvonalának javítása (Begg 1999; Maskell at al 1998; OECD 1997; Storper 1997).

> The first question is: what is the target of improving competitiveness? By the end of the 1990s, it had been generally accepted in the literature that the target was to improve the quality of life and the standard of living of the population in the region (Begg 1999; Maskell at al 1998; OECD 1997; Storper 1997).

A második kérdés, hogyan definiáljuk a regionális versenyképességet és milyen mutatókkal mérjük? A piramismodellnél az EU hatodik regionális jelentésének versenyképesség egységes fogalmából indultunk ki a (EC 1999, 75): „a vállalatok, iparágak, régiók, nemzetek és nemzetek feletti régiók képessége relatíve magas jövedelem és relatíve magas foglalkoztatottsági szint létrehozására, miközben a nemzetközi versenynek ki vannak téve". A relatíve magas jövedelem az egy lakosra jutó GDP-vel becsülhető, míg a foglalkoztatottsági szint a foglalkoztatási rátával. Az egy lakosra jutó GDP pedig egyenlő a munkatermelékenység, foglalkoztatási ráta és a munkaképes korú lakosság szorzatával. Emiatt három alapmutatót vettünk figyelembe: az egy lakosra jutó GDP-t, a munkatermelékenységet és a foglalkoztatási rátát.

> The second question is: how is regional competitiveness defined and what indicators is it measured with? The pyramid model was founded on the standard concept of competitiveness of the sixth regional report of the EU (EC 1999, 75): 'the ability of companies, industries, regions, nations and supra-national regions to generate, while being exposed to international competition, relatively high income and employment levels'. The relatively high income can be estimated with GDP per capita, while employment levels can be assessed with the employment rate. GDP per capita equals the product of labour productivity, employment rate and working-age population. Therefore, we considered three basic indicators: GDP per capita, labour productivity and employment rate.

A harmadik kérdés, milyen gazdaságfejlesztési programokkal javítható középtávon a régió versenyképessége, figyelembe véve az EU programozási időszakát (7 évet)? Az egységes versenyképesség fogalmát közlő jelentésben 5 stratégiai tényezőt javasoltak,

amelyek középtávon is képesek javítani a versenyképességet (EC 1999). A növekedés elméleteknél alapul vett szokásos termelési tényezők itt is megjelentek: a *tőke* (a jelentésben a külföldi működőtőke), a *munka* (a jelentésben infrastruktúra és humán tőke), a *technológia* (a jelentésben kutatási és technológiai fejlesztés). A további két tényező: a kis- és közévállalkozások támogatása, valamint az intézmények és társadalmi tőke erősítése. Ezt az 5 tényezőt tartottuk mi is fontosnak, mint stratégiai fejlesztési programokat.

> The third question is: what economic development programmes can improve the competitiveness of a region in the medium term, considering the programming period (7 years) of the EU? In the EU' report providing the standard concept of competitiveness, 5 strategic factors capable of improving competitiveness in the medium term were proposed (EC 1999). The common production factors used as a basis for growth theories can also be found here: *capital* (as foreign direct investment in the proposal), *labour* (as infrastructure and human capital in the report), and *technology* (as research and technological development in the report). Two additional factors are: support of small- and medium-sized enterprises, and strengthening institutions and social capital. We also considered these five factors important as strategic development programmes.

A negyedik kérdés, milyen hosszú távon módosítható háttérfeltételek befolyásolják a régió versenyképességét, amely háttérfeltételek színvonalán több esetben gazdaságon kívüli, inkább társadalompolitikai és területfejlesztési programokkal javíthatunk? Szintén az EU említett regionális jelentésében felhasznált egyik megalapozó vizsgálatból derült ki, hogy a GDP régiók közötti eltérések kétharmadát négy tényező magyarázza (EC 1999, 80): a gazdasági szerkezet, az innovációs tevékenységek, a régió elérhetősége és a munkaerő felkészültsége. De a hosszú távú sikerességet vizsgálva egyéb tényezők is felmerültek, Begg (1999) a városoknál négyet emelt ki, míg Enyedi György (1996) tíz háttértényezőt, Jensen–Butler (1997) eredményeit is felhasználva. A tartós sikeresség tényezőit mérlegelve ezen szakirodalmi eredmények alapján további négyet is fontosnak tartottunk: a társadalmi szerkezetet, a döntési központokat, a környezet minőségét és a régió társadalmi kohézióját.

> The fourth question is: what background conditions that can be changed in the long term affect the competitiveness of the region, the standard of which conditions can be increased with programmes from outside the economy, such as social policy and regional development in several cases? One of the founding studies used in the above-mentioned EU regional report revealed that two-thirds of the discrepancies of GDP between the regions were explained by four factors (EC 1999, 80): economic structure, innovative activities, regional accessibility and skills of workforce. However, other factors also emerged in examining long-term success: Begg (1999) emphasised four of them for cities, while

György Enyedi (1996) pointed out ten background factors, using Jensen–Butler's (1997) findings as well. Considering the factors of lasting success, we found four additional factors important based on the literature findings: social structure, decision centres, quality of environment and social cohesion of the region.

Az egymásra épülő logikai keret a szakirodalomban a háttérfeltételek → input → output → cél (eredmény) felépítésnek felel meg. Egy régió versenyképessége mérésének és a versenyképességére ható tényezőknek négy egymásra épülő szintje, mint a versenyképesség vizsgálatának logikai szerkezete (1. ábra):

– *Cél* (eredmény): a régióban élők jólétének, életminőségének javulása.
– *Alapkategóriák* (output): a versenyképesség mérését lehetővé tevő (jövedelem, munkatermelékenység és foglalkoztatottság) mutatók.
– *Alaptényezők* (input): a versenyképesség alapkategóriáit közvetlenül meghatározó gazdasági tényezők, amelyekre *regionális gazdaságfejlesztési programok* dolgozhatók ki, ezáltal javulhat a régió versenyképessége és felgyorsítható a gazdasági fejlődés.
– *Sikeresség faktorok* (háttérfeltételek): az alapkategóriákat és alaptényezőket közvetve, áttételesen befolyásoló, elsősorban gazdaságon kívüli tényezők, amelyek hosszabb időszakon keresztül módosulnak és főleg a *területfejlesztési politika* képes befolyást gyakorolni rájuk.

The successive logical framework we apply corresponds with the background conditions → input → output → target (outcome) structure in the literature. The four successive levels of the measurement of regional competitiveness and the factors affecting competitiveness as the logical structure of the study of competitiveness (*Figure 1*) are:

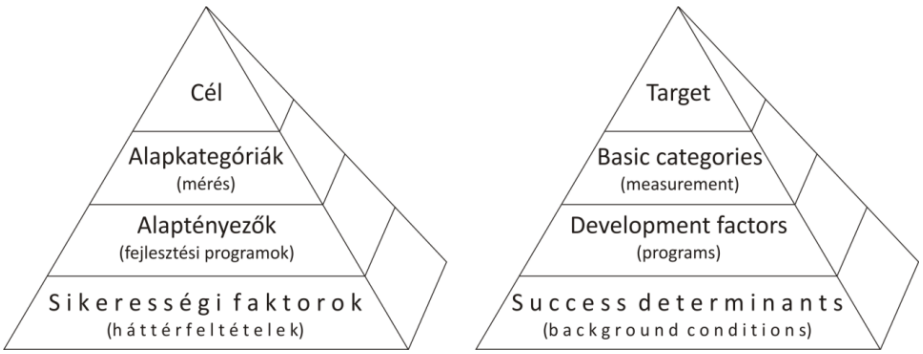
– *Target* (outcome): improving the standard of living and the quality of life of the population in the region.
– *Basic categories* (output): indicators enabling the measurement of competitiveness (income, labour productivity and employment rate).
– *Development factors* (input): economic factors directly determining the basic categories of competitiveness, for which *regional economic development programmes* can be elaborated, thereby improving regional competitiveness and accelerating economic growth.
– *Success determinants* (background conditions): factors affecting the basic categories and development factors indirectly, primarily outside the economic realm, which change over a longer period and can be particularly influenced by *regional development policy*.

A regionális versenyképesség vizsgálatára és gazdaságfejlesztési javaslatok kidolgozására összeállított modellnek a "piramismodell" nevet adtuk, amivel érzékeltetni szeretnénk az alul levő tényezők nagyobb fontosságát, illetve a modell térbeliségét is.

We named the model established for the study of regional competitiveness and the elaboration of economic development proposals the "pyramid model", which aimed to illustrate the greater importance of the factors placed at the bottom, as well as the spatiality of the model.

1.ábra A piramismodell logikai szerkezete

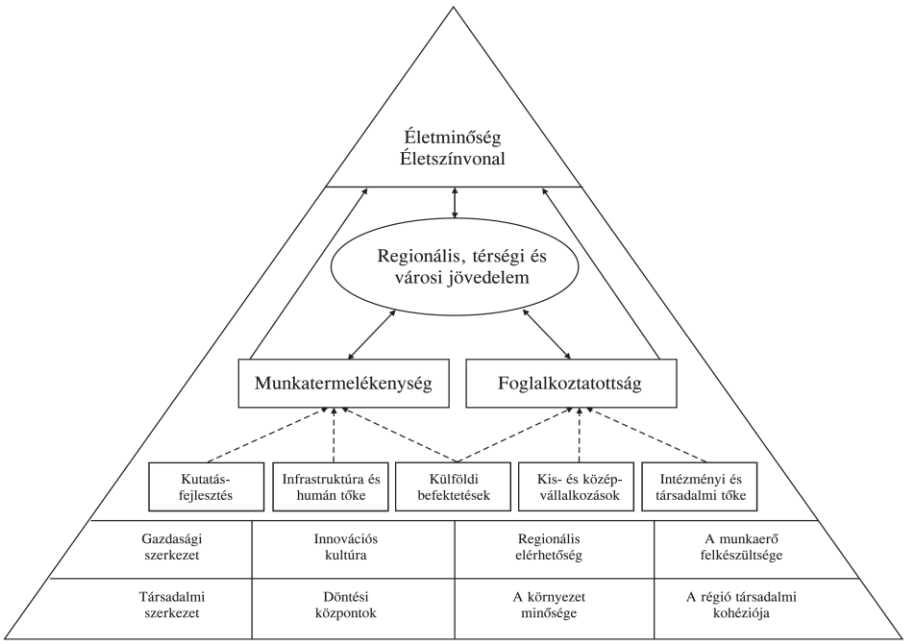
Figure 1 The logical structure of the pyramid model



A fenti logika alapján kidolgozott piramismodell először a *Közgazdasági Szemlében* jelent meg 2000 decemberében magyar nyelven.

The pyramid model developed on the basis of the above logic was first published in Hungarian in the *Economic Review* in December 2000.

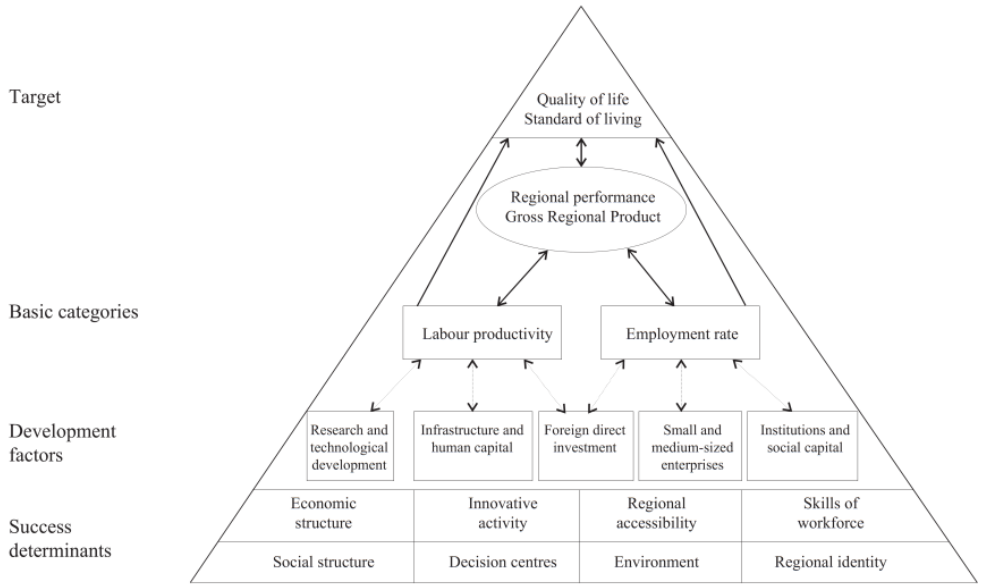
1. ábra
A régiók, térségek és városok versenyképességének piramismodellje



Source: Lengyel, I. (2000): A regionális versenyképességről (On regional competitiveness). *Közgazdasági Szemle (Economic Review)*, 12, pp. 962–987. (p. 979)
URL: http://epa.niif.hu/00000/00017/00066/pdf/lengyel.pdf
Független hivatkozások / Independent citations: 497
A modell változatlan formában jelent meg az alábbi publikációban/ The model was published in an unchanged form in the following publication: Lengyel & Rechnitzer (2000).

Az angol nyelvű modell formailag kissé átszerkesztve jelent meg 2004-ben az *Acta Oeconomica*-ban (a tanulmány első változata 2002-ben lett beküldve).

The English version of the model was published in a slightly reconstructed form in 2004 in *Acta Oeconomica* (the first version of the paper was submitted in 2002).



Source: Own construction.

Figure 6. The pyramid model of regional competitiveness

Source: Lengyel, I. (2004): The Pyramid Model: Enhancing Regional Competitiveness in Hungary. *Acta Oeconomica*, 3, pp. 323–342. (p. 336)
URL: https://www.jstor.org/stable/pdf/40730024.pdf
Független hivatkozások / Independent citations: 143

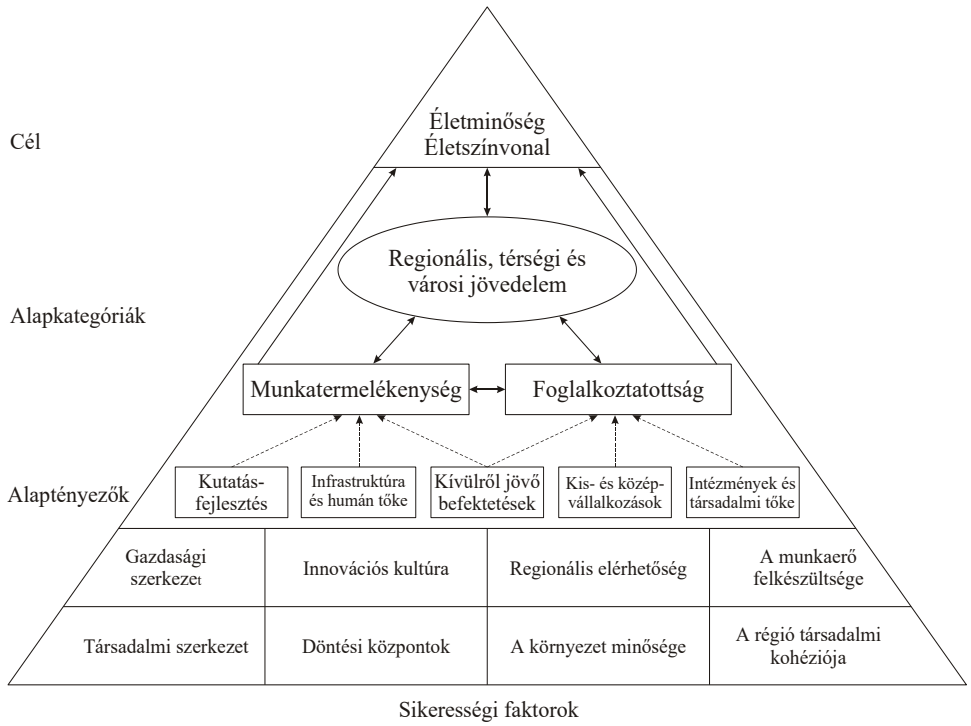
A modell változatlan formában jelent meg az alábbi publikációkban/ The model was published in an unchanged form in the following publications: Lengyel (2003b); Lengyel & Lukovics (2006); Lengyel (2009); Lengyel (2009b).

Az eredeti magyar nyelvű modell az első közlések megjelenése után nem sokkal kisebb módosításon esett át: a ’külföldi befektetések’ helyett a regionális gazdaságtan exportbázis modelljének fogalomhasználatához igazodva a régióba ’kívülről jövő befektetések” szerepelnek.

The original Hungarian version of the model underwent smaller modifications soon after the first publications: ‘foreign investments’ was replaced by ‘inward investments’, corresponding with the concept use of the export base model of regional economics.

8.3. ábra A területi egységek versenyképességének piramis-modellje

Figure 8.3 The pyramid model of regional competitiveness



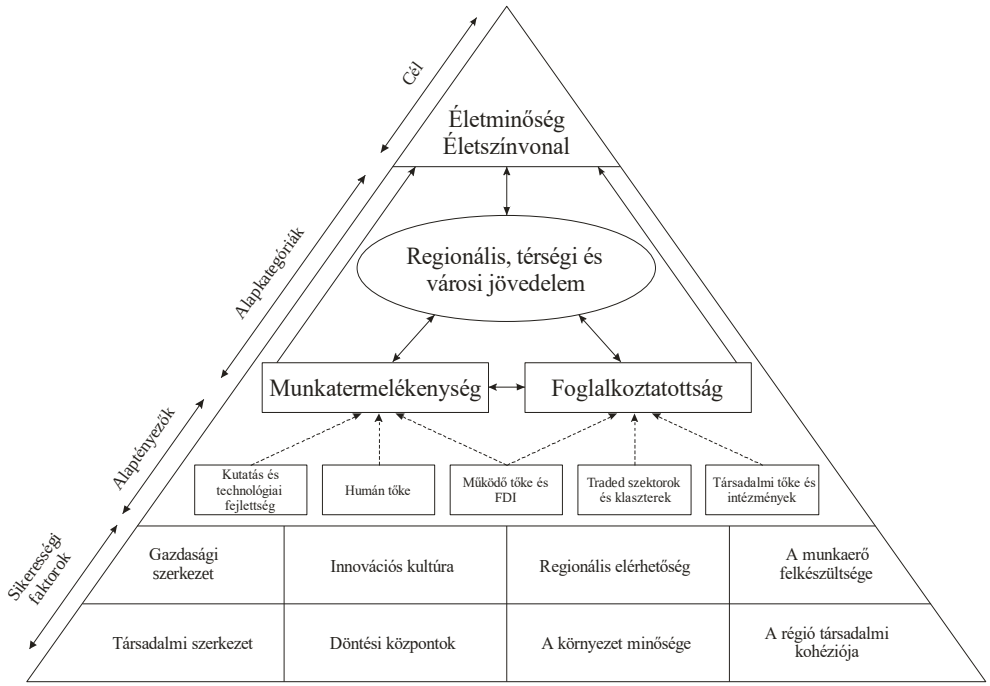
Source: Lengyel, I. (2003): *Verseny és területi fejlődés: térségek versenyképessége Magyarországon* (Competition and regional development: The competitiveness of regions in Hungary). JATEPress, Szeged (pp. 291–292).
URL: http://www.eco.u-szeged.hu/download.php?docID=40089
Független hivatkozások / Independent citations: 633

A modell változatlan formában jelent meg az alábbi publikációkban/ The model was published in an unchanged form in the following publications: Lengyel (2006a); Lengyel (2006b); Lengyel (2010).

A 2008-as válságot követően a regionális versenyképesség szakirodalmában egyre inkább előtérbe kerültek a térbeli koncentrációk (klaszterek) és a társadalmi tőke, amit a modell megújításakor megpróbáltunk figyelembe venni az alaptényezők újragondolásával. A ’kis- és középvállalkozások’ helyett megjelent a ’traded szektorok és klaszterek’, a ’humán tőke’ önálló maradt, a ’kívülről jövő befektetések’ helyére pedig a ’működő tőke és FDI’ került.

Following the crisis of 2008, spatial concentrations (clusters) and social capital gained an increased focus in the literature of regional competitiveness, which we tried to take into account when renewing the model through the reconsideration of development factors. The category of 'traded sectors and clusters' was used instead of 'small- and medium-sized enterprises', 'human capital' remained separate, and 'inward investments' was replaced by 'productive capital and FDI'.

5. ÁBRA
A regionális versenyképesség módosított piramis modellje
FIGURE 5
The modified pyramid model of regional competitiveness



Source: Lengyel, I. (2012a): A kelet-közép-európai országok régióinak versenyképessége. In Rechnitzer, J. & M. Smahó (eds.): *Járműipar és regionális versenyképesség*. Széchenyi István Egyetem, Győr, pp. 191–229. (p. 204)
URL: http://zoldhajtas.sze.hu/downloadmanager/download/nohtml/1/id/5647/m/4446
Független hivatkozások / Independent citations: 23

A megújult modell angol nyelvű verziója is megjelent 2012-ben, miután a vitaanyagként előadott tervezethez több nemzetközi konferencián hasznos kritikai észrevételek hangzottak el. A szintek elnevezései a javaslatok alapján megváltoztak: az input szint elnevezése ’competitiveness factors’ lett, míg az alapkategóriáké ’revealed competitiveness’. A sikerességi determinánsok is részben módosultak, a vállalkozókészséget az innovációs aktivitással vontuk össze, míg a regionális elérhetőséget az infrastruktúrával.

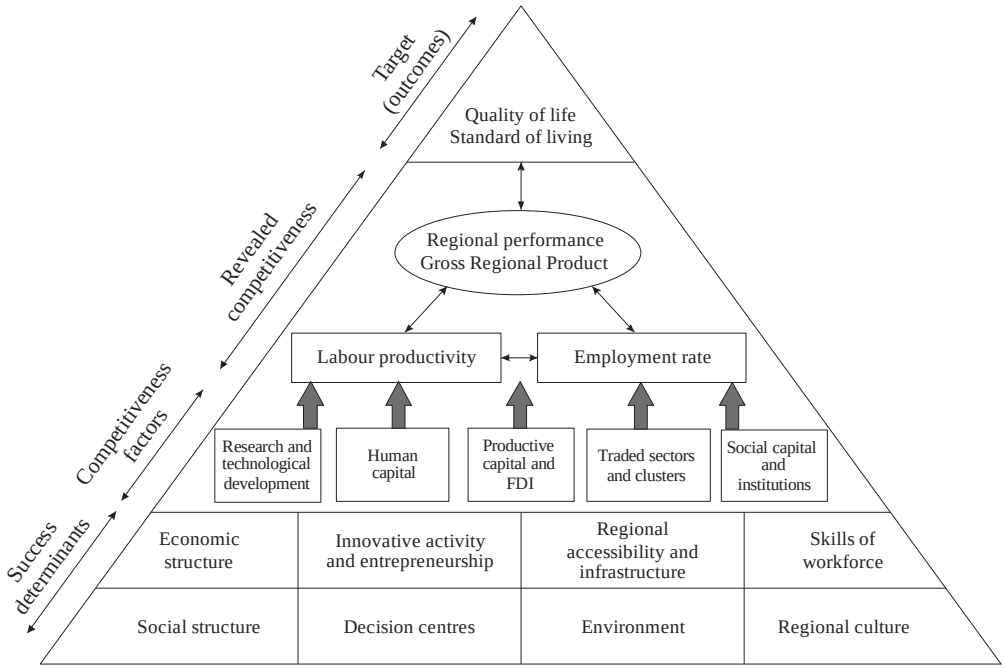
> The English version of the renewed model was also published in 2012, after receiving useful critical remarks for the draft presented as a discussion paper at several international conferences. The names of the levels were altered based on the proposals: the level of input was labelled as ‘competitiveness factors’, while the basic categories was changed to ‘revealed competitiveness’. Success determinants were also partially modified; we combined entrepreneurship with innovative activity, and regional accessibility with infrastructure.

A megújult piramismodell hazai empirikus tesztelése során a szinteknél az inputs-output-outcomes szemlélet lett kiemelve. A szintek elnevezései változtak: az angol nyelvű verzióból átkerült a ’megvalósult versenyképesség (output)’, az alaptényezők helyett ’mozgatóerők (inputs-1)’ lett, míg a sikerességi faktorok helyett ’hosszú távon ható tényezők (inputs-2)’. A növekedés elméleteknél alapul vett szokásos termelési tényezők elnevezései kerültek előtérbe, mint ’fizikai tőke’, illetve ’agglomerációs előnyök’. Az endogén fejlődés elméletekben megfogalmazódó ’stratégiai irányítás és intézmények’ pedig a társadalmi tőke helyét foglalták el. A gazdasági növekedés mérésében a GDP egyoldalúságát bíráló szakirodalmi javaslatok hatására a modellben a jólét jelent meg kiemelt célként.

> In the domestic empirical testing of the renewed model, the inputs-output-outcomes approach was emphasised in the case of the levels. The names of levels changed: ‘revealed competitiveness (output)’ was adopted from the English version, development factors was replaced by ‘drivers of competitiveness (inputs-1)’, while success determinants were replaced by ‘long-run sources of competitiveness (inputs-2)’. The names of the standard production factors used as a basis in growth theories gained focus, such as ‘physical capital’ and ‘agglomeration economies’. ‘Strategic leadership and institutions’ as a concept of endogenous development theories took the position of social capital. In the measurement of economic growth, as a result of the literature proposals criticising the unilateralism of GDP, the quality of life appeared as a major target.

Figure 1

The renewed pyramidal model of regional competitiveness

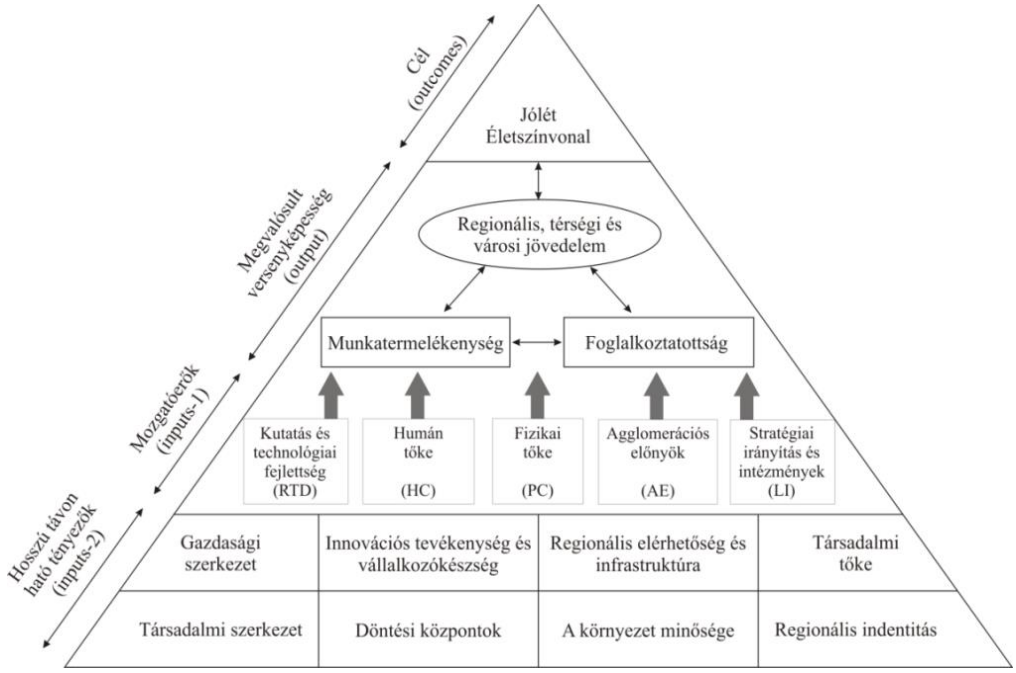


Source: Lengyel, I. & I. Szakálné Kanó (2012): Competitiveness of Hungarian Urban Microregions: Localization Agglomeration Economies and Regional Competitiveness Function. *Regional Statistics*, vol. 52., special issue 2, 27–44. (p. 30).
URL: http://www.ksh.hu/docs/hun/xftp/terstat/2012/RS02103.pdf
Független hivatkozások / Independent citations: 26

A modell változatlan formában jelent meg az alábbi publikációkban/ The model was published in an unchanged form in the following publications: Lengyel (2012b); Lengyel & Rechnitzer (2013).

1. ábra A térségek versenyképességének endogén jellegű, megújult piramismodellje

Figure 1 The endogenous, renewed pyramid model of regional competitiveness



Source: Lengyel, I. (2016a): A megyék versenyképességének néhány összefüggése a megújult piramismodell alapján. In Lengyel, I. & B. Nagy (eds.): *Térségek versenyképessége, intelligens szakosodása és újraiparosodása*. JATEPress, Szeged, pp. 143–161. (p. 149)
URL: http://www.eco.u-szeged.hu/download.php?docID=59327
Független hivatkozások / Independent citations: 5

A modell változatlan formában jelent meg az alábbi publikációban/ The model was published in an unchanged form in the following publication: Lengyel (2016b).

Ebben a módosított modellben pedig a regionális növekedés elméletekhez hasonlóan a jólét, vagy a megvalósult versenyképesség és az alaptényezők közötti összefüggésekre felírható és empirikusan vizsgálható egy *Regionális Versenyképességi Függvény* (RCF: Regional Competitiveness Function):

$$RCF = f\,(RTD, HC, PC, AE, LI)$$

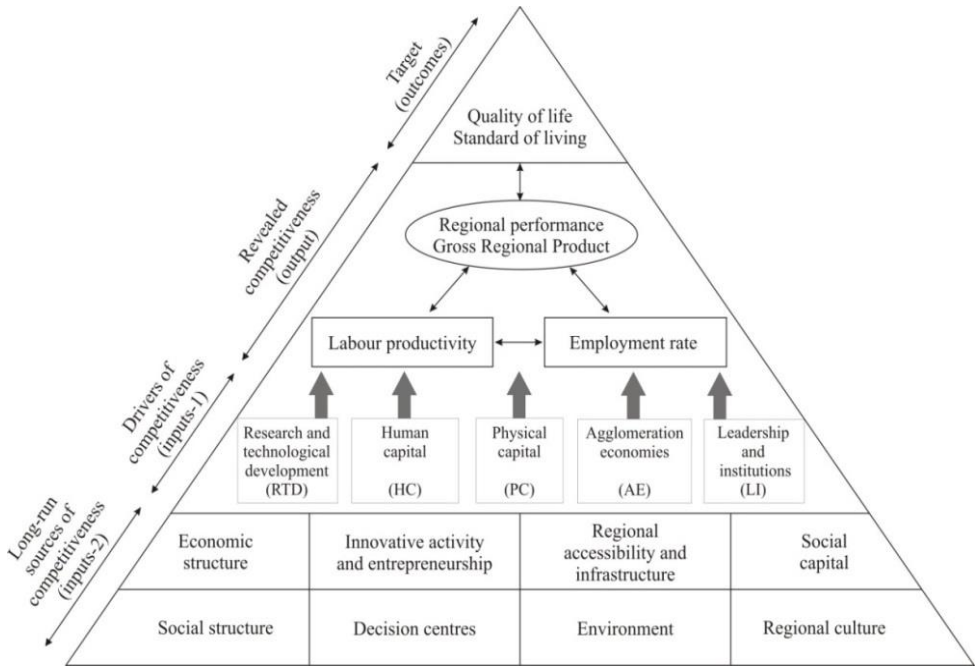
In this reconstructed model, similarly to regional growth theories, a *Regional Competitiveness Function* (RCF) can be written and empirically tested for the correlations between the quality of life or the revealed competitiveness and development factors:

$$RCF = f\,(RTD, HC, PC, AE, LI)$$

A *Regionális Versenyképességi Függvényt* több kutatás során teszteltük, a nemzetközi és saját tapasztalataink alapján kisebb finomítások történtek.

We tested the *Regional Competitiveness Function* in several research projects, and smaller refinements were made on the basis of international and our own experience.

Figure 18.1 The renewed pyramid model of regional competitiveness



Source: Lengyel, I. (2017): Competitive and uncompetitive regions in transition economies: the case of the Visegrad post-socialist countries. In Huggins, R. & P. Thompson (eds): *Handbook of Regions and Competitiveness. Contemporary Theories and Perspectives on Economic Development*. Edward Elgar, Cheltenham, pp. 398–415. (p. 402)
Független hivatkozások / Independent citations: 4

A piramismodell nemzetközi alkalmazásai /

International applications of the pyramid model

A Regional Studies Association Pisa-ban 2003-ban megtartott éves konferenciájának előadásában levő modellt vették át *Ben Gardiner*, *Ron Martin* és *Peter Tyler*, a University of Cambridge professzorai az egyik jelentős európai regionális versenyképességi vizsgálathoz. Tanulmányukban a modell néhány eleme is kisebb mértékben át lett nevezve.

The model from the presentation of the annual conference of the Regional Studies Association held in Pisa in 2003 was adopted by *Ben Gardiner*, *Ron Martin* and *Peter Tyler*, professors of the University of Cambridge, for one of the major European regional competitiveness studies. In this paper some of the elements of the model were modified.

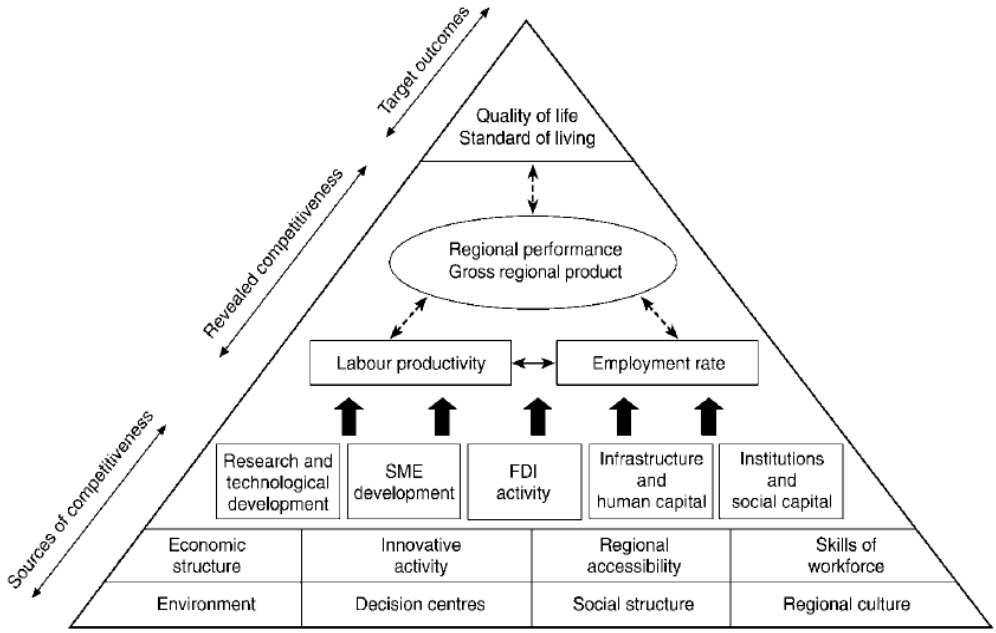


Fig. 1. *A 'Pyramidal model' of regional competitiveness*

Sources: Based on BEGG (1999), EUROPEAN COMMISSION (1999), JENSEN-BUTLER (1996), LENGYEL (2000, 2003).

Source: Gardiner, B., R. Martin & P. Tyler (2004): Competitiveness, Productivity and Economic Growth across the European Regions. *Regional Studies*, 9, pp. 1045–1067. (p. 1048)

Több angol nyelvű publikáció átvette az *Acta Oeconomica*-ban vagy a *Regional Studies*-ban megjelent tanulmányok modelljeit, időnként kissé módosítva.

Several English-language publications adopted the models of the papers published in *Acta Oeconomica* or *Regional Studies*, with some occasional modifications.

Source: Pike, A., T. Champion, M. Coombes, L. Humphrey & J. Tomaney (2006): *New Horizons Programme the Economic Viability and Self-Containment of Geographical Economies: A Framework for Analysis*. Office of the Deputy Prime Minister, London. (p. 26.)

A regionális és lokális gazdaságfejlesztési stratégiák számára is átdolgozták egy alapvető tankönyvben.

It has also been revised in a basic textbook for regional and local economic development strategies.

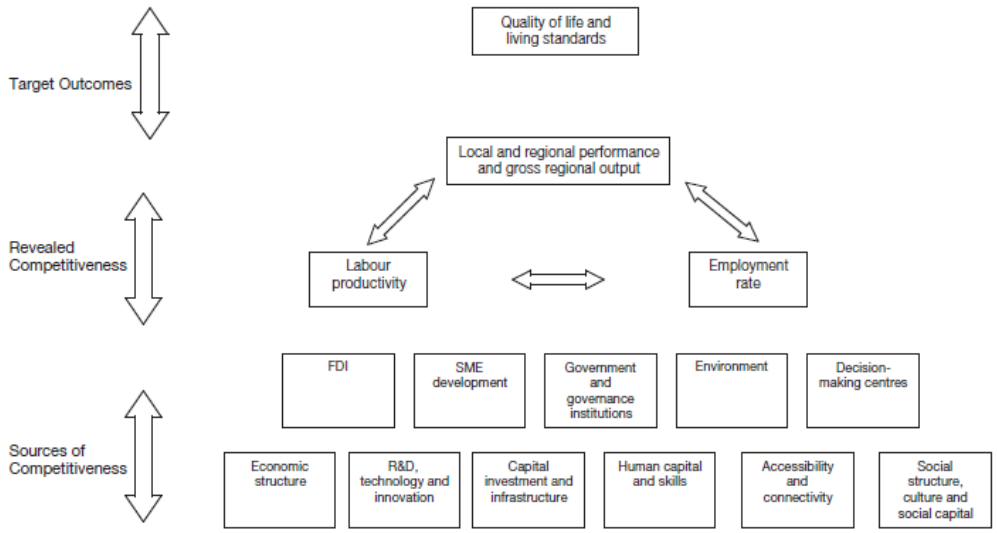


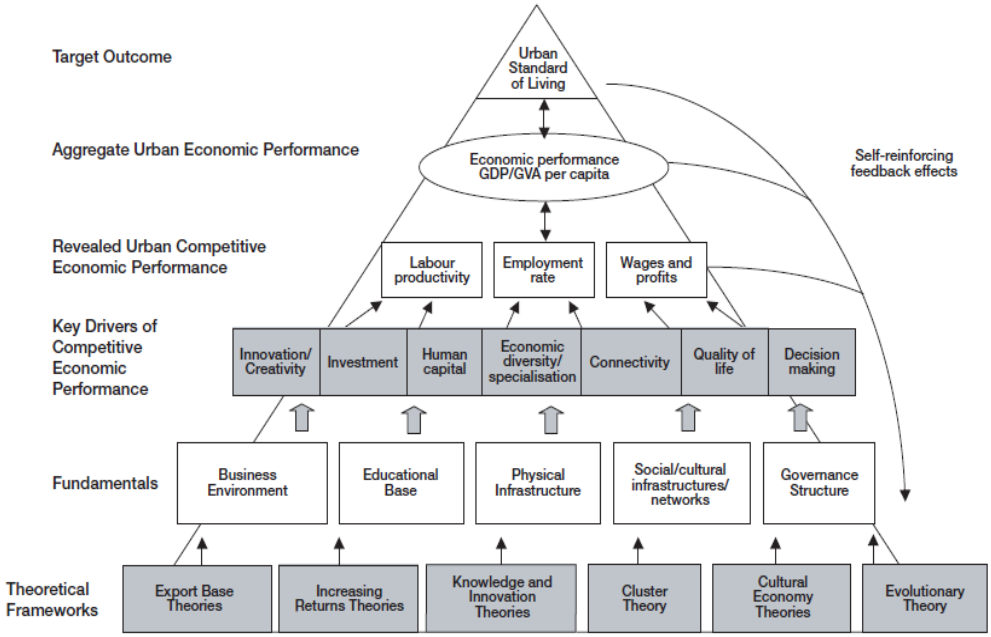
Figure 3.14 ***The 'pyramid model' of local and regional competitiveness***

Source: Pike, A., A. Rodriguez-Pose & J. Tomaney (2006): *Local and Regional Development*. Routledge, London. (p. 114)

Az Egyesült Királyságban felhasználták a módosított modellt városok versenyképességének elemzésére.

In the United Kingdom, the modified model was used to analyze the competitiveness of cities.

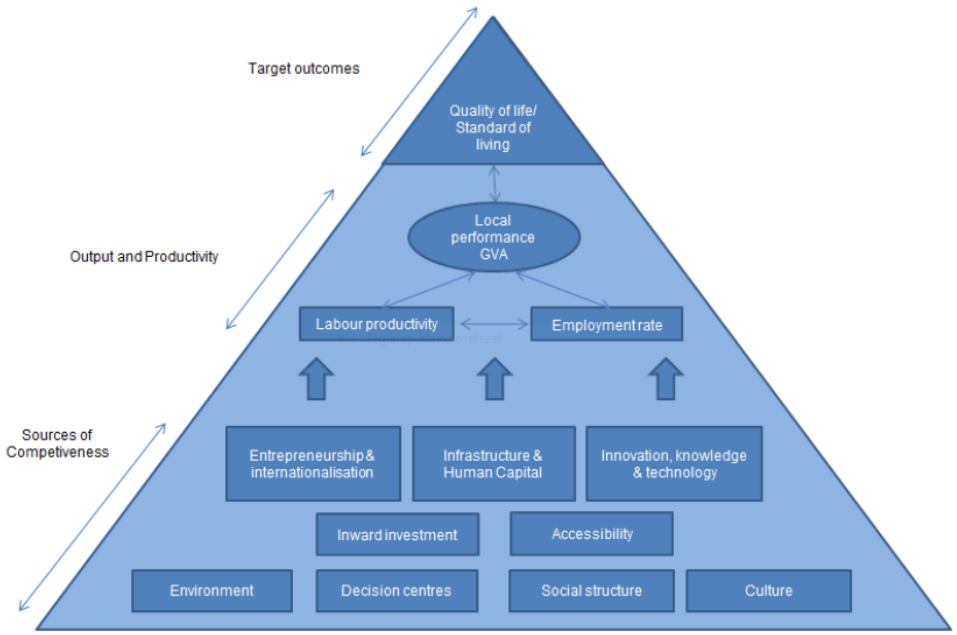
Figure 4.1: Conceptualising Urban Competitive Performance



Source: Parkinson, M. et al. (2006): *State of the English Cities. A Research Study*. Volume 1. Office of the Deputy Prime Minister, London (p. 67)
URL: http://image.guardian.co.uk/sys-files/Politics/documents/2006/03/07/StateoftheEnglishCitiespart1.pdf

Az Egyesült Királyságban felhasználták a módosított modellt térségi fejlesztési stratégiák készítésekor is.

The modified model was also used for preparing regional development strategies in the United Kingdom.

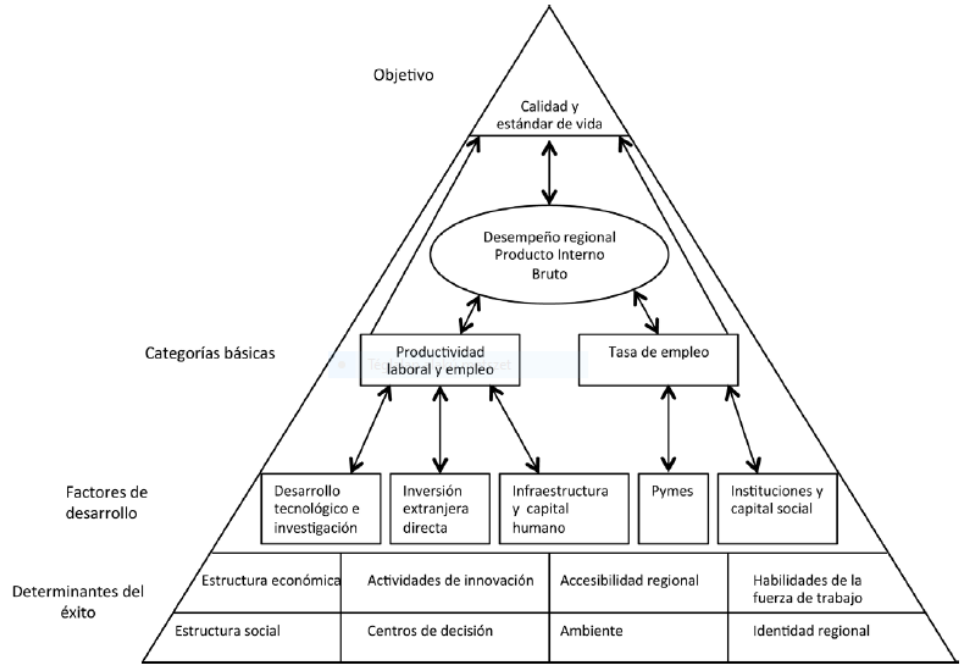


Source: Adapted from Begg (1999), Camagni (1999), EC (1999), Jensen-Butler (1996), Lengyel (2003)

Source: World Class Worcestershire. Our Strategic Economic Plan (March 2014). (p. 162)
URL: https://www.wlep.co.uk/wp-content/uploads/WLEP-Final-SEP-310314-V-1-1.pdf

Az *Acta Oeconomica*-ban 2004-ben közölt modellt spanyolra is lefordították és több spanyol nyelvű országban alkalmazták.

The model published in *Acta Oeconomica* in 2004 was also translated into Spanish and applied in several Spanish-speaking countries.



Fuente: Lengyel (2004).

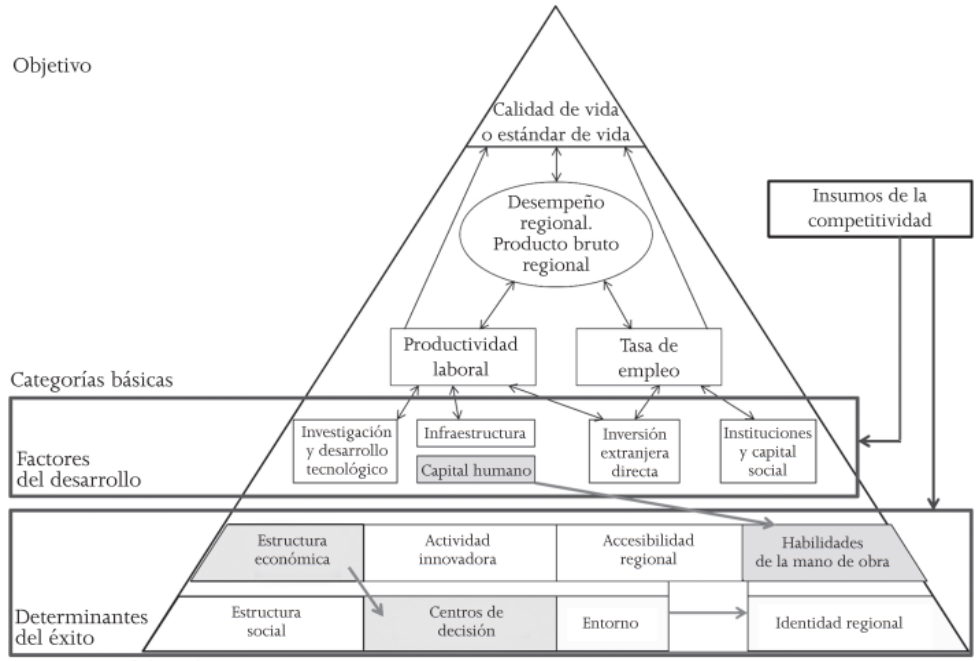
Source: Ibarra–Armenta, C. I., & A. B. Trejo–Nieto (2014): Competencia territorial: un marco analítico para su estudio. *Economía, Sociedad y Territorio*, vol. 14., no. 44., pp. 49–78. (p. 56)
URL: http://www.scielo.org.mx/pdf/est/v14n44/v14n44a3.pdf

Az empirikus vizsgálatok során a modell elemei közötti kapcsolatok értelmezésére is kísérlet történt.

There was an attempt to interpret the correlations between the elements of the model in empirical analyses.

Figura 1

Modelo piramidal ajustado de la competitividad



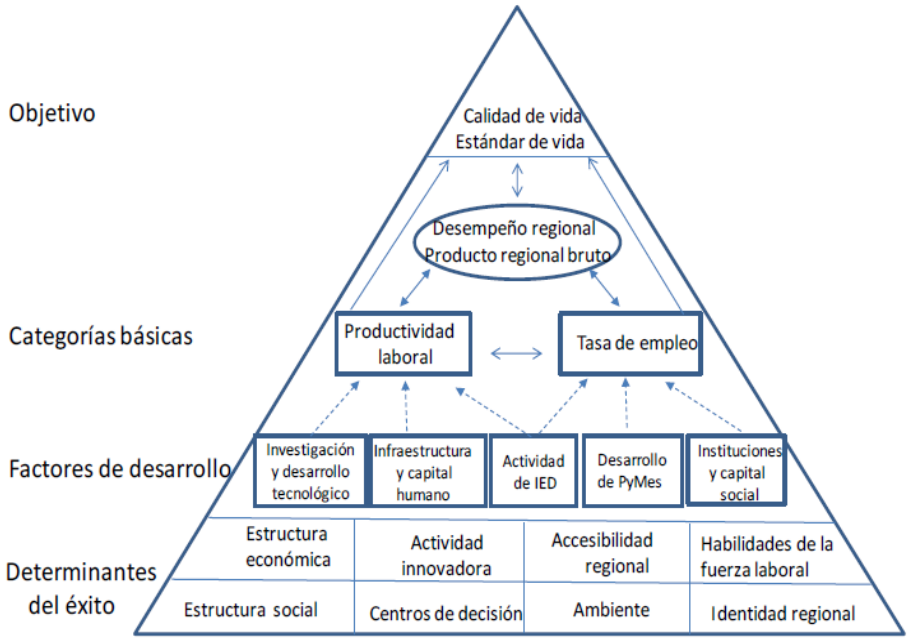
Fuente: Lengyel (2004).

Source: Esquedo, W. R. & A. N. Trejo–Nieto (2014): Desarrollo local, competitividad y apertura económica en Tamaulipas. *Region y Socieadad*, vol. 26., no. 59., pp. 113–150. (p. 121)
URL: http://www.redalyc.org/articulo.oa?id=10230714004

Az eredeti modell spanyol nyelvű PhD-disszertációba is bekerült.

The original model was also incorporated in a Spanish PhD dissertation.

Figura 2.8 Modelo de Lengyel (2004)



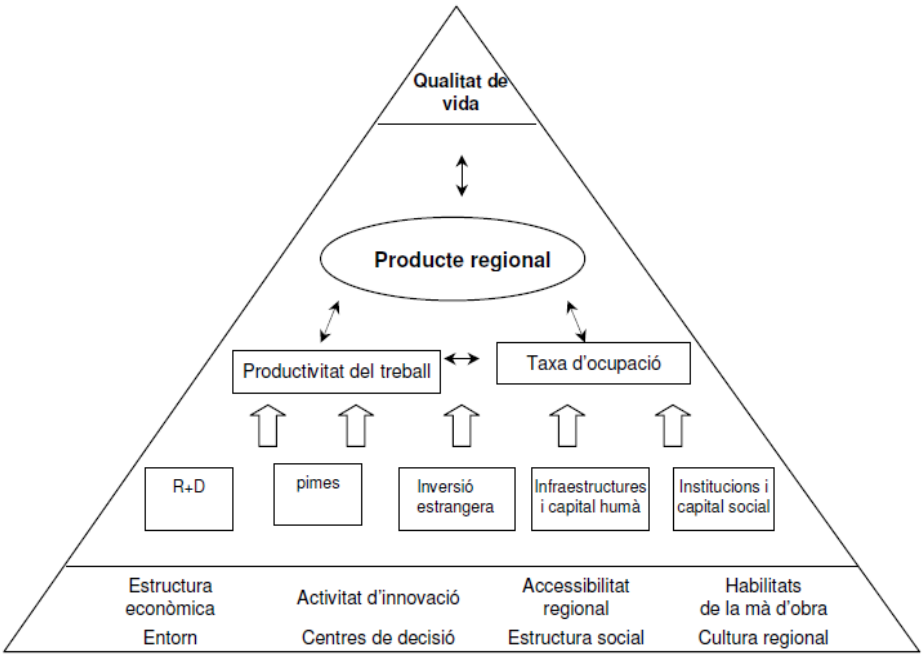
Fuente: Lengyel (2004) pág. 12

Source: Garcia, C. L. (2015): Hacia un Análisis Integral de la Competitividad Territorial: El Caso del Estado de Querétaro, México. *Tesis Doctoral*, Universidad de Deusto, Bilbao. (p. 72)
URL: http://www.orkestra.deusto.es/images/investigacion/publicaciones/tesis/Analisis-competitividad-Queretaro.pdf

Katalán nyelven is megjelent a modell egy doktori értekezésben Barcelonában.

The model was published in Catalan in a doctoral dissertation in Barcelona.

Quadre 1.2.3
Model piramidal de competitivitat regional

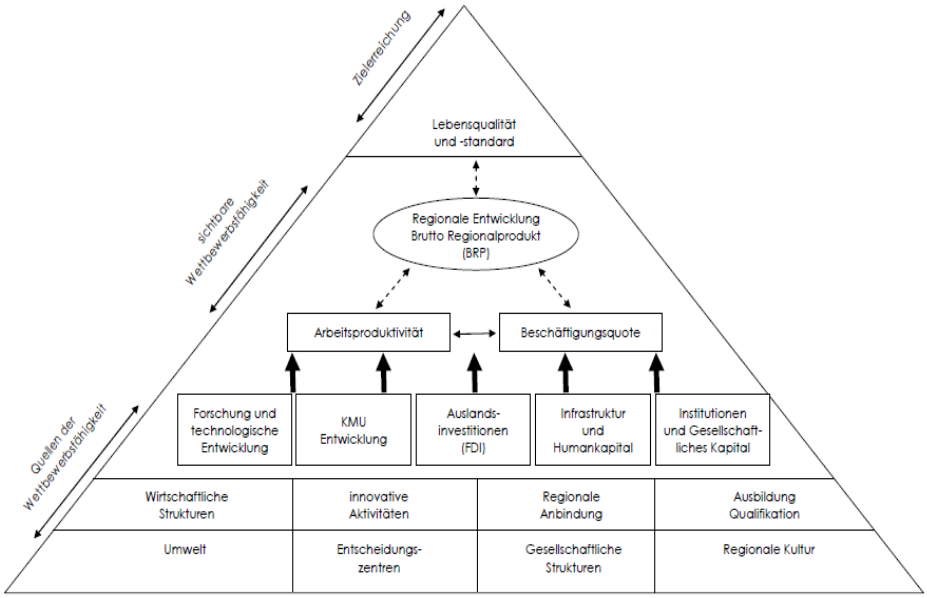


Source: Sirera, T. F. (2006): La competitivitat de les manufactures catalanes a la Unio Europea ampliada des de la perspectiva del quality gap. *Tesi doctoral*, Institut Universitari d'Estudis Europeus Universitat Autonoma de Barcelona.
URL: https://www.tesisenred.net/bitstream/handle/10803/5822/tfs1de1.pdf?sequence=1&isAllowed=y

Ausztriában lefordították német nyelvre a régiók versenyképességének vizsgálatához.

In Austria, it was translated into German to test the competitiveness of the regions.

Abbildung 3: Das Pyramidenmodell der regionalen Produktivität



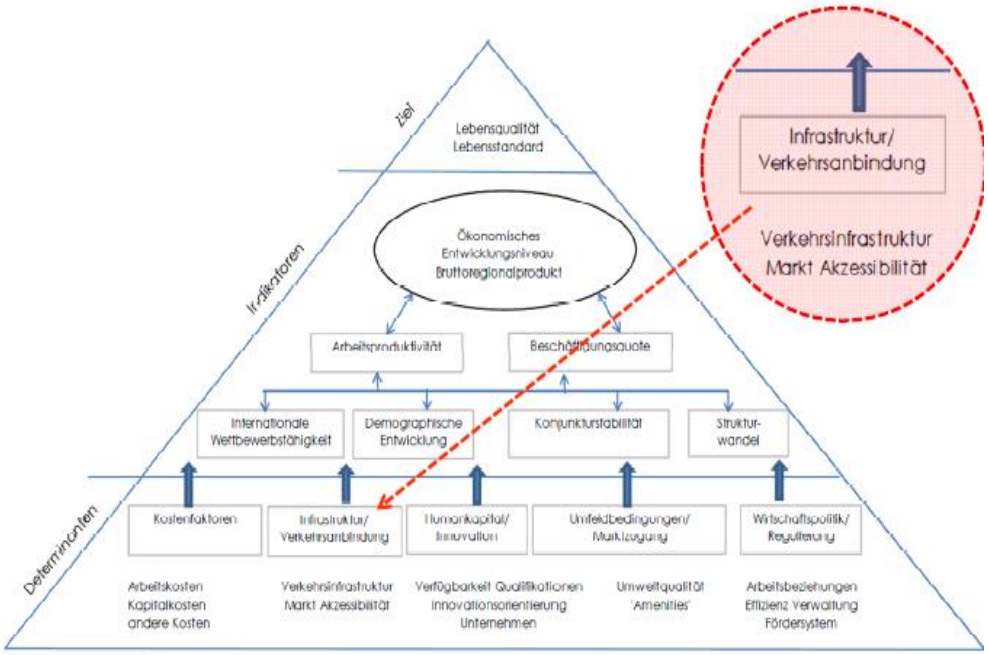
Q: *Lengyel*, 2004; eigene Übersetzung

Source: Sinabell, F. etal. (2011): *Indikatoren für die Auswirkungen des Programms der Ländlichen Entwicklung 2007/2013 in Österreich*. Österreichisches Institut für Wirtschaftsforschung, Statistik Austria, Universität für Bodenkultur Wien.
URL: https://www.wifo.ac.at/jart/prj3/wifo/main.jart?content-id=1454619331110-&publikation_id=41207&detail-view=yes

A német nyelvű modell módosított változatát célzott vizsgálatokban is felhasználták az infrastruktúra fejlesztéséhez.

A modified version of the German model was also used in targeted analyses for development of infrastructure.

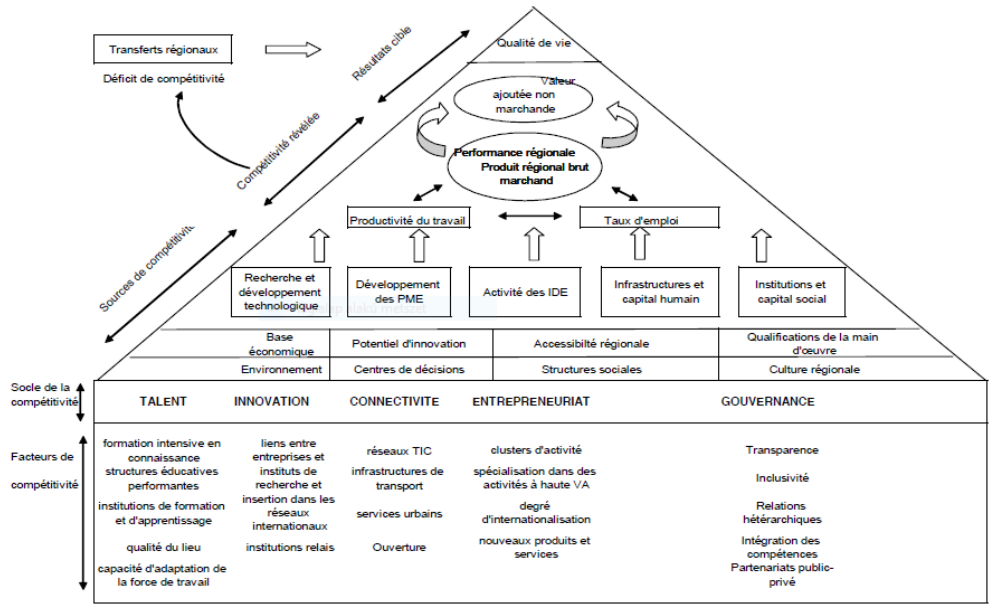
Abbildung 6: Das Pyramidenmodell der regionalen Produktivitat



Source: Schönfelder, S. (2013): *Urbane Mobilität – Finanzierung und Bewertung von Maßnahmen Ausgewählte Rahmenbedingungen*. WIFO–Vorträge, Nr. 118. (p. 4)
URL: http://www.wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?-publikationsid=46119&mime_type=application/pdf

Belgium francia nyelvű részén is használták a modellt egy regionális politikai jelentésben.

In the French-speaking part of Belgium, the model was also used in a regional policy report.



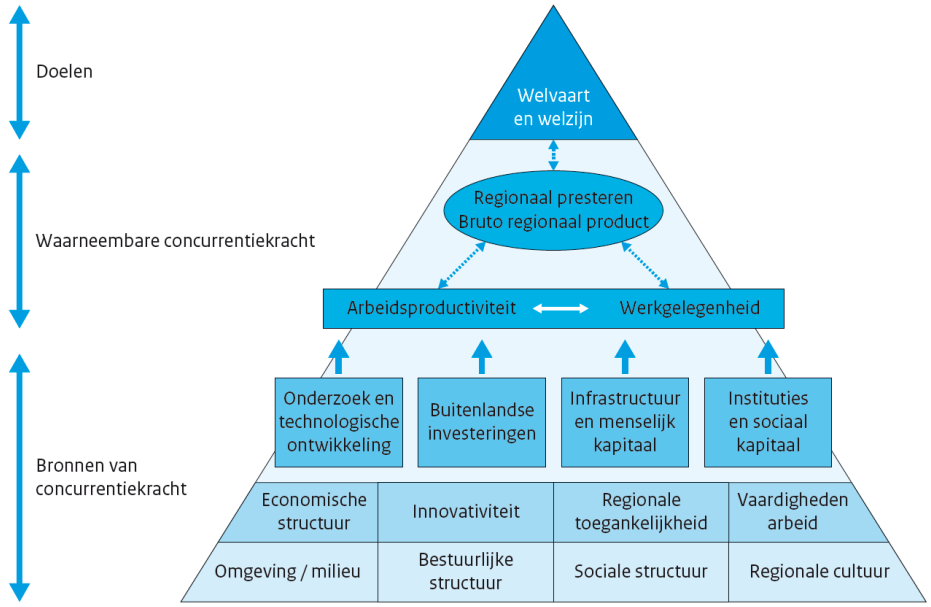
Source: Horizon 2022: *Rapport scientifique*. Version finale (Wallonie). (p. 61)
URL: https://orbi.uliege.be/bitstream/2268/167927/1/Horizon%202022_Rapport%20scientifique_V01%20-%20copie.pdf

Holland nyelven (flamandul) is megjelent a kissé módosított modell.

A slightly modified model was published in the Netherlands (in Flemish).

Figuur 1.1

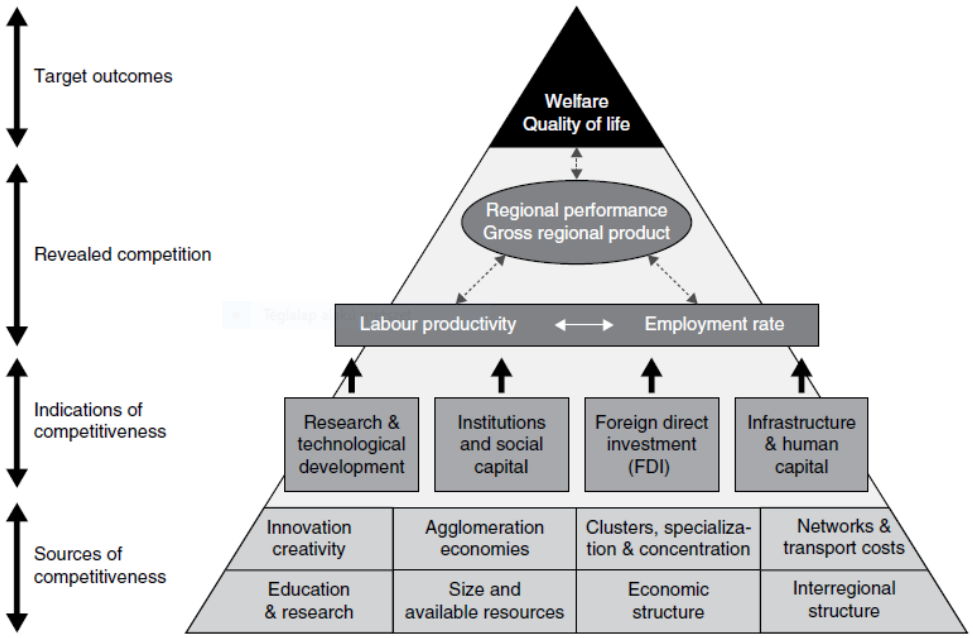
Piramidemodel van het concept 'regionale concurrentiepositie'



Source: Thissen, M., A. Ruijs, F. van Oort, D. Manting & D. Diodato (2011): *De concurrentiepositie van Nederlandse regio's. Regionaal-economische samenhang in Europa*. Planbureau voor de Leefomgeving (PBL), Den Haag. (p. 33)
URL: http://www.pbl.nl/sites/default/files/cms/publicaties/PBL-2011-De_concurrentiepositie_van_-Nederlandse_regios-500210002_1.pdf

Ezt a módosított modellt a holland szerzők angolul is publikálták az Európai Unió régiói versenyképességéről és intelligens szakosodásáról írott könyvükben.

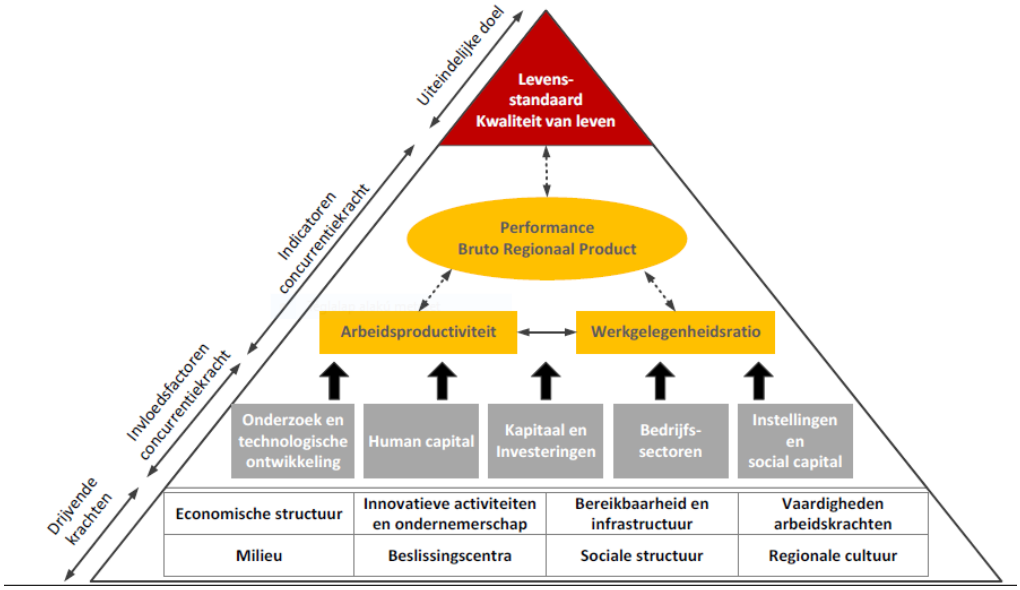
This revised model was also published in English by the Dutch authors in their book on competitiveness and smart specialization of the regions in the European Union.



Source: Thissen, M., F. van Oort, D. Diodato & A. Ruijs (2013): *Regional Competitiveness and Smart Specialization in Europe: Place-based Development in International Economic Networks*. Edward Elgar, Cheltenham. (p. 50)

A modell újabb, 2013-as változatának módosítását is alkalmazták Hollandiában egy kutatási jelentésben.

The modification of a newer, 2013 version of the model was applied in the Netherlands in a research report.



Bron: Lengyel & Rechnitzer, 2013.

Source: Panteia, Onderzoek Economische Betekenis, 2015 (p. 5)
URL: http://www.regiorivierenland.nl/uploads/images/Mobiliteit/Onderzoek Economische betekenis.pdf

Olaszul is megjelent a modell Svájcban Ticino kanton éves jelentésében, először 2011-ben.

The model was published in Italian in Switzerland in the annual report of the Canton of Ticino, first in 2011.

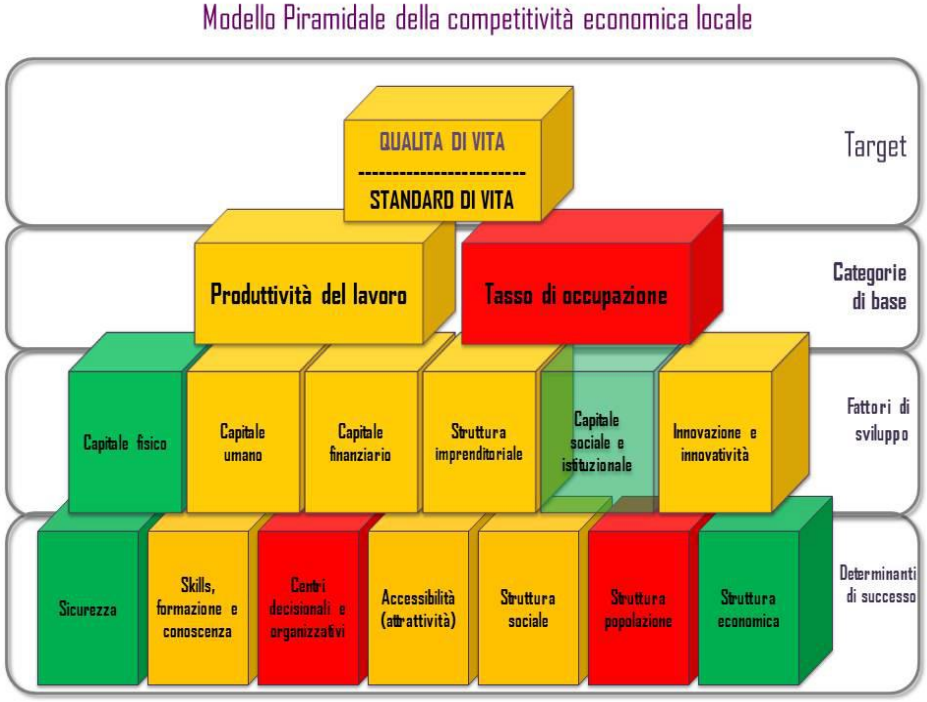


Figura 2: La valutazione della competitività del Ticino rispetto al resto dei cantoni svizzeri seguendo il modello piramidale.

Source: Mini, V. & A. Airaldi (2012): *Competitivitá Economica 2011. Rapporto sulla struttura economica ticinese*. Istituto di Ricerche Economiche, Universitá della Svizzera Italiana, Lugano. (p. 11)
URL: http://www.opol.usi.ch/sites/www.opol.usi.ch/files/uploads/rapporto-o-pol-2011.pdf

Ez az olasz változat az évek során kissé módosult.

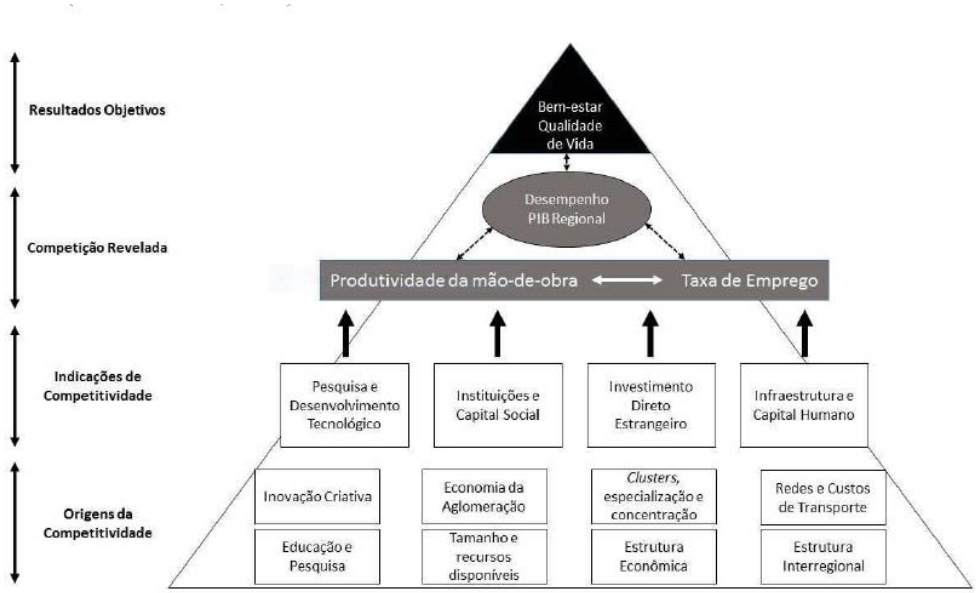
This Italian version was slightly modified over the years.

Figura 2: **LA VALUTAZIONE DELLA COMPETITIVITÀ DEL TICINO RISPETTO AL RESTO DEI CANTONI SVIZZERI SECONDO IL MODELLO PIRAMIDALE.**

Source: Rossi, F. & P. Malfitano (2015): *Competitività economica 2015*. Istituto di ricerche Economiche, Universitá della Svizzera Italiana, Lugano. (p. 6)
URL: https://ssl.lu.usi.ch/entityws/Allegati/3014678_635957118168528000.pdf

Portugál nyelven is megjelent a modell egy doktori értekezésben Brazíliában.

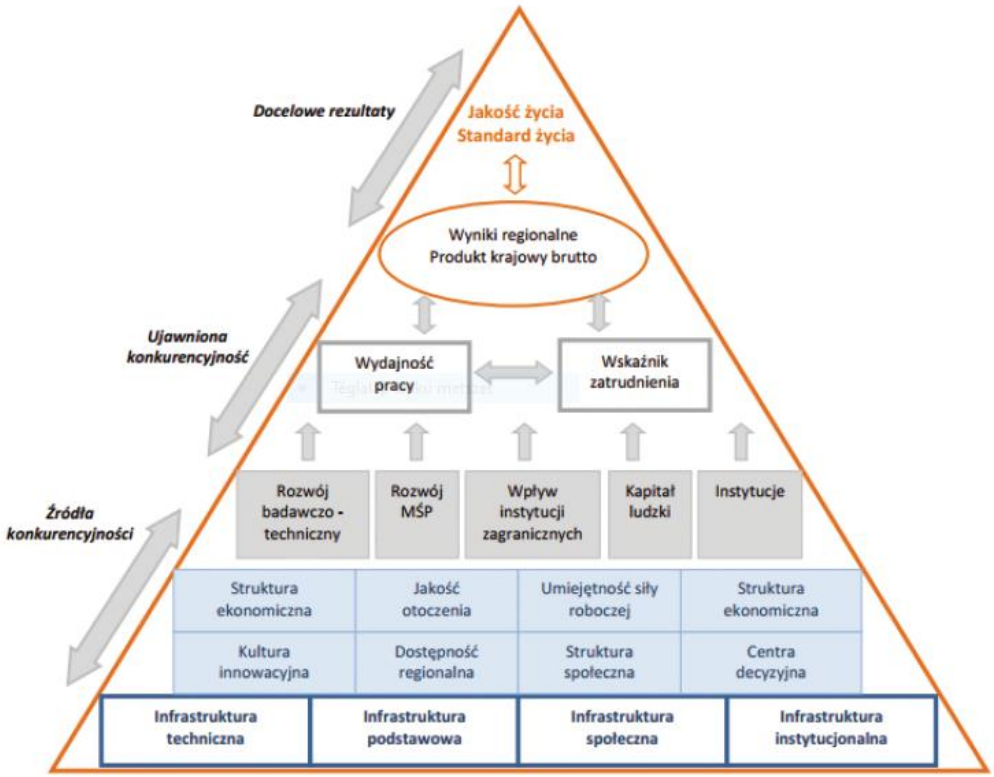
The model also appeared in Portuguese in a Ph.D. dissertation in Brazil.



Source: Canuto, K. C. (2018): Fatores de competitividade municipal: proposta de modelo de análise por meio de variáveis de natureza econômica, social e tecnológica. *Tese (Doutorado)*, Universidade Federal do Paraná, Curitiba. (p. 11)
URL: https://www.prppg.ufpr.br/siga/visitante/trabalhoConclusaoWS?idpessoal=14407&idprograma=40001016025P6&anobase=2018&idtc=1345

Lengyel nyelven is megjelent a modell, amit kiegészítettek egy speciális elemzéshez.

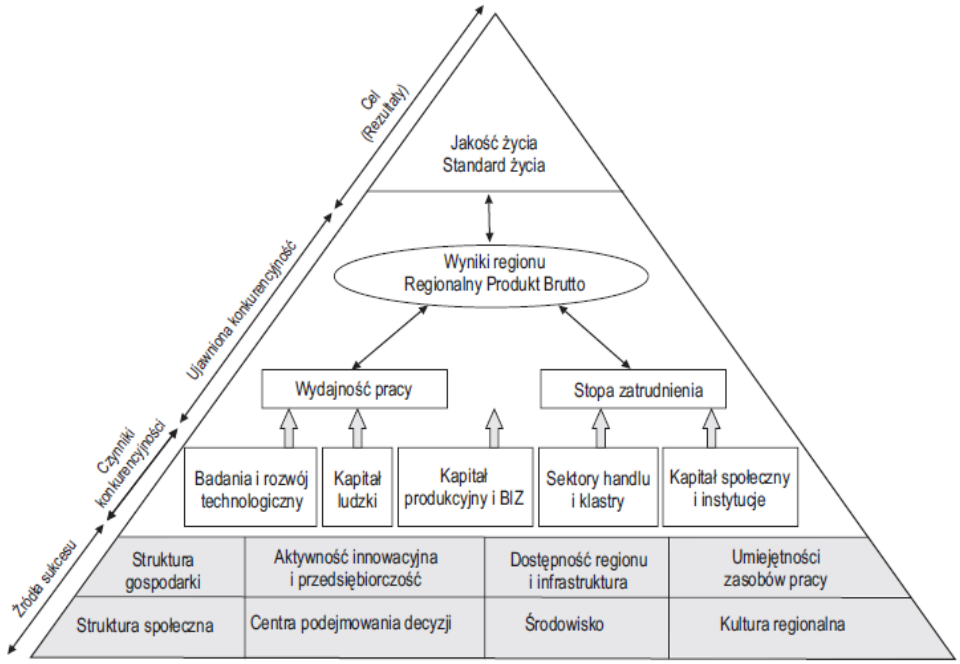
The model was published in Polish; it was completed for a special analysis.



Source: Gołębiewski, J. & O. Podlińska (2015): Determinanty konkurencyjności polskich regionów w Unii Europejskiej. *Prezgląd Zachodniopomorski*, Rocznikik XXX (LIX) Zeszyt 2, pp. 7–20. (p. 10)
URL: http://przegladzachodniopomorski.pl/wp-content/uploads/2015/12/-PZ_2015_2.pdf

Lengyelországban a 2013-as megújult modellt is alkalmazták.

The renewed model of 2013 was also applied in Poland.



Rysunek 1. Piramidalny model konkurencyjności regionalnej

Źródło: I. Lengyel, J. Rechnitzer, *The Competitiveness of Regions in the Central European Transition Countries*, „The Macrotheme Review" 2013, nr 2(4), s. 108.

Source: Kozlak, A. (2013): Miejsce dostepnosci transportowej w koncepcji scynników konkurencyjnosci regiónow. In Bak, M. (ed): *Infrastruktura transportu a konkurencyjnosc gospodarcza*. Uniwersytetu Gdańskiego, Ekonomika Transportu i Logistyka, Nr 49., pp. 75–89. (p. 82)
URL: http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.ekon-element-4b087f68-2886-3739-8f60-d0886006fcdd

Lengyel kutatók a mezőgazdaság versenyképességének elemzésére is adaptálták.

Polish researchers also adapted it for analysing the competitiveness of agriculture.

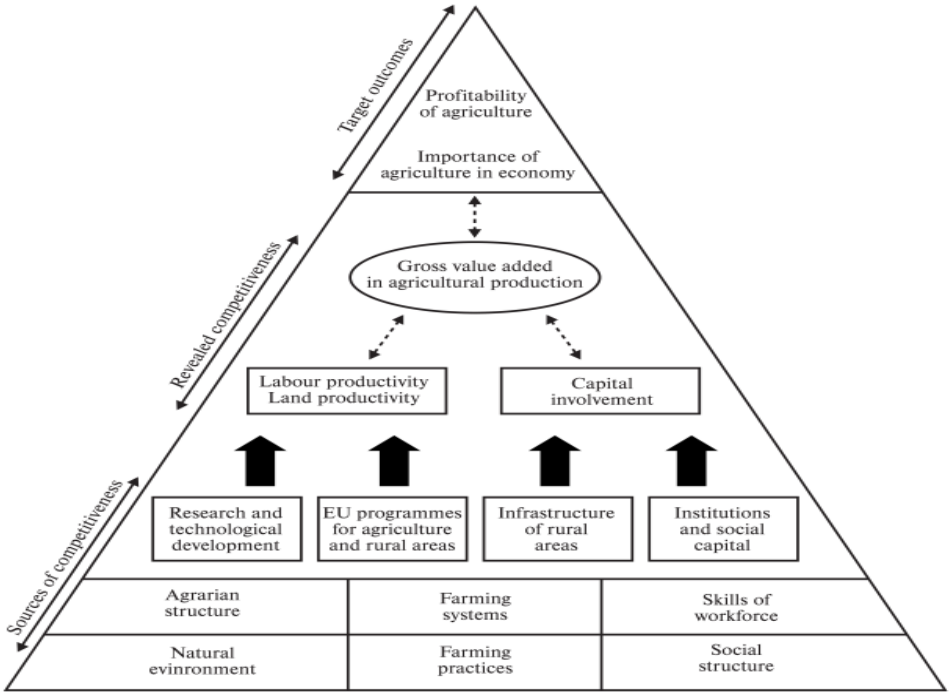


FIGURE 1. Model of the regional competitiveness of agriculture
RYSUNEK 1. Model regionalnej konkurencyjności rolnictwa

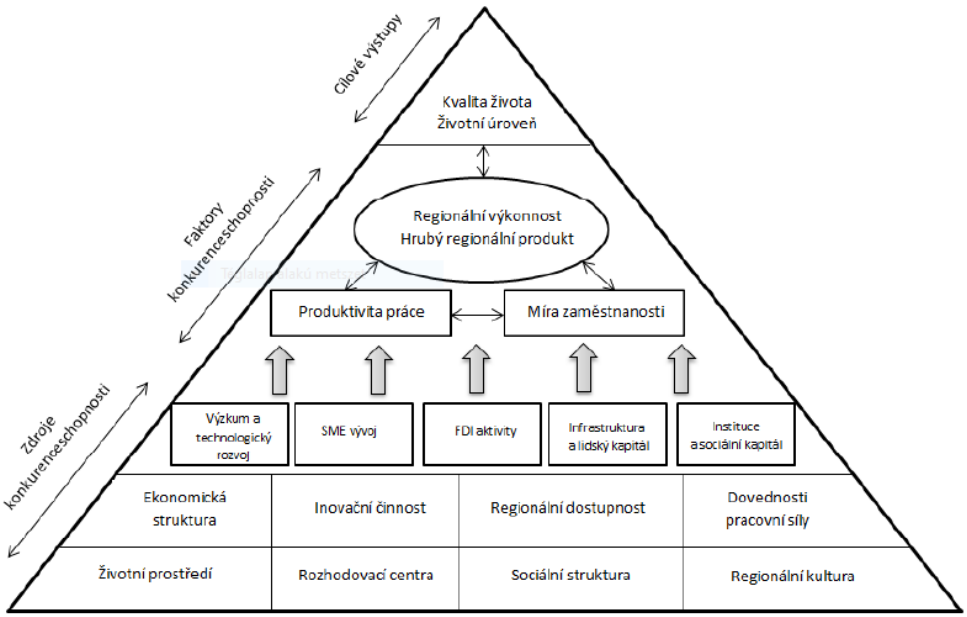
Source: own compilation on the basis of Begg [1999], European Commission [1999], Jansen-Butler [1996], Lengyel [2000, 2003] and Gardiner et al. [2004].

Source: Kolodziejczak, A. & T. Kossowski (2014): Regional competitiveness of agriculture in Poland. *Wieś i Rolnictwo (Village and Agriculture)*, 3., pp. 57–70. (p. 60)
URL: http://www.kwartalnik.irwirpan.waw.pl/dir_upload/photo/-9aa235c9436e497d7251da86dfb8.pdf

Cseh nyelven is megjelent Gardiner és szerzőtársai (2004) tanulmánya alapján.

Also published in Czech, according to Gardiner et al. (2004).

Obr. 1: Pyramidový model regionální konkurenceschopnosti

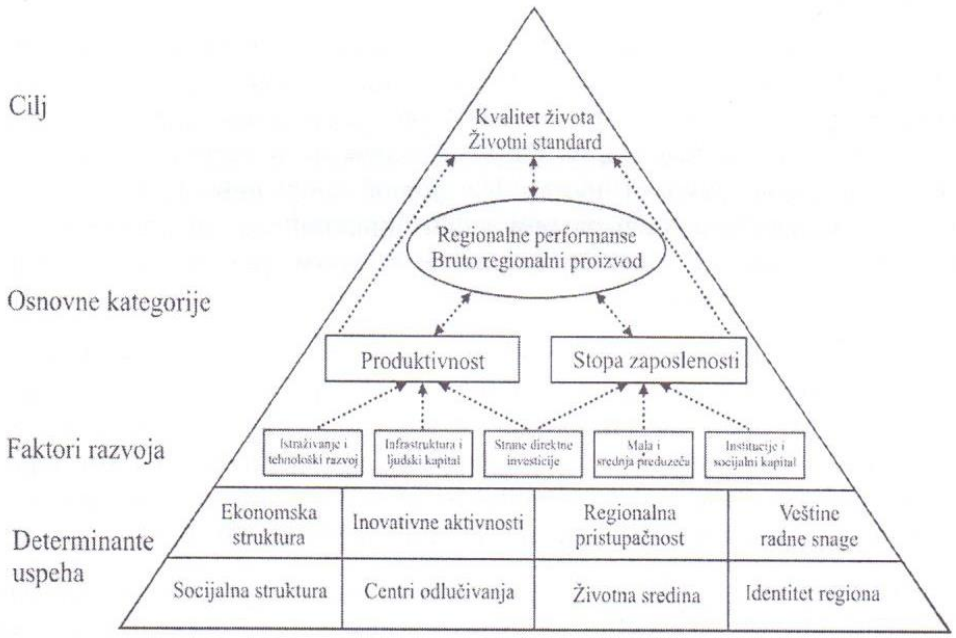


Source: Šimáčková, K. – Puchýř, B. (2013): Faktory působící na konkurenční schopnost regiónu (Moravskoslezský kraj). *Proceedings of Construction Macroeconomics Conference*. Czech Technical University in Prague.
URL: http://www.conference-cm.com/podklady/history4/Prispevky/prispevek_ Simackova_ Puchyr_VUT.pdf

Az eredeti modellt szerb nyelvre is lefordították és latin betűs tanulmányban publikálták.

The original model was translated into Serbian and was published in a paper in Latin script.

Slika 1. Piramidalni model regionalne konkurentnosti [7, str. 335]



Source: Krstic, B. & D. Vukadinovic (2011): Determinante Konkurentnosti MSPP – Pretpostavke za Revnomerni Regionalni Razvoj. *Regionalni razvoj i demografski tokovi zemalja jugoistočne Evrope*. Univerzitet u Nisu, Ekonomski Fakultet, 26, pp. 553–568. (p. 556)
URL: http://bojankrstic.net/wp-content/uploads/2013/clanci/103/determinante%-20konkurentnosti%20mspp.pdf

Az eredeti modellt szerb nyelvű cirill betűs PhD értekezésben is publikálták.

The original model was also published in PhD dissertation in Serbian by Cyrillic script.

Извор: Lengyel (2004, стр. 336), превод: Аутор

Source: Вуковић, Д. (2013): Модел Регионалне Конкурентности: Теоријско - Методолошка Анализа и Могућности Примене у Србији. *PhD thesis*, University of Kragujevac, Serbia (p. 184)
URL: https://fedorakg.kg.ac.rs/fedora/get/o:217/bdef:Content/get

Oroszul is publikálták a modellt, amit kiegészítettek egy statisztikai elemzéshez.

The model was published in Russian, it was completed for a statistical analysis.

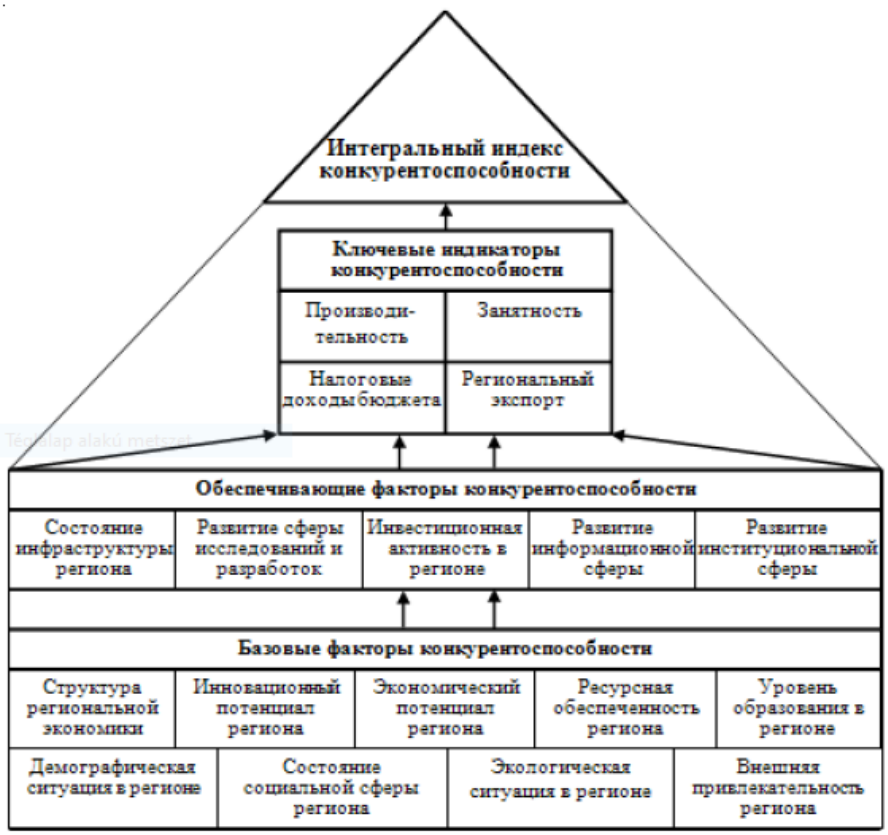


Рис. 1. Пирамидальная система факторов и индикаторов региональной конкурентоспособности

Source: Кузьмин, О. М. (2010): Статистическое исследование конкурентоспособности регионов России. *Статистика и экономика*, 6, pp. 165–169. (p.166)
URL: http://cyberleninka.ru/article/n/statisticheskoe-issledovanie-konkurentosposobnosti-regionov-rossii

Orosz nyelven a kifejezéseket kissé másképp lefordítva az előzőhöz képest egy regionális politikai tanulmányban.

In Russian, the terms are translated slightly differently from the previous one in a regional political study.

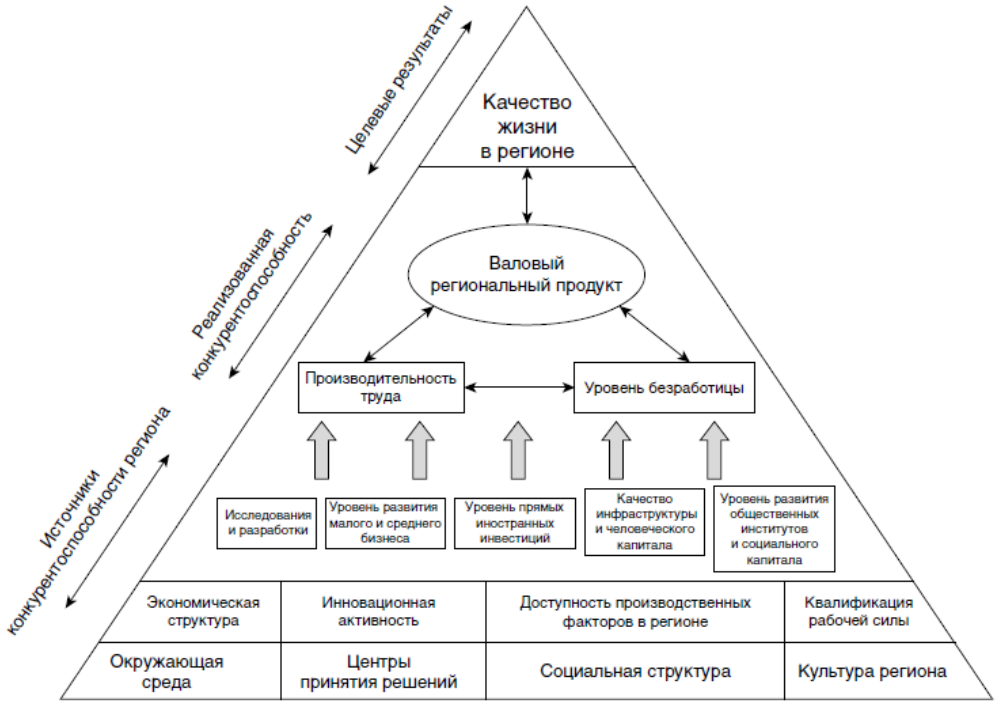
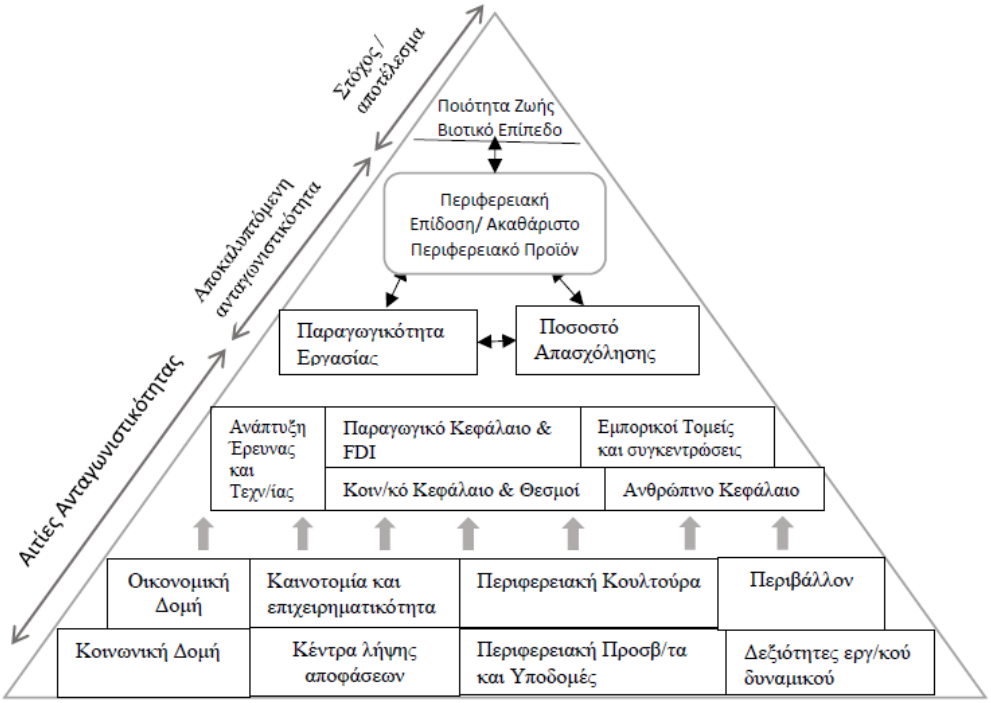


Рис. 1. Пирамидальная модель региональной конкурентоспособности[3]

Source: Khasanov, R. (2014): Regional policy of competitiveness. Theory and international experience. *Современная конкуренция*, 4., pp. 93–100. (p. 97)
URL: https://cyberleninka.ru/article/v/regionalnaya-politika-povysheniya-konkurentosposobnosti-teoriya-i-mezhdunarodnyy-opyt-1

Görög nyelven is megjelent a modell a régiók versenyképességével és a regionális politikával foglalkozó doktori értekezésben.

> The model was also published in Greek in a PhD thesis on regional competitiveness and regional policy.

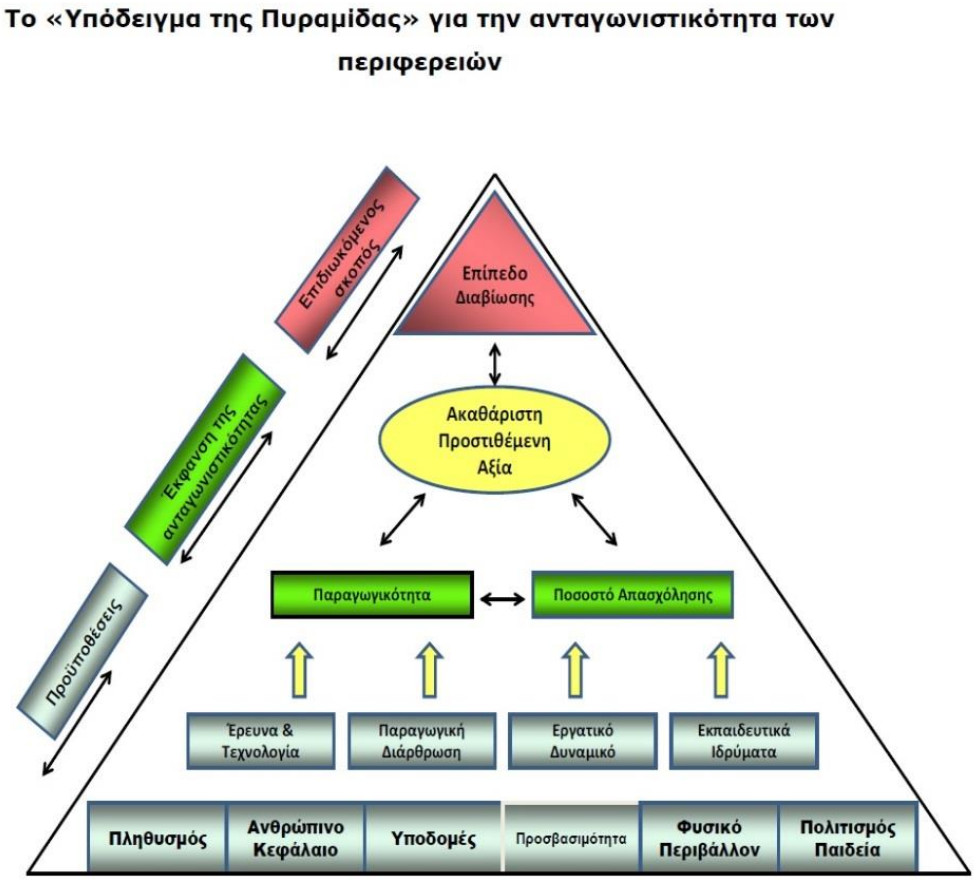


Σχήμα 1: Μοντέλο της Πυραμίδας (pyramid model) για την μέτρηση της περιφερειακής ανταγωνιστικότητας. Πηγή: Lengyel (2004)

Source: Ζακυνθινού Αικατερίνη (2018): Ποσοτική Εκτίμηση και Αξιολόγηση της Περιφερειακής Ανταγωνιστικότητας στην Ελλάδα. *Τμήμα Μηχανικών Χωροταξίας, Πολεοδομίας και Περιφερειακής Ανάπτυξης,* Βόλος, Ιούνιος. (p. 40)
URL: http://ir.lib.uth.gr//handle/11615/48907

Egy módosított verzió görög nyelven is megjelent a Gardiner et al. (2004) tanulmányra hivatkozva.

A modified version was published in Greek, referring to the paper of Gardiner et al. (2004).



Source: URL: http://ireteth.certh.gr/specialisation/

Ukránul is közölték a régiók versenyképességeinek tényezőit ismertető egyik tanulmányban.

It was also reported in Ukrainian in a paper on the factors of regional competitiveness.

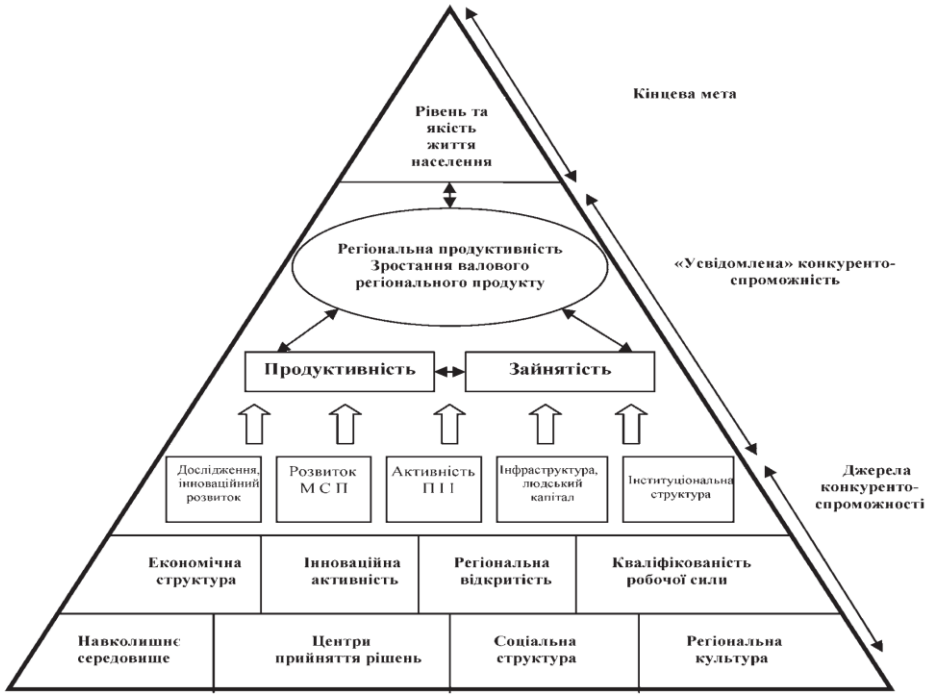
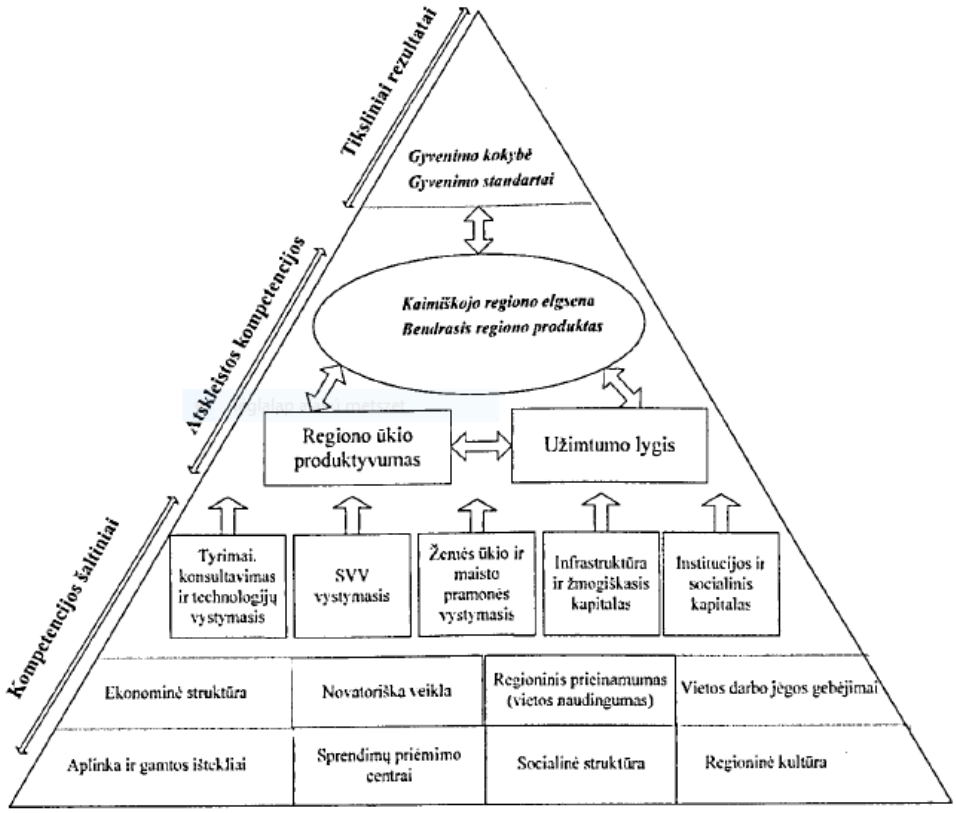


Рисунок 1 «Пірамідальна модель» конкурентоспроможності регіону за [21, с. 7].

Source: Ісиченко І.В. (2010): Фактори конкурентоспроможності регіону. *Український географічний журнал*, No 1., pp. 40–47. (p. 45)
URL: http://www.nbuv.gov.ua/old_jrn/natural/UGJ/2010_1/07-Isychenko.pdf

Litván nyelvű tanulmányban is felhasználták a modellt rurális térségek versenyképességét befolyásoló tényezők vizsgálatához.

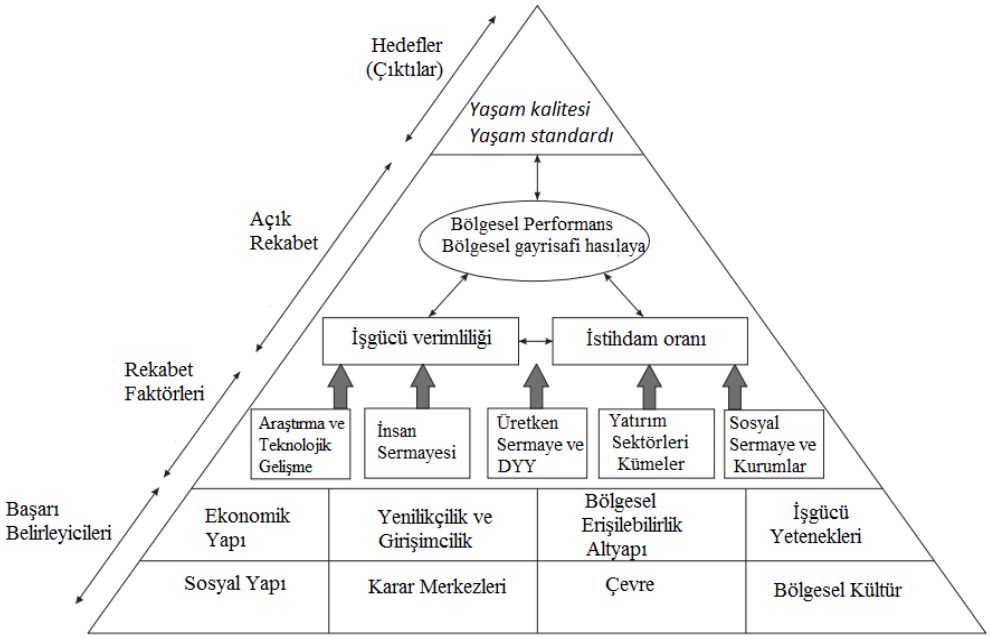
The model was also used in the Lithuanian-language study to examine the factors influencing the competitiveness of rural areas.



Source: Atkociuienė, V. (2009): KAIMO VIETOVIŲ KONKURENCINGUMĄ LEMIANTYS VEIKSNIAI. *Ekonomika ir vadyba: Aktualijos ir Perspektyvos*, 3., pp. 49–59. (p. 52)
URL: https://etalpykla.lituanistikadb.lt/object/LT-LDB-001:J.04~2009~1367170524284/J.04~2009~1367170524284.pdf

Török nyelven is publikálták a modellt egy turizmust elemző publikációban.

The model was also published in Turkish in a paper analyzing tourism.

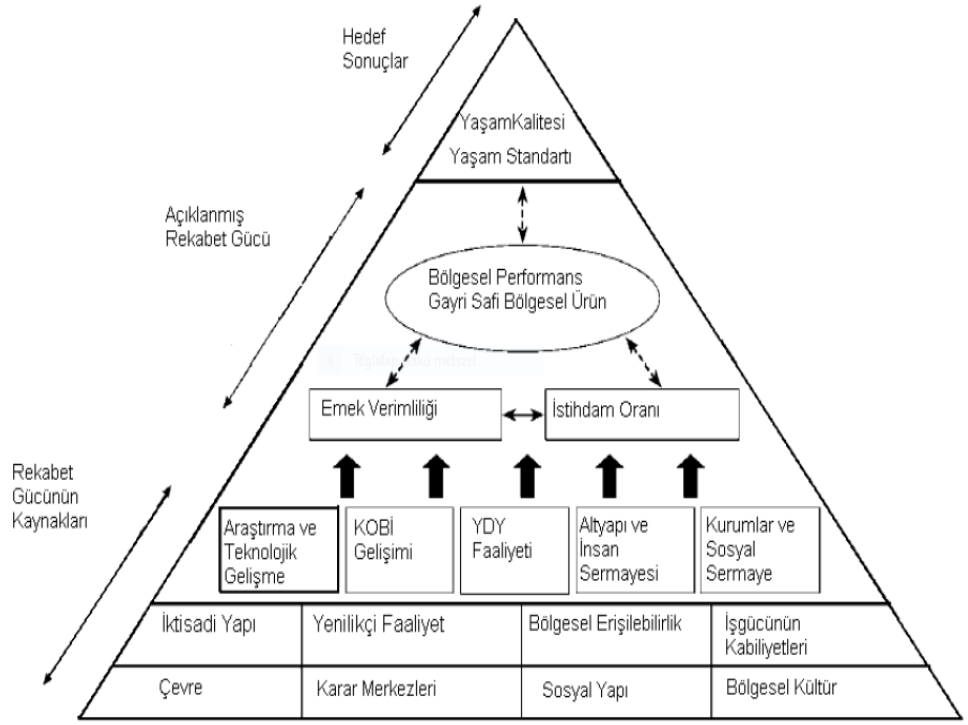


Şekil-2: Rekabet Faktörleri Piramidi

Source: Halis, M., M. Ehadov & M. Halis (2015): Azerbaycan / Gence Bölgesi Turizm Sektörünün Rekabet Analizi. *Kastamonu Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi Nisan*, Sayı 12, pp. 561–571. (p. 562)
URL: http://iibf.kastamonu.edu.tr/images/dergi/s12/sayi.12.makale.35.pdf

Török nyelven megjelent a modell egy műhelytanulmányban is a kifejezéseket az előzőhöz képest másképpen lefordítva.

In Turkish, the model appeared in a workshop study, translating the terms differently from the previous one.

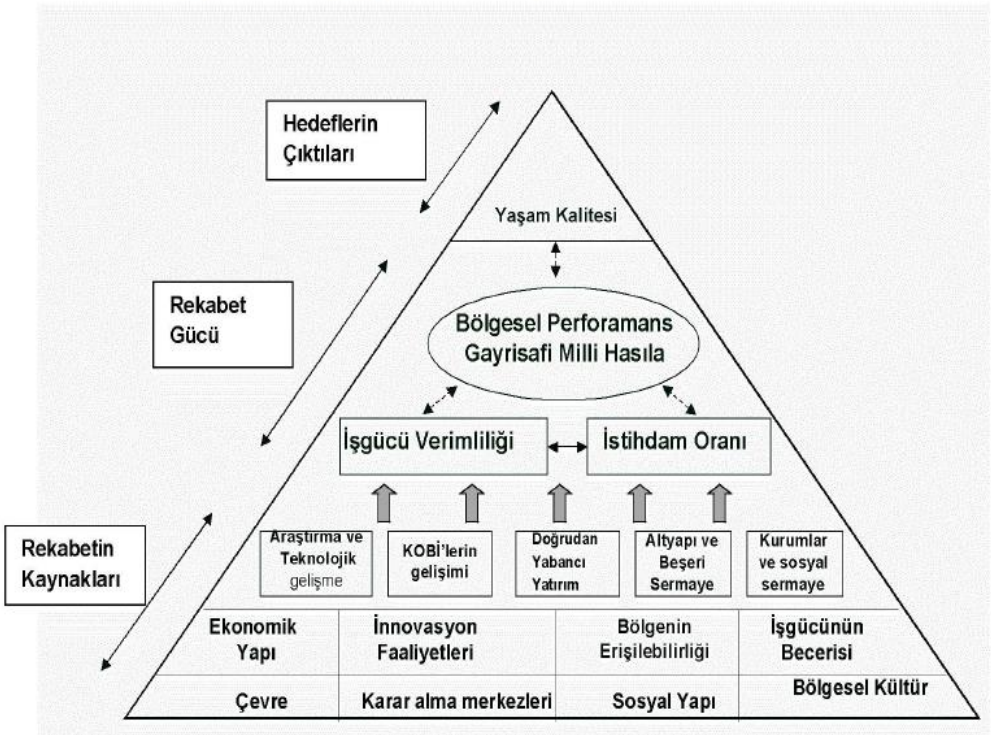


Source: Kumral, N. – Akgüngör, S. – Güçlü, M. (2012): Rekabet gücü, yasam kaldtesd ve yaraticilik: Türkdye düzey 2 bölgereld. *Working Papers in Economics*, Ege University. *URL:* https://www.researchgate.net/publication/241756833_Rekabet_Gucu_Yasam_Kalitesi_ve_Yaraticilik_Turkiye_Duzey_2_Bolgeleri

Egy török nyelvű PhD értekezésben újrafordították a modellt szintén más kifejezésekkel.

In a PhD thesis in Turkish, the model was re-translated in other terms.

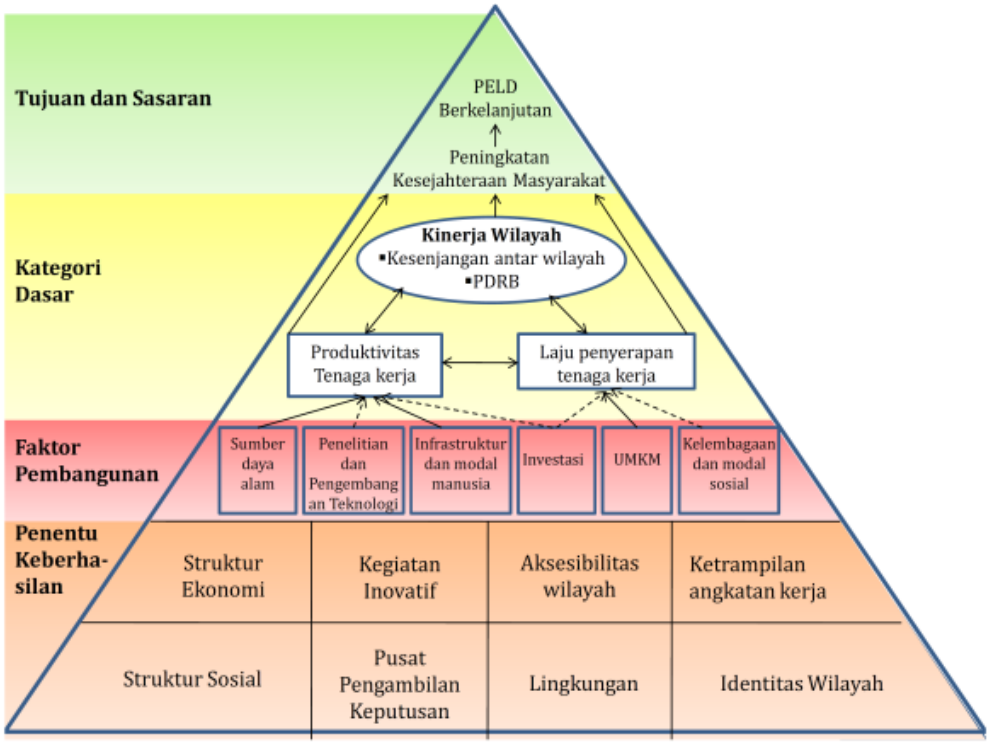
Şekil 1 Bölgesel Rekabet Edebilirlik Modeli[362]



Source: Özer, Y. E. (2009): Bölgesel kalkinma ajanslarinin yapilanmasi ve islevselligi: Izmir ve cukurova örnekleri *Doktora Tezi*, Dokuz Eylul Universitesi.
URL: https://www.hepsiburada.com/bolgesel-kalkinma-ajanslarinin-yapilanmasi-ve-islevselligi-izmir-ve-cukurova-ornekleri-pm-kekinbasim01294

Az eredeti modell indonéz nyelven is megjelent a versenyképességen alapuló regionális gazdaságfejlesztési stratégiában.

The original model also published in Indonesian in the regional economic development strategy based on competitiveness.



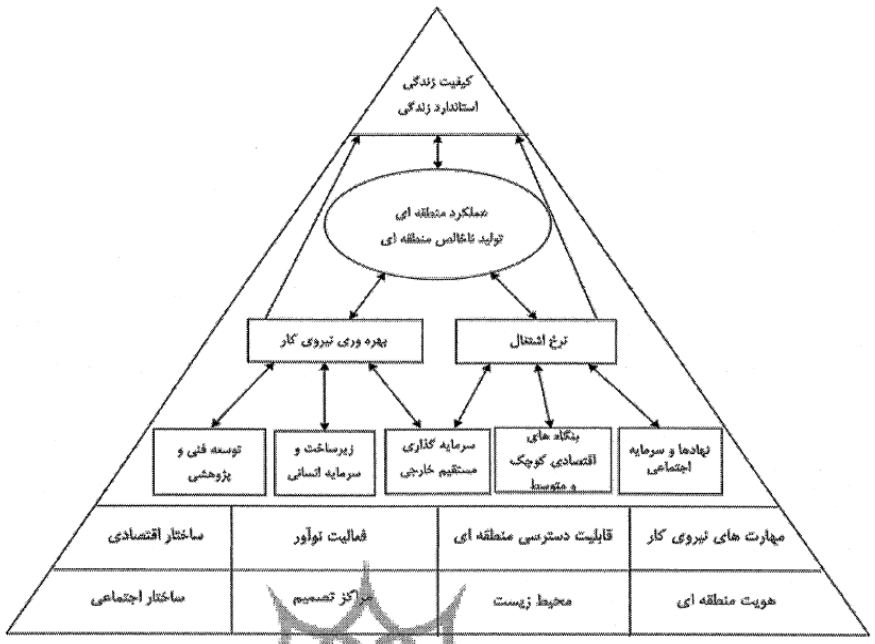
Gambar 1. Modifikasi Model Piramida Daya Saing Daerah Imre Lengyel

Source: Budiharsono, S. (2015): *Pengembangan Ekonomi Lokal dan Daerah untuk. Meningkatkan Daya Saing Daerah*. Sugeng Budiharsono, Bogor (p. 7)
URL: https://www.academia.edu/11332782/Pengembangan_Ekonomi_Lokal_dan_Daerah_-untuk_Meningkatkan_Daya_Saing_Daerah

Az eredeti modellt Iránban is publikálták perzsa nyelven.

The original model was published in Iran in the Persian language.

۴-۲- نمودار مدل هرمی رقابت‌پذیری منطقه‌ای



منبع: (لنیقل،۲۰۰۴: ۳۳۷-۳۳۴)

Source: Dadashpoor, H. & F. Ahmadi (2010): Regional Competitiveness as a New Approach in Regional Development. *Rahborde*, 22, pp. 51–80. (p. 68) (in Persian)
URL: http://www.ensani.ir/storage/Files/20120504170452-9018-15.pdf

Kínában is publikálták a modellt a városok versenyképességének vizsgálatára alkalmazott alapvető modellek között.

The model has also been published in China among the basic models used to research the urban competitiveness.

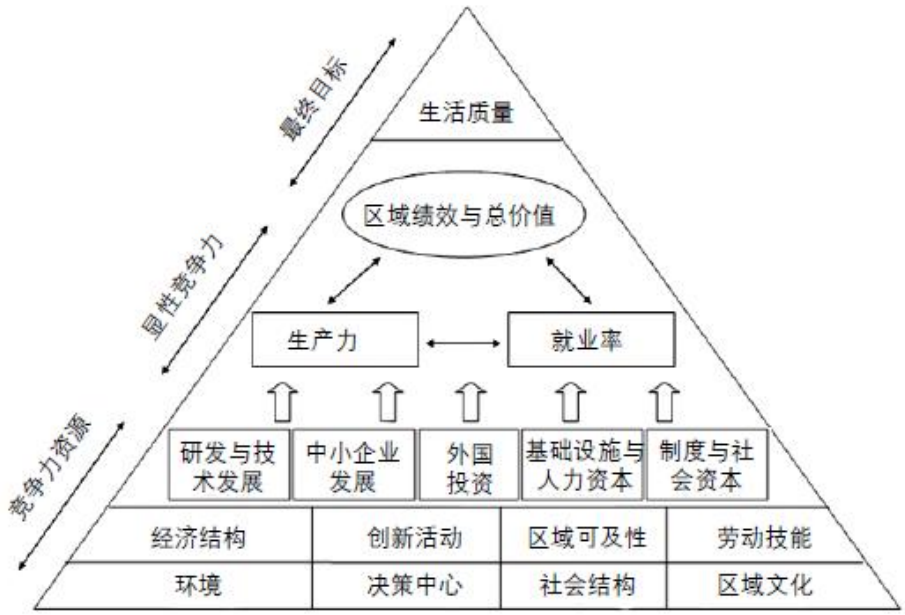
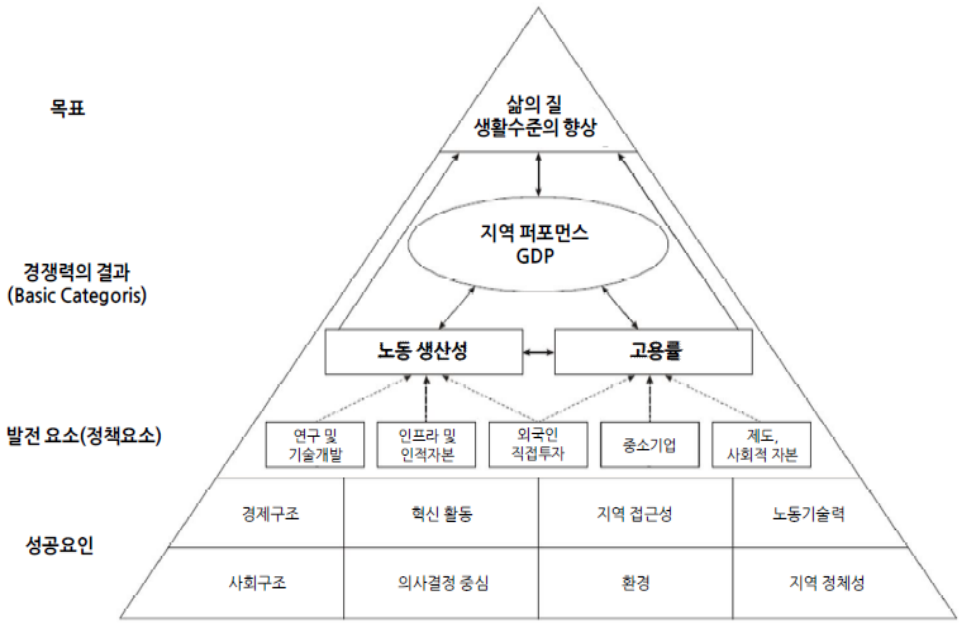


图 3 “迷宫”模型（a）和金字塔模型（b）
资料来源：参考文献 [15,16]

Source: Luo Tao, Zhang Tianhai, Gan Yonghong, Qiu Quanyi, Zhang Tin (2015): The Review of Urban Competitiveness Study in Domestic and Abroad. *Urban Planning International*, Vol. 30., No S1, pp. 7–15.
URL: http://www.upi-planning.org/Files/hjcsgh/MagazinePDF/d6f31c83-e23f-40aa-a67a-f92ebb3a0c5a.pdf

Koreában az eredeti modellt alkalmazták az ipari térségek versenyképességének elemzéséhez.

In Korea, the original model was used to analyze the competitiveness of industrial areas.



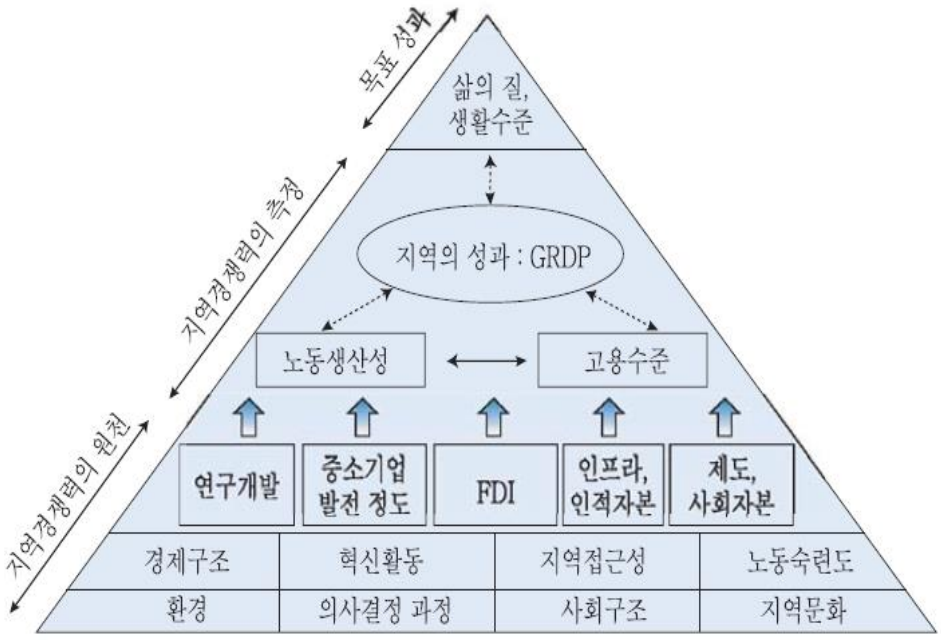
출처: Lengyel, I.(2004), p.12.

[그림 2-3] 지역 경쟁력의 피라미드 모델

Source: Wontak, Yang (2018a): *Determinants of Competitiveness and Actual Conditions of Old Industrial Complexes in Korea*. Department of Environmental Planning, Seoul National University.
URL: http://s-space.snu.ac.kr/handle/10371/143368

Másik koreai szerző Gardiner és társai (2004) tanulmánya alapján adaptálta a modellt.

Another Korean author adapted the model according to Gardiner et al. (2004).

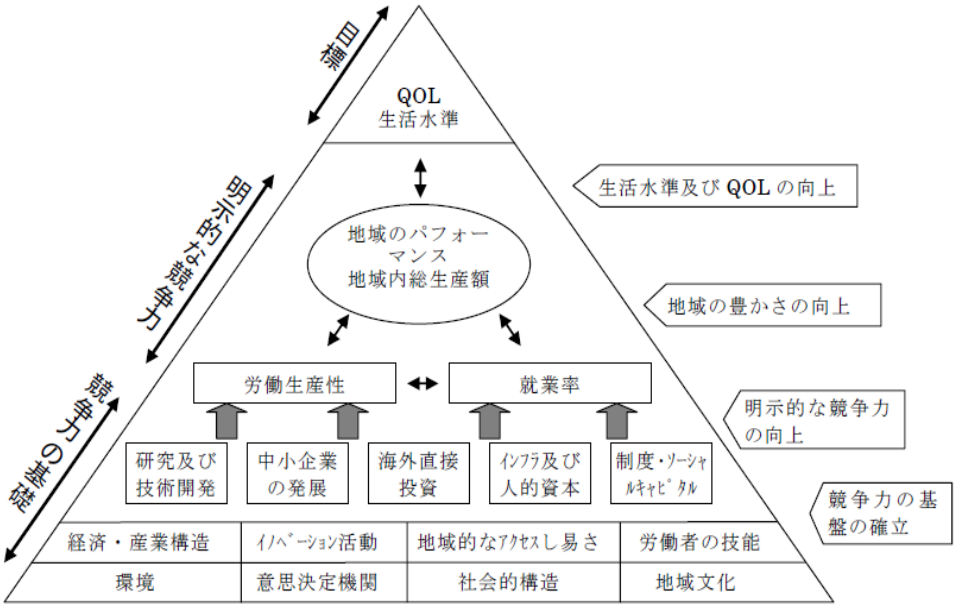


Source: Kim, Jeong–Hong (2010): Evaluation of Korea's regional competitiveness and its implications. *i-KIET Issues & Analysis*, no 490.
URL: http://eng.kiet.re.kr/kiet_eng/index.jsp?sub_num=209&ord=0&pageNo=17&state=view&idx=7312&recom=0

Japánban szintén adaptálták a földrengések utáni helyreállítás során alkalmazható regionális fejlesztési stratégiák kidolgozásához.

Also adapted in Japan to develop regional development strategies for earthquake recovery.

第 1-2-1 図　地域の競争力のピラミッドモデル



Source: Great Hanshin–Awaji Earthquake, Disaster Reduction and Human Renovation Institute
URL: http://www.dri.ne.jp/updata/kokusai_5009.pdf

Japánban funkcionális városrégiók versenyképességének vizsgálatára is alkalmazták és az eredményeket egy angol nyelvű tanulmányban közölték.

In Japan, it was also applied to study the competitiveness of functional urban regions, and the results were published in an English-language paper.

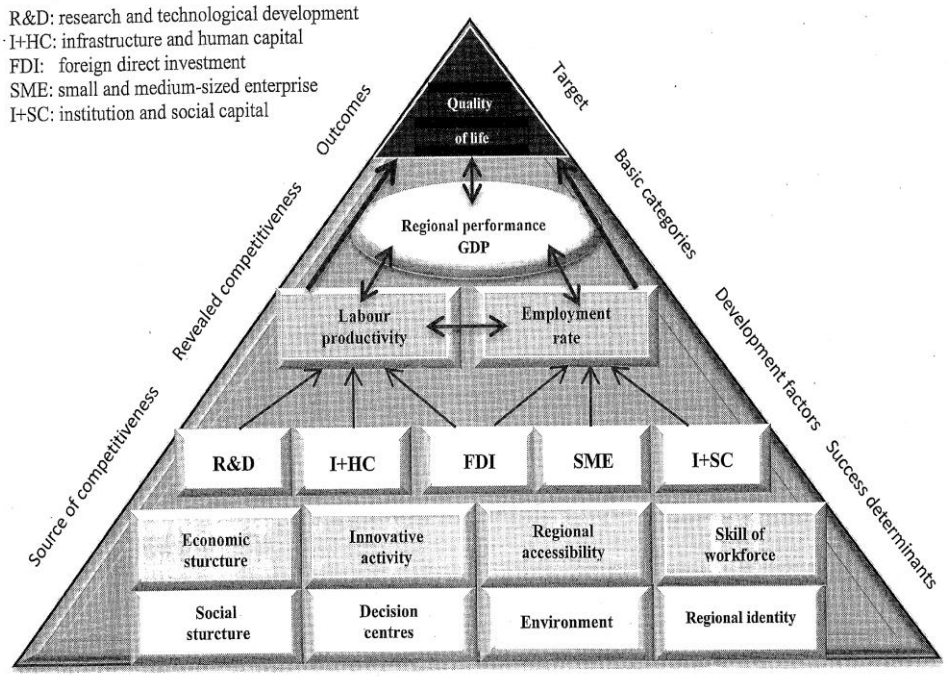


Figure 1. The structure of the Pyramid Model

Source: Lengyel 2004, 336.

Source: Komlósi, É. & T. Fujii (2012): Competitiveness of Japanese Functional Urban Areas (JFUAs): Empirical Testing of the Pyramid Model. *Japanese Journal of Human Geography*, vol. 64., no. 5. pp. 434–451. (p. 437)
URL: https://www.researchgate.net/publication/322671377_Competitiveness_of_Japanese_Functional_Urban_Areas_JFUAs_Empirical_Testing_of_the_Pyramid_Model

Szlovák kutatók kissé átalakították az eredeti modellt angol nyelvű publikációjukban.

Slovak researchers slightly modified the original model in their English-language publication.

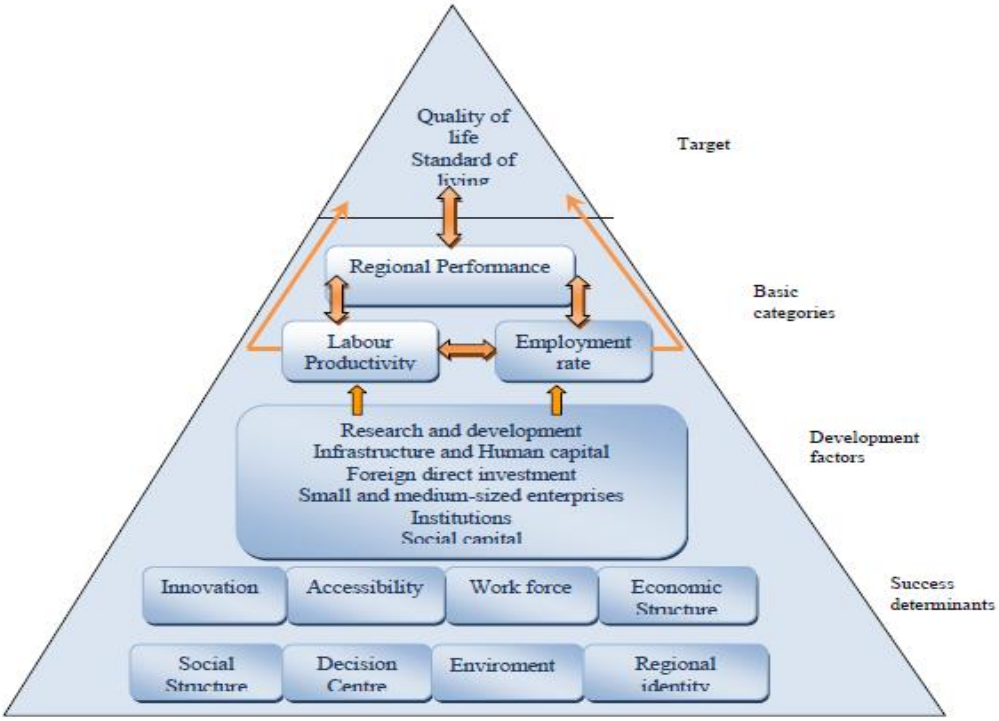


Figure 2
Pyramidal model of regional competitiveness

Source: Rucinská, S. & P. Paska (2009): Measuring regional competitiveness. *Acta Oeconomica Cassoviensia*, 1., pp. 4–12. (p. 7)
URL: http://acta.euke.sk/uploads/Acta%20oeconomica%20cassoviensia%201-2009.pdf

Finnországban egy doktori értekezésben a piramismodellen alapuló regionális fejlesztési stratégia egyik alaptípusát alkalmazták.

In Finland, a PhD dissertation used a basic type of regional development strategy based on the pyramid model.

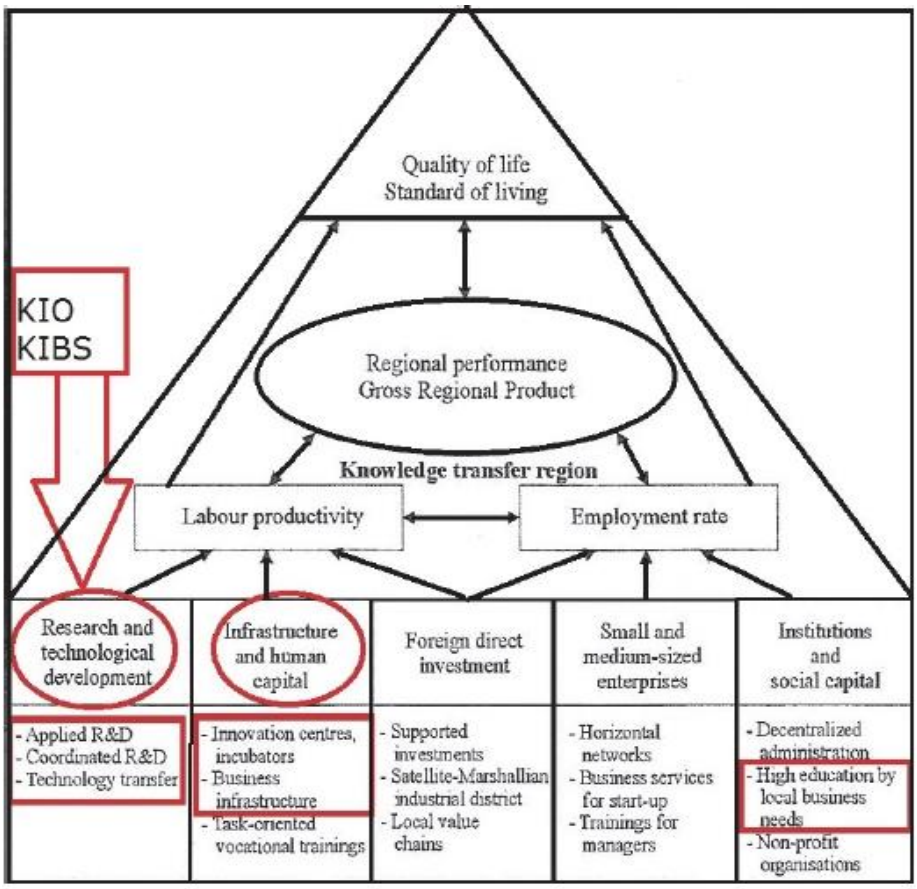


FIGURE 18 Enhancing competitiveness of a knowledge transfer region depicted through the pyramid model. Modified and adapted from Lengyel (2009)

Source: Kotthaus, D. (2019): Economic, Social and Stakeholder-related Analysis in Sport Facility Management. *PhD Thesis, JYU Dissertations 49*, University of Jyväskylä. *URL*: https://jyx.jyu.fi/handle/123456789/60738

Magyar kutatók turisztikai desztinációk versenyképességének értelmezésére is átdolgozták angol nyelvű publikációjukban.

Hungarian researchers revised it for the interpretation of tourism destination competitiveness in their English-language paper.

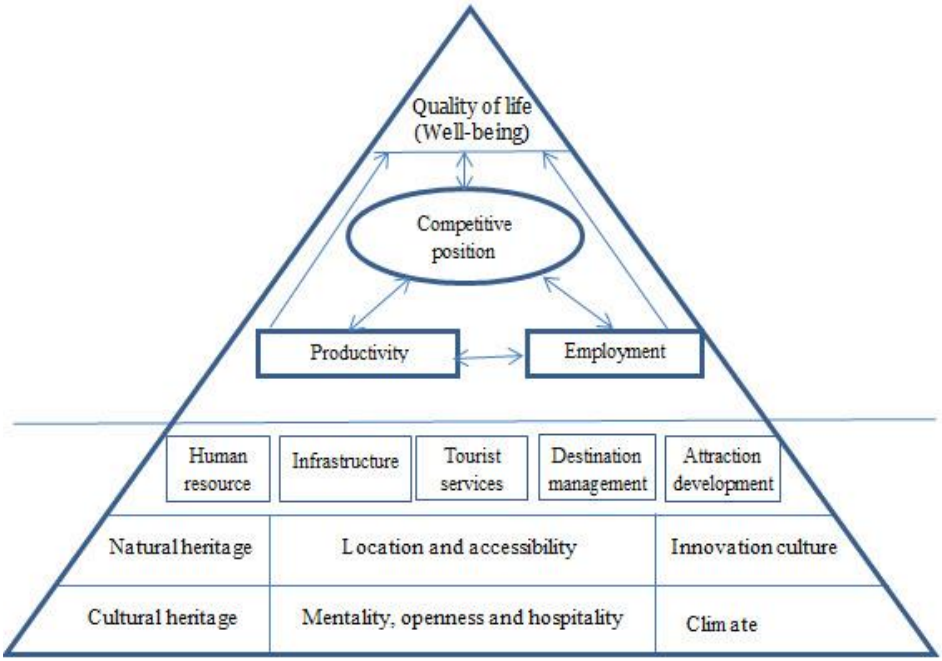


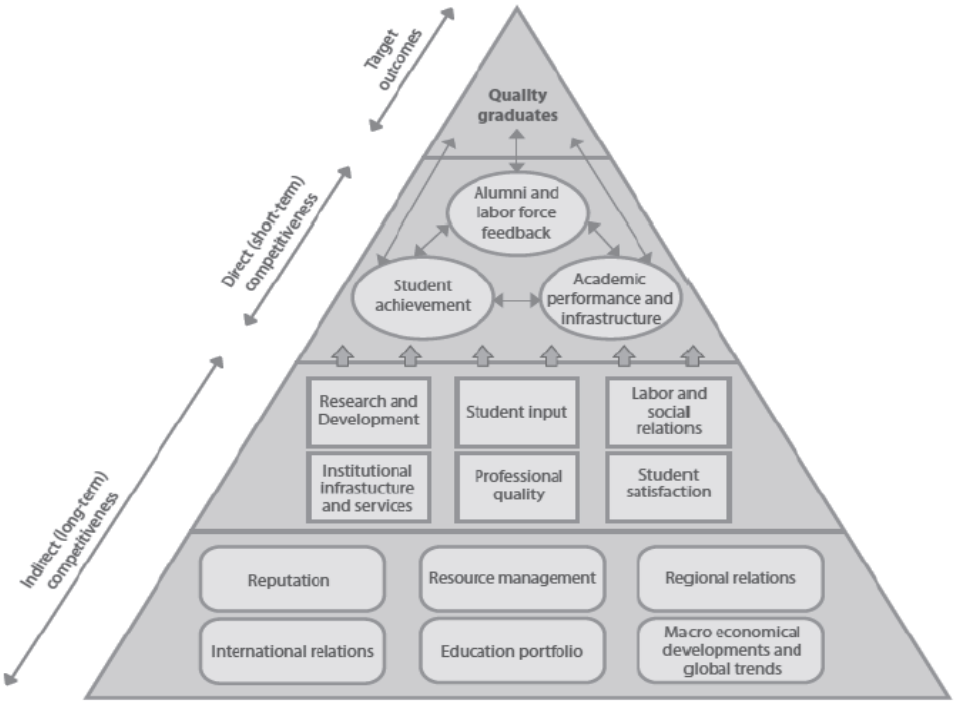
Figure 4. Pyramid Model for Tourism Destination Competitiveness

Source: Papp, Zs. & Á. Raffay (2011): Factors influencing tourism competitiveness of former socialist countries. *Human Geographies – Journal of Studies and Research in Human Geography*, vol. 5, no 2, pp. 21–30. (p. 26)
URL: http://www.humangeographies.org.ro/articles/52/5_2_11_3_papp.pdf

Magyar szerzők átdolgozták a modellt felsőoktatási intézmények versenyképességének elemzésére szintén angol nyelvű publikációjukban.

Hungarian scholars have revised the model to analyze the competitiveness of higher education institutions also in their English-language paper.

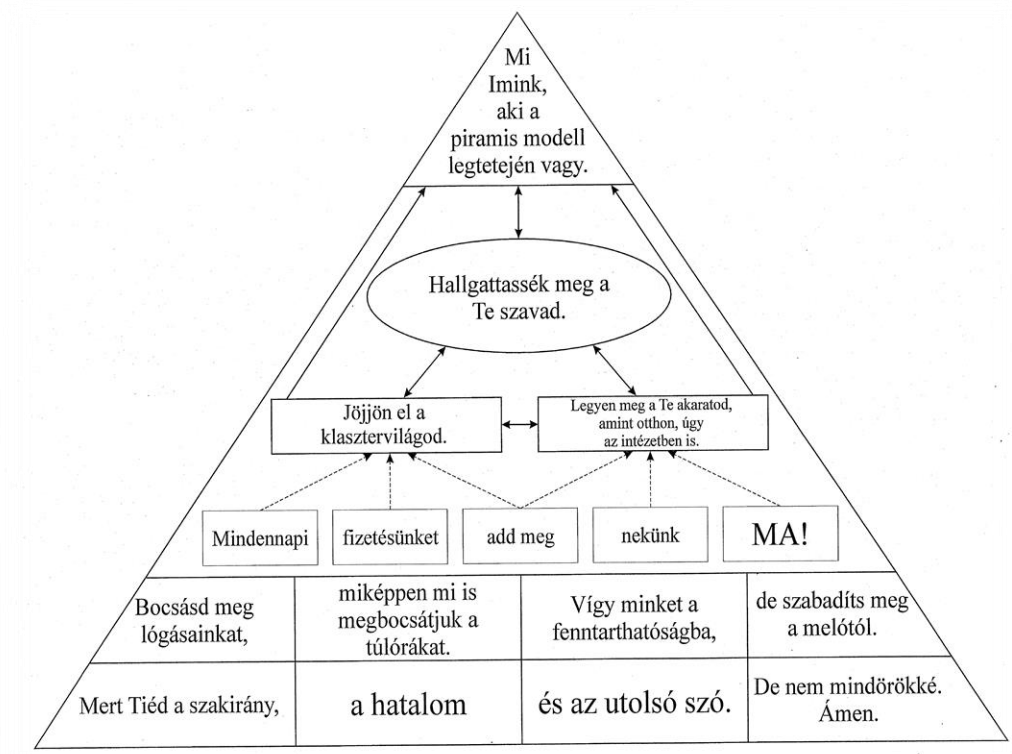
Figure 1: The competitiveness model of higher educational institutes



Source: Rámháp Sz. – Nagy D. – Országh Á. – Rechnitzer J. – Filep B. (2017): Career choice motivation of high school students in context with changing higher education in knowledge economy. *Poslovna Izvrsnost / Business Excellence*, vol. 11, no 2. pp. 23–37.
URL: https://hrcak.srce.hr/file/284315

A kollégáim is kiélték kreativitásukat egy 2008-as farsangi bulin, amikor egy imádságot foglaltak a modellbe☺

My colleagues also expressed their creativity in a 2008 carnival party, when they incorporated a prayer in the model ☺



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II. A piramismodell és empirikus tesztelései / The pyramid model and its empirical tests

3. The Pyramid Model: Enhancing Regional Competitiveness in Hungary*

Imre LENGYEL

The notion of competitiveness figures nowadays frequently and centrally both in economic policy and in regional development. Current economic development programmes, in short, have been directly responsible for the increasing attention devoted to analyses of regional competitiveness. At the same time, there is a growing consensus that a single notion of competitiveness can be found to describe processes of the globalising economy for companies (microlevel), industrial sectors and regions (mesolevel) as well as for national economies (macrolevel). The standard (common) concept of competitiveness has been partly developed in order to serve as a widely accepted theoretical definition, which can be measured and also be used by economic development policies. Competitiveness is intimately bound up with successful economic development.

This study reviews the conceptual background and some special aspects of competitiveness and also looks more closely at one of the basic models of enhancing regional competitiveness. First, some aspects of the standard notion of competitiveness are discussed. Then some key indicators of the competitiveness of Hungarian regions will be investigated. I shall end by introducing the so-called pyramid model, which has been designed to measure and improve regional competitive

Keywords: regional competitiveness, regional policy, regional economic programming

JEL classification index: P2, R10, R15

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INTRODUCTION

Competitiveness has become one of the key concepts in economics and economic policy over the last two or three decades. It is a fashionable term the use of which seems nowadays to be nearly obligatory. In Iain Begg's apt formulation: "improved competitiveness, as we all know, is the path to economic nirvana" (Begg 1999, p. 795). Meanwhile, competitiveness is a collective economic term that is hard to define. Generally speaking, it indicates the capability or tendency to compete under market

conditions. In particular, it denotes the ability to gain and maintain economic positions in market competition as shown by an increase in business success, market shares and profitability (Török 1999a).

The last decade has also brought the attention to the crucial impact of geographicallocation of economic activities on corporate competitiveness. Distance and location have started to play a different role than before. One of the most conspicuous tendencies in economies shaped by the globalisation processes is the strengthening of localisation (and regionalisation). This development is especially palpable in developed countries with knowledge-based economies (Dicken 1998; Malecki 1997). Economic theory has also reacted to these economic developments. Both theoretical research and business management have increasingly adopted an approach that focuses primarily on geographical clusters.

The significance of geographical location has been stressed most prominently by a line of theoretical economic thought closely associated with the work of Paul Krugman. The "new economic geography", regarded by many as the mainstream approach nowadays, emphasises the characteristics of the geographical concentration of most economic activities (Krugman 1999; 2000).

In the area of applied economics Michael Porter, one of the leading experts in strategic planning, has analysed the competitive strategies and advantages of global companies and found the role of location and that of regions to be exceptionally important (Porter 1990; 1998). The competitiveness of nations, regions and various economic regions are also assessed in terms of *high productivity rates and a high growth of productivity:* "the only meaningful concept of competitiveness at the national level is national productivity" (Porter 1990, p. 6). Porter has argued that regional clusters are capable of improving competitiveness and proposed, therefore, a cluster-based approach to regional economic development (Porter 2000).

In the age of globalisation the previous, one-sided approach was no longer considered reliable in explaining what factors are responsible for success in international competition. Economic output (GDP/inhabitant), the rate of economic growth, export market shares and the balance of trade do not show how competitive a given country or region might be. In many cases, due to the transfer of goods among multinational companies, capital and profit transfer (withdrawal) or economic output no longer depends on the countries and regions themselves but rather on external factors (Dicken 1998; Hatzichronoglou 1996). An innovative approach and the development of new indicators became necessary in order to reliably indicate the competitiveness of individual countries and regions under the conditions of global competition.

When trying to understand regional competitiveness, it is important to take into account that the regional level forms an intermediate, aggregate level between the macro- and the micro-levels. Hence it makes sense to define the term "regional competitiveness" either by using macro-level concepts of competitiveness (disaggregation) or, starting from the micro level, by adding up the competitive

advantages of companies active in the given region (aggregation). Different methods have been developed to interpret competitiveness on a global scale (EC 2001b; 2002; Hall et al. 2001; Kitson and Mithchie 2000; Kresl and Singh 1999; Malecki 1997; 1999; Maskell et al. 1998; OECD 1997; Török 1999b; Wren 2001).

There are several well-known surveys of national competitiveness – three of these are of particular interest. First, the Yearbook of the Institute for Management Development (IMD 2001) containing a yearly competitiveness ranking of countries since 1987. Second, the Global Competitiveness Report of the World Economic Forum (WEF 2001) published annually since 1996. Third, the set of indicators on national competitiveness issued by the World Bank (WB 1999). All of these authoritative empirical surveys include both *ex ante* and *ex post* indicators of competitiveness.

In recent years, the European Union (EU) has firmly identified the improvement of regional competitiveness to be the primary objective of regional policy (Enyedi 2000; Hall et al. 2001). This is regarded as the most important means to promote balanced development and cohesion. Competitiveness figured as the central theme both in the Sixth (and last) Periodical Report of the European Commission published in February 1999, and in the second cohesion report issued in 2001 (EC 1999a; 2001a). The guidelines on the use of Structural and Cohesion Funds also set the improvement of regional competitiveness as their principal aim in order to reduce the backwardness of regions in the first target category (EC 1999b).

This shows quite clearly that in reaction to the processes of globalisation economists are more and more preoccupied with two topics in particular. First, there has been a marked increase of interest in the geographical concentration of economic activities as well as in the weight attributed to regional and urban economies. Second, improved competitiveness has become a key issue for regional and economic policies seeking to meet the challenges of the global competition. The two topics form an organic whole setting the task for economists to provide a more precise definition of regional competitiveness and to suggest means of economic development for its potential improvement. Therefore, in regional policy, proposals for improving competitiveness have also started to rely on the *standard notion of competitiveness*.

At the same time, there is growing consensus that the term "competitiveness" can be used to describe processes of the global economy for companies (micro level), sectors and regions (meso level) as well as for national economies (macro level). The standard (common) concept of competitiveness has been partly developed in order to serve as a widely accepted theoretical definition that can be measured and also be used by economic development policies. Competitiveness is intimately connected to successful economic development. There are different ideas and strategies as to what may constitute economic success. This is why a sufficiently general notion of competitiveness is necessary. The standard concept of competitiveness tries to meet precisely this new requirement.

This study will review the conceptual background and some special aspects of the standard concept of competitiveness and will also look more closely at one of the basic models of enhancing regional competitiveness. First, I shall briefly discuss some aspects of the standard concept of competitiveness. Then I analyse key indicators of competitiveness in Hungarian regions. Finally I introduce the so-called pyramid model, which has been designed to measure and improve regional competitiveness.

THE STANDARD DEFINITION OF REGIONAL COMPETITIVENESS

There were a number of attempts to define the idea of standard and extended competitiveness in the mid-1990s. Particularly important examples include the proposals put forward by the US Competitiveness Council, the OECD and the European Union (Begg 1999; Edmonds 2000; Myant 1999). I shall also rely on these suggestions when defining and developing a suitable model of competitiveness below. On the basis of various documents published by the OECD (1997), the Sixth Regional Periodic Report (EC 1999a) and the Second Cohesion Report of the EU (EC 2001a), the *standard definition of competitiveness* is as follows (EC 1999a, p. 75):

> *"the ability of companies, industries, regions, nations and supra-national regions to generate, while being exposed to international competition, relatively high income and employment levels."*

Similarly in the European Competitiveness Report (EC 2001b, p. 9):

> *"Competitiveness…is understood to mean a sustained rise in the standards of living of a nation and as low a level of involuntary unemployment as possible."*

In the report of Regional Competitiveness Indicators of theUK(DTI 2002, p. 3):

> *"Regional competitiveness describes the ability of regions to generate income and maintain employment levels in the face of domestic and international competition."*

The standard definition of competitiveness appears to be quite flexible and can be used for a number of different purposes. The following points will help form a correct understanding of this definition:

- it presents competitiveness as a complex notion which can apply to all basic economic units (company, sector, region, nation, macro region);
- it focuses on two measurable economic categories: income and employment;
- it assumes participation in international competition and an open economy – in other words, it is only concerned with products and services marketable in the global competition;
- it presupposes a relatively high income level, but contains no specifications for how the income is to be distributed among capital owners and employees;

– it assumes a high rate of employment, partly in connection with the aims of social policy, but does not reflect the structure of employment (the qualification of the workforce).

Since regions, towns and countries display different income and employment characteristics, one can continue to distinguish microeconomic (based on the competitiveness of products) and macroeconomic approaches (based on productivity). Consequently, this wider and more complex notion of competitiveness becomes more specific (Edmonds 2000):

– Companies and sectors are competitive if their products and services are marketable internationally, and if they are capable of realising high income (added value) without reducing the number of their employees, i.e. if they do not have to cut their workforce because they introduce new technologies or increase their productivity.
– Regions, towns and countries are competitive, if their economies are open, their per capita income is steadily high and increasing, and if they are capable of sustaining a high rate of employment, i.e. if large segments of the population can expect to benefit from the income realised.

How to measure income is a fundamental question: In practice, calculations of regional GDP are based on the regional GDP, that is to say, the share of the GDP generated in the region including all primary income (wages, capital interest, dividends, land lease, company profits, amortisation) as realised by the local population and companies with headquarters or branch-plants in the region. In NUTS II level regions, the European Union measures the volume of income generated in a region using per capita GDP. Of course, regional income and regional GDP are not the same, but in practice we cannot measure interregional income transfers.

The definition refers to "a relatively high income". This can be measured by means of the per capita GDP and the GDP growth rate. A high employment level is in turn indicated by the rate of employment. These two indicators can be measured independently from one another, but as is well known, the per capita GDP can also be expressed as follows (EC 1999a, p. 75):

$$\frac{GDP}{total \cdot population} = \frac{GDP}{employment} \times \frac{employment}{working-age \cdot pop.} \times \frac{working-age \cdot pop.}{total \cdot population}$$

The first fraction on the right-hand side of the formula is approximately equal to labour productivity and the second to the rate of employment. The third fraction, the age distribution of the population changes slowly. It can nevertheless play an important role in some regions with smaller populations.

The three fractions on the right-hand side are of different importance as far as measuring competitiveness:

– The *GDP per employee*, i.e., the GDP divided by the number of those actively participating in generating it, which is approximately equal to labour productivity (output per hour worked), usually forms the basis of empirical assessments of regional competitiveness.
– The *employment rate* measures whether there is a sufficient supply of jobs available for the working-age population of the region. Clearly, how precisely this component can represent employment in the region will also depend on the number of people commuting between regions.
– The *share of the working-age population from the total population* remains more or less constant, or changes slowly over longer periods of time. Consequently, analyses of competitiveness usually do not extend to this figure.

These remarks suggest that measuring regional competitiveness can be traced back to three economic categories, among which a trivial correlation holds (Hall et al. 2001, p. 8):

$$\textit{Regional income} \cong \textit{Labour productivity} \times \textit{Employment rate}$$

Given the standard definition of competitiveness, no unique indicator of regional competitiveness can be found. It is interpreted rather as a combination of closely connected, well-measurable and unambiguous economic categories:
– per capita GDP of the region (otherwise regional growth);
– labour productivity of the region;
– employment rate of the region;
– economic openness of the region (exports and imports).

Therefore the notion of regional competitiveness means: *the per capita income in the region, which income is generated by both a high level of labour productivity and a high level of employment.* In other words, competitiveness is economic growth driven by high productivity and a high employment rate. The growth rates of all four categories are as important as the absolute levels reached.

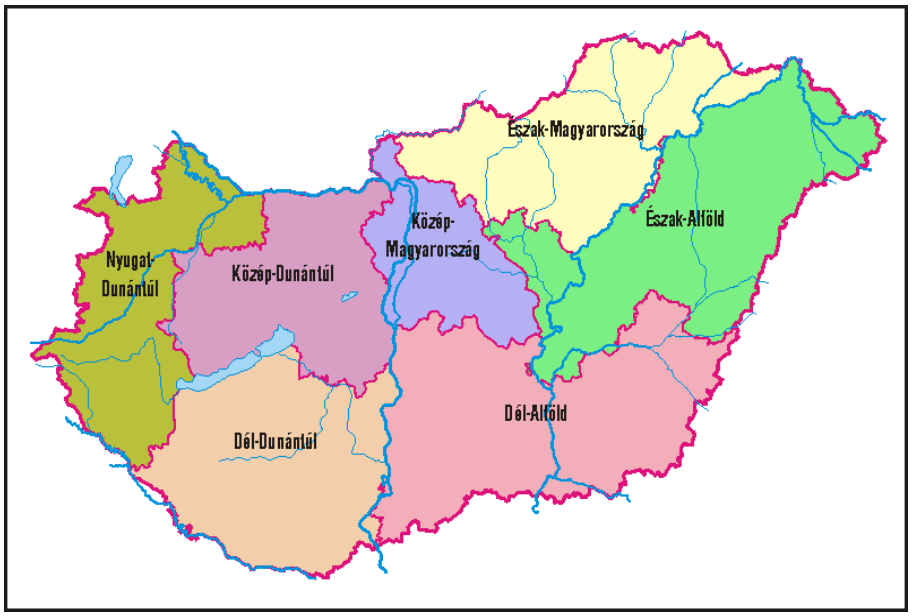
A closer look at the definition of competitiveness and the four associated indicators will clearly show that the traditional concept of economic growth has been refined and adjusted to the conditions of globalisation to develop this definition (Armstrong and Taylor 2000; Malecki 1997). I would particularly like to highlight the requirement concerning a relatively high employment rate included in the standard definition of competitiveness. On the one hand, seeking an optimal and maximally efficient use of the available workforce is an economic objective, one of the basic "quantitative" factors of economic output. But it is also an objective of social policy, a characteristic feature of the so-called "European model".

ON THE COMPETITIVENESS OF HUNGARIAN REGIONS

The basic categories can be used to measure regional competitiveness: GDP per capita, labour productivity, employment and openness. There are seven NUTS II regions in Hungary *(Figure 1)*. Regional GDP at purchasing power parity (PPS) has been recorded since 1996 in Hungary (Lengyel 1998; 2002; Rechnitzer 2000).

Hungary's economic growth reached 20.3% between 1996 and 2000, which corresponds to an annual (geometric) average of 4.7%. The regional distribution of *GDP per capita* has been strongly unequal. Three regions (Central Hungary, Central Transdanubia and Western Transdanubia) actually began catching up to their Western European counterparts with a dynamic annual growth of approximately 6% in the period mentioned (*Table 1* and *Figure 2*). The economic growth of the other four regions remained at a yearly 2–3%, which is more or less around the EU average or falling slightly below. In other words, Hungary's impressive economic development has been realised by three developed regions with two other regions (Southern Transdanubia, Northern Hungary) somewhat decelerating and the two remaining regions (Northern and Southern Great Plain, those located at the east and south part of Hungary) actually "hindering" economic prosperity.

Figure 1. Regions in Hungary



Note: Közép-Magyarország – Central Hungary, Közép-Dunántúl – Central Transdanubia, Nyugat-Dunántúl – Western Transdanubia, Dél-Dunántúl – Southern Transdanubia, Észak- Magyarország – Northern Hungary, Észak-Alföld – Northern Great Plain, Dél-Alföld - Southern Great Plain

Regional growth depends on a combination of *labour productivity* and the *employment rate*. Hungary has been characterised by unequal regional development in this respect as well: three regions can boast exceptional figures for these two indicators, both in absolute terms and in terms of the rate of change between 1996 and 2000 *(Table 2)*. The two other pairs of regions have been found to be much less competitive: growing employment has generated increasing economic output. *Table 2* also shows that, to a varying extent, growing labour productivity and employment have been responsible for the improved competitiveness of all the regions.

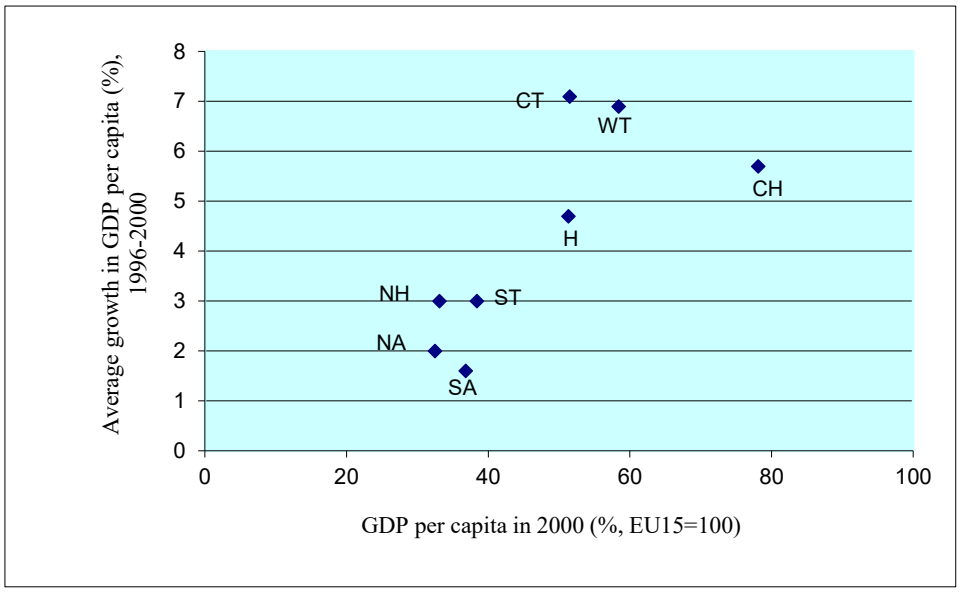
Table 1 The purchasing power (PPS) adjusted GDP per capita relative to the EU-average (15 countries) in %, 1995–2000

Region, County	1995	1996	1997	1998	1999	2000	Difference between 2000 and 1995
Central Hungary	66.4	68.4	70.9	71.6	75.1	78.1	+11,7
Central Transdanubia	41.6	42.8	45.6	47.5	46.6	51.5	+9,9
Western Transdanubia	47.4	48.9	50.0	53.5	57.1	58.4	+11,0
Southern Transdanubia	37.6	37.3	36.9	37.4	38.6	38.4	+0,8
Northern Hungary	33.5	32.2	32.0	32.9	33.0	33.1	-0,4
Northern Great Plain	32.8	32.8	32.9	32.8	31.9	32.5	-0,3
Southern Great Plain	38.3	37.9	37.0	37.0	37.0	36.8	-1,5
Hungary	46.0	46.6	47.5	48.4	49.7	51.3	+5,3

Source: HCSO (1999, 2001)

The essential question to be asked with regards to regional competitiveness is whether improving labour productivity or rather improving employment is responsible for economic growth? It is safe to say that economic growth has been driven by both increasing employment rates and improved labour productivity, although not to the same extent *(Figure 3)*. About 60–70% of the economic growthof the three developed regions and of Hungary overall can be traced back to improved labour productivity and 30–40% to increasing employment. Labour productivity was responsible for 55% of economic growth in Southern Transdanubia, 35% in Northern Hungary, 15% in the Northern Great Plain and as little as 10% in the Southern Great Plain. Thus in the less developed regions GDP growth is, to an overwhelming extent, attributed to the fact that more people are at work, while traces indicating technological development or a more effective organisation of the workforce are scarcely evident.

Figure 2. Regional growth and development in Hungary



Note: H: Hungary, CH: Central Hungary, CT: Central Transdanubia, WT: Western Transdanubia, ST: Southern Transdanubia, NH: Northern Hungary, NA: Northern Great Plain, SA: Southern Great Plain

Source: own calculation based on HCSO (1999, 2001)

Table 2 Labour productivity (GDP per employment) and employment rates of regions

Regions	Labour productivity (thousand PPS)			Employment rate (%)		
	1996	2000	Growth (%)	1999	2000	Difference between 2000 and 1996
Central Hungary	32,1	42,0	31	57,6	61,3	+3,7
Central Transdanubia	21,6	28,2	31	54,1	60,0	+5,9
Western Transdanubia	22,4	30,3	35	59,8	63,7	+3,9
Southern Transdanubia	19,9	23,8	20	50,8	53,5	+2,7
Northern Hungary	19,3	22,5	17	46,1	49,5	+3,4
Northern Great Plain	19,7	22,3	13	46,6	49,7	+3,1
Southern Great Plain	19,7	22,2	13	53,0	55,7	+2,7
Hungary	24,0	30,1	25	53,1	56,7	+3,6

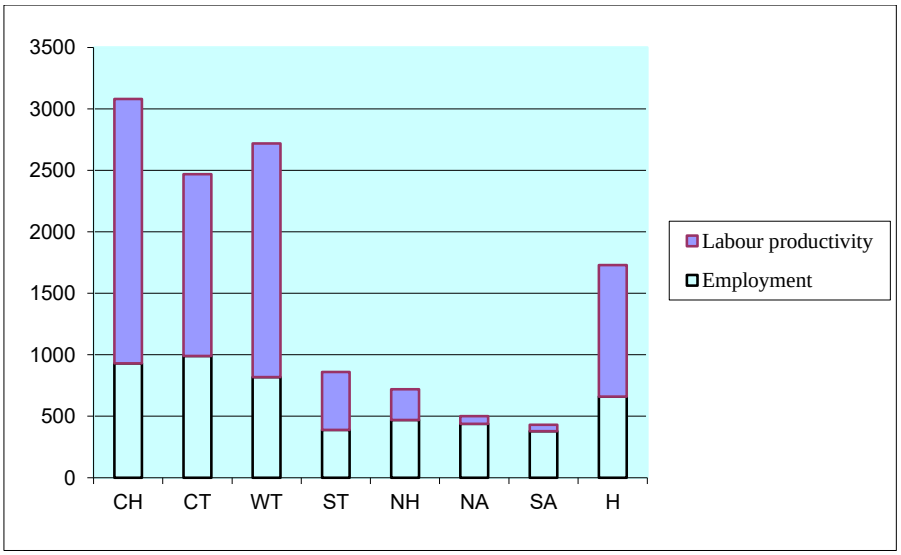
Source: HCSO (1999, 2001)

Note: for population aged 15–74

The available data clearly suggest that the growing competitiveness of the Central Hungarian, Western Transdanubian and Central Transdanubian regions can be explained by *improved labour productivity*. Employment is high, but its growth has slowed down. The competitiveness of the remaining four regions has improved only slightly. Both employment and labour productivity have improved approximately to the same extent.

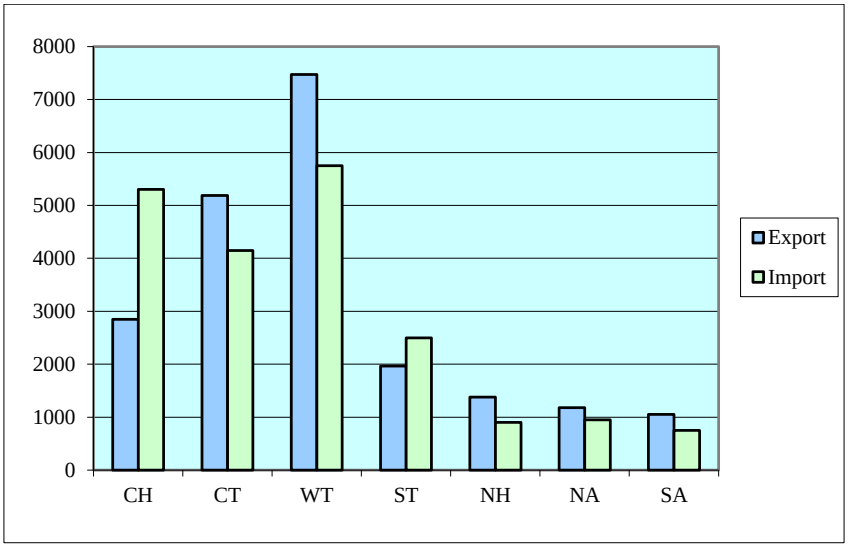
Competitiveness is closely connected to economic performance in the international (global) competition. The "openness" of regions is best expressed in terms of export and import figures, indicating the extent to which companies situated in the region have been able to produce globally marketable goods and services *(Figure 4)*. Exports, which have greatly contributed to the rapid growth of the Hungarian economy, have been produced almost exclusively in three developed regions: Western Transdanubia, Central Transdanubia and Central Hungary. These three regions generated 76% of all Hungarian exports in 2000. In short, these three regions are well "embedded" in the global economy, while the other four regions cater mainly for domestic demand.

Figure 3. Sources of the growth of GDP per capita (from 1996 to 2000, PPS)



Source: own calculation.
Note: see *Figure 2*.

Figure 4. Per capita export and import of the Hungarian regions (USD, 2000)



Source: Ministry of Economy and Transport
Note: see *Figure 2.*

In sum, there are significant differences in the competitiveness of Hungarian regions: three regions have demonstrated improving competitiveness, whereas the economies of the other four have stagnated. Both the absolute value and the growth rate of employment and labour productivity have contributed to leveraging the competitiveness of the three rapidly developing regions. They have already become an integral part of international trade, while the other four continue to export at relatively low levels. The region of Central Hungary has already exceeded 75% of the EU-average. It cannot, therefore, expect subsidies from the Structural Funds, at least not if current regulations continue to stay in place. The other six regions, however, are likely to benefit from cohesion-oriented policies in the long-term.

THE PYRAMID MODEL: FACTORS UNDERLYING REGIONAL COMPETITIVENESS

Measuring regional competitiveness has been traced back to four related economic categories: income generated in the region, labour productivity, employment rate and openness. Competitiveness in this meaning cannot be used, however, to identify factors responsible for regional competitiveness or areas which are to be strengthened or developed by regional development policies and programmes for improved competitiveness. The *pyramid model of regional competitiveness* seeks to provide a systematic account of these means and to describe the basic aspects of improved

competitiveness. The regional economic development strategy of the Southern Great Plain region was based on this model (Lengyel 2000).

The standard definition and the resulting economic indicators enable us to measure competitiveness fairly precisely. However, when it comes to regional policy and economic development it is not enough to establish how competitive a given region might be, it is also important to suggest ways to improve regional competitiveness. Since the notion of competitiveness can be seen as refining that of economic growth, it can often be observed that proposals for improved competitiveness combine traditional means of economic development with methods based on endogenous development (Malecki 1997). In any case, two important ideas motivate the objectives identified: the *creation of employment opportunities* (employment rate, and closely related, SMEs and human capital) and *efficiency* (labour productivity, and closely related, R&D and incentives for foreign direct investment).

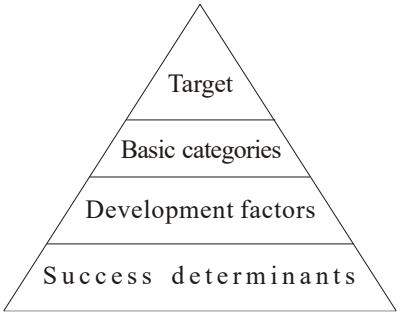
The development of a region in Europe will only be stable, balanced and sustainable in the long run as long as no sharp social tensions emerge (EC 2001a). This implies that wide segments of the population must enjoy a high living standard which in turn assumes a high employment rate and the lack of excessive inequalities of income. This *target* of social and economic policy constitutes an extremely important consideration for regional policymaking, the representation of local interests and the drawing up of development priorities for improved competitiveness.

The standard of living and prosperity in any region depends on its competitiveness (Begg 1999; Maskell et al. 1998; Porter 2001). Factors influencing regional competitiveness can be divided into two groups of *direct* and *indirect* components. Of particular importance are programming factors with a direct and short-term influence on economic output, profitability, labour productivity and employment rates. But social, economic, environmental and cultural processes and parameters, the so-called "success determinants", with an indirect, long-term impact on competitiveness are also of key importance (Jensen and Butler 1996).

Three levels can be distinguished with regard to the objectives of regional development programming and the various characteristics and factors influencing competitiveness *(Figure 5)*:

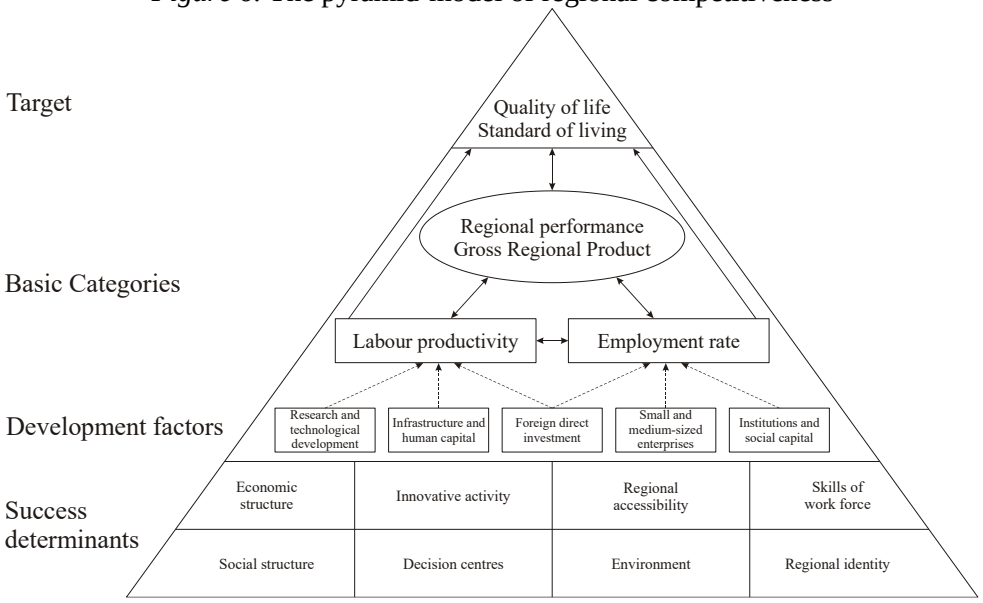
– *Basic categories* of regional competitiveness (*ex post* indicators; measuring competitiveness): these categories measure competitiveness and include income, labour productivity, employment and openness.
– *Development (programming) factors* of regional competitiveness (*ex ante* factors; improving competitiveness): factors with an immediate impact on basic categories. These can be used to improve regional competitiveness with the help of institutions in short-term programming periods.
– *Success determinants* of regional competitiveness (social and environmental conditions; explaining competitiveness): determinants with an indirect impact on basic categories and development factors. These determinants take shape over a longer period of time and their significance reaches beyond economic policymaking.

Figure 5. The structure of pyramid-model of regional competitiveness



When characteristics determining competitiveness are placed on a figure, one obtains the "pyramid model" of regional competitiveness: the components of long-term success are at the bottom, the middle layer consists of development (programming) factors, the basic categories included in the standard definition of competitiveness are located one level higher, while the standard of living and welfare of the region's population (the ultimate objective) forms the peak of the pyramid.

Figure 6. The pyramid-model of regional competitiveness



Source: own construction based on Begg (1999), EC (1999a), Enyedi (1996) and Jensen–Butler (1996).

Competitiveness depends on a wide range of factors and conditions. The five programming factors underlying competitiveness included in the Sixth Periodic Regional Report of the EU (EC 1999a) are, however, exceptionally significant (*Figure 6*). These development factors shape, to varying extent, economic output, labour productivity and employment. (Broken lines mark only the closest connections in the figure.) Improving individual programming factors is the goal of regional policies. They are likely to improve the competitiveness of regions directly and in the short run through regional partners and local institutions.

Programming factors include:

– *Research and technological development (RTD):* the fast introduction of innovations and new technologies creates competitive advantages. Innovation may come from outside the region (e.g. technological transfer), but the competitiveness of the region is most effectively advanced by successful R&D activities, innovations and their fast and wide-ranging distribution. The development of research, innovation, education and training is crucial to improving competitiveness. This can produce a spillover of scientific and technological advantages in the region.
– *Small- and medium-sized enterprises (SME):* SMEs are flexible and can quickly adapt to market changes. They are principally responsible for generating employment in the region. More recently, innovative SMEs acting as independent global players (using information technology and networks) have also appeared.
– *Foreign direct investment (FDI):* foreign direct investment usually creates new sectors, markets, new technologies and new jobs. It also improves labour productivity and can encourage technological transfer as well.
– *Infrastructure and human capital:* technological infrastructure as well as educational and training institutions and their successful functioning are crucially important for improved competitiveness. Advanced transport, telecommunications and information networks play a particularly significant role. In addition, much depends on the efficient use of available educational and training systems. Infrastructure should not be developed for its own sake; it needs to serve the region's competitiveness by catering for the needs of local sectors and clusters.
– *Institutions and social capital:* economic prosperity also assumes efficient cooperation among existing institutions. Successful companies also depend on
– the level of administrative services and public institutions. Social capital is particularly important: trust, reliability, readiness to cooperate, etc.

Success components with an indirect, often spontaneous, long-term impact on regional competitiveness cover a wide range of variables. At the same time, there is agreement with regard to the success determinants. Enyedi (1996, pp. 62–64) lists ten important determinants underlying regional success. Begg (1999, pp. 802–804) highlights four determinants and the Sixth Periodic Regional Report of the EU (EC 1999a, p. 80) mentions four determinants as well. Surveys on regional success are

characteristically based on an analysis of a considerable amount of statistical data (usually factor analysis). They use these figures to determine the connection between certain indicators and economic performance (generally expressed as GDP per capita).

Success determinants include:

- *Economic structure*: the workforce of successful regions typically concentrates in economic services and/or the processing industry. Both productivity and employment are usually higher in services sectors generating high added value (information technology, financial services, telecommunications and high-tech industries), while sectors of the processing industry are characterised by high and increasing productivity in combination with falling employment figures.
- *Innovative activity*: an appropriately innovative environment (innovation background) can ensure the region's ability to respond to any kind of technological, business, environmental or other challenge with the right adaptive strategy. Such strategies can help turn innovational challenges to the advantage of the region. Innovational capacities cover not only institutional research and development capacities but also companies' capacities with quickly reacting and innovative SMEs in the new sectors of the market and prosperous lines of business.
- *Regional accessibility*: the accessibility, transport networks and geographical location of successful regions are more advantageous than those of other regions. Geographical location limits the range of opportunities, influences travel costs and time as well as how much time it takes to get products on the market. Transportation (airports, trains, motorways, ports, etc.) and communications (traditional media, internet, data transfer, etc.) infrastructure can help reduce the effects of geographical limitations.
- *Skills of the workforce*: the share of educated and skilled labour in the total population is relatively high in successful regions. Education is effective in the sense that it can flexibly adjust to changing demands on the labour market, can prepare younger generations and retrain existing workforce to pursue creative and innovative activities (the requirements of informational society), and business services.
- *Social structure*: knowledge-intensive economic activities and the growth of economic services strengthen the middle-classes in successful regions. Typically, the blue collar working class becomes smaller and only few activities offer opportunities for unskilled labour (local construction industry, some public services, etc.).
- *Decision centres:* the presence of company headquarters is important and so is the location of strategic units pursuing core competencies. The central departments f companies generate demand for highly qualified employees on the labour market, provide incentives for better training locally, strengthen the knowledge base and enhance the business environment. The spillover of their know-how and "patterns" as well as the possible establishment of start-up companies by some of their more enterprising experts can give further stimuli to SME activities and create additional competitive advantages.

– *Environment:* a qualified, culturally demanding and growing middle-class of successful regions welcomes a more developed environment (public safety, quality public services, attractive urban architecture, high-standard housing, good local public transport, etc.) as well as a healthy and safe natural environment. The population not only presents its demands, but is also prepared to assume an active role in protecting the environment (waste collection and recycling, protecting green areas, spending time outdoors, etc.).
– *Regional identity*: every region and town has to face conflicts all the time. Successful ones are able to handle problems caused by structural changes of the economy, rapid growth (leading to massive immigration) as well as discrepancies in space or among various settlements (fast urban growth accompanied by growing rural backwardness). It is important to foster the regional identity of the population, to promote localism which in turn may provide incentives for a more active population and non-governmental organisations.

Needless to say, the above success determinants are interdependent on one another but can partly overlap as well. It is important to emphasise that the two bottom levels of the model are built on one another: economic structure depends on the social constitution of the region, the innovative activity will be shaped by company and institutional headquarters, better regional accessibility will tend to have negative effects on the environment, and the regional identity will have an impact on the qualifications and motivation of the workforce.

In its complexity, the pyramid model can help assess the sustainable development of regions relying on what is known about successful regions. It aims to accommodate *ex ante* indicators with *ex post* ones on the basis of the standard notion of competitiveness. The *ex post* indicators constitute the basic categories (income, labour productivity, employment rate), while the *ex ante* indicators cover the programming factors and the success determinants. *Ex post* indicators as economic categories serve to measure and evaluate competitiveness, whereas *ex ante* indicators, which also include several non-economic considerations, are useful for regional policies and the elaboration of economic development strategies.

CONCLUSIONS

This study has reviewed the standard definition of competitiveness which is well-suited to measure and improve the competitiveness of regions. The standard definition can be widely used and is applicable to all basic economic units, for instance to regions. It is in essence a means to assess economic growth and development, while it also constitutes the main objective of economic policy under the new and changing circumstances.

The article analysed the competitiveness of Hungarian regions based on the standard definition. The most important findings have been that the economies of three Hungarian regions have developed faster than the EU-average. These regions have been found to be catching up more and more with their Western counterparts (especially the region of Central Hungary). The economies of the other regions have stagnated. Consequently, statistical findings on Hungarian regions make it clear that the high economic growth of the Hungarian economy has been generated exclusively by the improving economic performance of three regions. Only these regions can be called competitive with a per capita GDP growth above the EU-average and labour productivity and employment rates exceeding the national average. The remaining four regions cannot be considered competitive given their economic stagnation, insignificant growth rates, low levels of employment and labour productivity.

By combining various concepts of competitiveness one can obtain the so-called pyramid model. This includes not only indicators to measure competitiveness, but also factors underlying improved competitiveness. The latter factors can be divided into two groups: those having a short-term impact (for regional programming), and success factors.

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4. Bottom-up Regional Economic Development: Competition, Competitiveness, and Clusters*

Imre LENGYEL

In the economies developing and transforming as a result of globalisation processes, increasing localisation represents one of the most marked processes: while the importance of national economies (relatively) is decreasing, the economic role of regions and cities seems to grow. Global competition has intensified also in space, especially with the growing importance of knowledge-based economy. Interregional competition, which means the competition of regions and cities for scarce resources, global aims and so on, is increasingly prevalent. The economic characteristics of interregional competition differ form those of the competition of companies or on the labour market; consequently, the improvement of competitiveness can be described differently in the case of regions.

After reviewing the most important features of global competition, the present paper provides a detailed analysis of the concept and characteristics of interregional competition. Departing from the criteria of interregional competition, it reviews the concept of regional competitiveness and gives the pyramidal model serving the improvement of regional competitiveness. Based on this model it also outlines the development ideas, so called 'UFO model', aiming to improve the competitiveness of regions with different development levels.

Keywords: interregional competition, regional competitiveness, cluster-based regional economic development

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1. Introduction

Increasing regionalization represents one of the most spectacular processes of the economies that develop and transform as a result of globalisation processes: while the (relative) importance of national economies is decreasing, the economic role of regions and cities seems to grow. Global competition has intensified also in space, especially with the growing importance of the knowledge-based economy.

Interregional competition, which refers to the competition of regions and cities for scarce resources, global aims and so on, is increasingly prevalent. The modes of improving regional competitiveness and the regional economic development strategies are heavily dependent on the type of the given regions.

Regional economic development strategies are especially important for the new member states of the EU, since between 2007 and 2013 they will receive significant subsidies from the European Union's regional development funds to improve the competitiveness of their lagging regions. The analysis of this issue calls for clarifying various questions for the less developed regions. What do we mean by regional competitiveness and how can it be described and measured? Do the economic, social and institutional background and the cultural characteristics of a region influence regional economic development strategies? Which development strategy can most significantly improve regional competitiveness in the lagging regions?

After reviewing the most important features of interregional competition, this study provides a detailed analysis of the so-called "UFO model" serving as a cluster-based improvement of regional competitiveness. On the basis of this model we outline the regional economic development ideas aiming to improve the competitiveness of regions with different development levels. This model is suitable for the systematization of both top down regional policy and bottom-up regional economic development ideas, consequently it was also applied for the planning of the economic development strategies of the different region (nodal region) types of the Southern Great Plain region in Hungary.

2. New economics of competition

Globalisation has radically transformed the criteria and characteristics of market competition as well; the majority of new economic political answers and of the strategic answers of companies to newly emerging questions generated by global challenges depart from a novel understanding of competitiveness. As a result of global competition, the formerly characteristic territorial processes of the economy also changed; a 'global economy' is being shaped, where the former role of territorial levels undergoes reinterpretation. *Dicken* appropriately calls this newly emerging (world) economy 'new geo-economy', which is characterised by an increasing, unprecedented and intense unification process of economic activities; the world economy may be seen as a new organic unit of interconnected elements (Dicken 2003).

Intensifying competition, which characterizes the global economy, significantly shapes the theory and also the practice of regional economic development. This brings us to several fundamental questions. Is there interregional competition, and if yes how can it be characterized? Are lagging regions able to compete with developed ones, and what sort of strategy should they develop?

Market competition amongst companies can easily be interpreted, but it is questionable whether the long existing rivalry of countries and regions should be considered competition or not. Two opposing views exist in this respect. According to the first opinion, while in the case of companies the concept of market competition is unambiguous, in the case of cities, regions and countries it is impossible to talk about real competition. In the other view competition among regions and cities exists, but its features essentially differ form those of the market competition existing among companies. The basic position of the trends departing from *comparative advantages* demonstrates the first approach well, while the schools accepting *competitive advantages* support the second one (Camagni 2002, Neary 2003, Pike et al 2006b, Sheppard 2000, Török 2006).

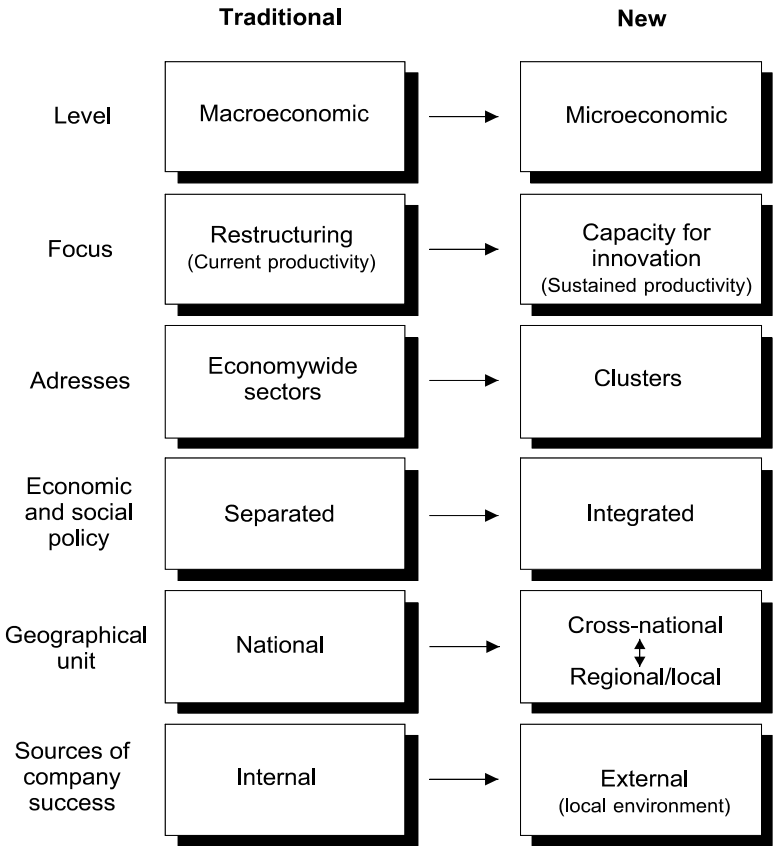
According to the theory of *comparative advantages*, if countries in international trade specialize in producing the goods and products, in which their relative labour productivity or their relative expenditure cost is more favourable, that leads to the development of an international division of labour, from which each country benefits (Krugman 1994, Krugman–Obstfeld 2002). This means that there is *no competition among countries* since free trade and the market automatisms governed by the 'invisible hand' generate a balanced development and create a favourable situation for each country that recognises its comparative advantages. Therefore, it is useless to talk about competition among countries and to talk about competitiveness. Krugman's abovementioned thoughts are widely acknowledged and it has become commonly accepted in regional science that *the rivalry of countries and regions cannot be compared to companies' market competition* (Polenske 2004).

On the other hand, there is also relative consensus about the idea that there is not only rivalry among regions, but 'competition-like' features have also emerged: due to the effects of globalisation, the 'traditional' rivalry among cities, regions and countries has gained a new meaning by today (Begg 1999, 2002; Camagni 2002; Cheshire–Gordon 1998; Lever 1999; Malecki 2002, 2004).

The theory of *competitive advantages* reflects to the *new conditions of the global competition*. Michael Porter claims that today the theory of comparative advantages does not provide an acceptable explanation about the international division of labour (Porter 1990; 1998, pp. 322–324). Porter's proposal to development is the *theory of competitive advantages*, which systematizes the development phases of countries and the new elements of the international (and regional) division of labour. The competitive advantage of a given country or region depends on economic structure, the development level of the institution system and the quality of its operation, governmental economic policies and ideas on regional development.

The competitive strategies of globally competing companies and the regional clusters exploit dynamic agglomeration economies. Defining the *new economics of competition*, Michael Porter (2001, pp. 139–141) highlights six fundamental factors (*Figure 1*).

Figure 1. Transitions in competition



Source: own construction based on *Porter* (2001, pp. 139–141)

Formerly, the acting space of economic players and the conditions of competition were controlled mainly by macro-economic aspects like balanced budget, foreign trade balance, economic policies developed on the basis of inflation (monetary, fiscal, customs and industrial policies, etc). Today, however, economic growth and the development of a given country are primarily defined by *microeconomic bases* like the strategies of the dominant global companies and the local business environment. Obviously, governmental economic policies remain important but these have become highly similar in different countries (e.g. in the EU's member states) and their acting space has narrowed down due to the formation of global capital markets and the predominance of transnational corporations.

The recognition of this has brought along a fundamental change in the economic policy of developed countries: instead of traditional investment promotion, industrial policy, infrastructural development, etc. that influence productivity merely in the short

run, the main focus shifted to supporting the formation of a business environment that *improves innovation skills and capacity* by helping the business realisation of new ideas, the emergence of new lines of business and applying more effective company strategies. The improvement of productivity in a region depends on what types of new goods are produced, which new market needs are satisfied and not on the more effective production of old products.

The new economic policy does not focus on economic sectors and large companies, the ownership and market relations of which it can hardly comprehend and influence, but rather on improving the sources of the competitive advantages of companies. These competitive advantages derive mainly from company collaborations and positive local externalities. Furthermore, they are highly specific depending on localness, which can be exploited in a flexible way only by *clusters, networks and SMEs*. Formerly, improving economic conditions was almost exclusively the task of economic policy, while social policy mostly dealt with 'spending' the budgetary earnings, and the institutions, their agents and ministries representing the two policies were also distinct. Today, *economic and social policies* must work together, the two are closely intertwined, therefore, need to set a shared objective: to improve the welfare of the local population. It is impossible to design separate economic and social policies because in case of differing objectives these weaken each other, which quickly leads to deterioration in the given country's position in global competition.

Nowadays, besides national economies (and partly instead of these), supranational economies crossing national economies (e.g. the EU) and (subnational) regional economies have become *dominant territorial units*. Partly related to this, the sources of the competitive advantages of global companies are mainly local and depend on the local environment, which means that the external economies of scale (local externalities, agglomeration advantages) and the overflow of knowledge have become important. The recognition, that *innovation processes* basically have 'double ties' partly depending on the local environment (the local innovation climate) and on global networks (mainly among knowledge creation city regions), also seems more and more common (Varga 2006).

The above-mentioned thoughts related to the new economics of competition cannot be regarded as fully mature, but should rather be interpreted as tentative proposals or research concepts (hypotheses). However, real economic processes more and more justify these observations and it seems that the traditional approach to competition fails to describe reality. The strong competition generated by globalisation processes and the changed economic circumstances force economic players to come up with new answers.

According to *Porter* (1996), regions do not compete with one another like national economies, which means that they do not use various governmental (monetary, fiscal, customs, export promotion, tax, investment and other) economic policies, since they do not even have such policies. But their competition is not similar to that of

companies either, since there is no single decision making centre in the region that designs and executes a regional competition strategy by focusing on prifit maximizing. Regions and cities compete by creating a *business environment that fosters the productivity improvement* and contributea to the success of the region's firms: specialised institutes of education, effective special infrastructure, information services facilitating innovation, enterprise-friendly administration, developing research and development institutes that meet the profile of clusters. Networks consisting of the various local groups (chambers, institutes, universities and so on) participate in creating the business environment.

3. Interregional competition

In connection with the territorial units we need to distinguish between competition among countries and among the different (sub-national) regions of a country. When analysing regional competition and competitiveness, *Malecki* (2002) underlines the fact that the regions seem to separate from the national economy more and more: today the development pace of the national economy depends on the economy of regions and cities as successful 'regional motors' and not vice versa. Companies can choose from a great variety of locations, therefore cities compete in 'attracting' the scarcely available profitable companies: not only financial benefits (tax discounts, promotion, etc.) but mainly the favourable business conditions (the quality of the infrastructure, the flexibility and standard of institutes in education, transparent legal regulations, etc.) are the decisive factor in the competition. „In short, competition among cities is real and has become 'fiercer'" (Malecki 2002, p. 930). Interregional competition is a special type of competition that can be characterised with easily producible parameters and regional competencies (Budd–Hirmis 2004).

In the competition among the different regions within a country *scarcity* derives from two interrelated factors: investments made in the new market segments demanding special expertise and talented experts (Malecki 2002, p. 930). The competition of regions is a skill 'sticking' or attracting investments and talented labour force and the main goal is "to sustain their attractiveness to both labour and capital" (Markusen 1999, p. 98). Not only the attraction of capital and creative employess from outside the region is necessary, but the attraction of tourists as well, and the local entrepreneurial skills also need stimulation. The results of interregional competition are similar to those of the competition among countries: in the successfully competing regions thewelfare (living standard) improves, employment and incomes (wages) are high, new investments take place, talented young people and successful businessmen move there, etc. (Malecki 2004, Polenske 2004).

Based on the abovementioned features the *definition of interregional competition* may be conceptualized as the following (Cheshire 2003; Cheshire–Gordon 1998; Gordon–Cheshire 2001; Lengyel 2003a): a *process that occurs among territorial*

units aiming to increase the welfare of the people living in the cities or regions by promoting the development of regional and local economy, a development that certain groups try to influence explicitly or often implicitly through local policies by competing and rivalizing with other territorial units.

The definition of interregional competition described above is relatively general and can be interpreted for a wide range of territorial units. Taking into account also the practical characteristics of interregional competition, the following factors are important in interpreting the definition (Lengyel 2003a):

(1) The *aim* of interregional competition is to improve the welfare of the population living in the region, what calls for the permanent increase of the income produced there. This income is distributed to a wide range of the local population especially through a high rate of employment.

(2) The *players* of interregional competition are the territorial units: regions and cities, the interests of which are represented by *local groups* often competing with one another. Besides the local government, city council and its institutions, the representatives of the *local economic scene* and *civil sphere* are also involved jointly constituting a so-called regional network. The (city or county) *local government's coordinating* role is indispensable in this network.

(3) We can only talk about interregional competition in case of a *bottom-up* regional and local economic development, when the local players design and implement their competition strategy independently.

(4) The main instrument of interregional competition is the development and implementation of *local economic development ideas* facilitating the economic development. The creation of a business environment that generates an improvement in the income generating capacity of the local economy is obviously essential. The city or region's vision of future together with the ideas that lead to it must be made public so that enterprises and households can make their decisions (of implicit effect) with awareness.

(5) Interregional competition is a *process*, which means that it has a dynamic approach and needs adaptation to constant changes. Therefore, it is necessary to rephrase actual goals regularly and shift focus among local groups based on which of them can best achieve the realization of these goals.

(6) Interregional competition occurs primarily among the territorial units of the *same hierarchical level* (NUTS-system) and in the same competitive phase, so among cities or regions of similar development level and size. Therefore, an industrial region, for instance, is not a direct competitor of an agrarian region or a city region operating as a logistics-financial centre. Indirect competition among regions at different development levels also occurs but only temporarily, for the duration of certain projects.

(7) Interregional competition *does not zero-sum game*, which means that winners do not necessarily gain advantages to the disadvantage of losers; instead, economic development is possible in each region or city simultaneously. Consequently,

besides competition, conscious cooperation and harmonized development strategies (e.g. an airport in case of a larger scale infrastructural investment) may prove beneficial, especially among neighbouring territorial units.

(8) Beyond a conscious development strategy, interregional competition may also be influenced by *implicit (indirect)* developments not included in community programmes and unforeseeable synergic effects, especially the consequences of the decisions made by enterprises and households.

It is essential that interregional competition mostly occurs *based on economic aspects* and the major goal of the players participating in the competition is to generate a long-term and stable increase in the income of the region or city, that is, successful economic development. A region or city does not participate in this competition as a whole, but is divided in *various interest groups* often with conflicting interests.

The *results of interregional competition* are similar to those of the competition among countries: in the region successfully competing welfare (living standard) improves, employment and incomes (wages) are high, new investments take place, talented young people and successful businessmen move there, etc. (Camagni 2002, Malecki 2004). Naturally, in the less successful regions just the opposite occurs: welfare (living standard) deteriorates or stagnates, incomes fail to increase, there is a reduction in the number of work places, no new investments occur, unemployment increases, talented young people and successful businessmen leave, the population grows older, etc. However, contrary to company competition the results of interregional competition become apparent slowly, usually after long decades, especially owing to the low mobility of households.

Summarizing the competition among regions: it occurs with economic goals to achieve the constant improvement of welfare (living standard). In this competition regions compete by creating a business environment calculable and attractive for companies, by attracting or keeping successful enterprises and talented labour force. Each region must develop a *bottom-up competition strategy*: they must design a vision of future, concept and programmes and achieve wide public awareness this way orienting the local population, the inhabitants and enterprises excluded from active regional networks (Rechnitzer 1998). Regions can only be successful by actively implementing a bottom-up development strategy that departs from a widely accepted vision of future and harmonizing projects that have different economic development effects with the help of dynamic regional networks.

4. UFO model: cluster-based regional economic development

Successfulness in competition, or in other words, *competitiveness* has been one of the key concepts often used and quasi ’fashionable’ in many areas of economics over the past two or three decades partly due to the acumination of global competition. It is a

fashionable term the use of which seems nowadays to be nearly obligatory. In Iain Begg's apt formulation: "improved competitiveness, as we all know, is the path to economic nirvana" (Begg 1999, p. 795).

The objective of regional and local economic development is the improvement of the standard of living and quality of life of the region's inhabitants. Hence economic development and competitiveness are strongly connected, only those kinds of programmes belong into the competence of economic development which improves regional competitiveness.

Two major issues emerged in the debates aiming at the interpretation of competitiveness: on one hand, *how to define regional competitiveness and what indicators should be used to measure it*? On the other hand, *how can regional competitiveness be improved*, which governmental and local interventions may be regarded as successful? These two questions usually lie in the background of other professional debates too; while representatives of academic economics concentrate on the first one, experts of regional policy tend to focus on the second one.

There were a number of attempts to define the new notion of competitiveness according to new global competition conditions in the mid 1990s. The standard notion of competitiveness in the Sixth Regional Periodic Report of EU (EC 1999): '*The ability of companies, industries, regions, nations and supra-national regions to generate, while being exposed to international competition, relatively high income and employment levels*'. In other words *'high and rising standards of living and high rates of employment on a sustainable basis*' (EC 2001). In the European Competitiveness Report (EC 2008, p. 15): "*Competitiveness is understood to mean a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment, as possible.*" In the report of Regional Competitiveness Indicators of UK (DTI 2002): '*Regional competitiveness describes the ability of regions to generate income and maintain employment levels in the face of domestic and international competition*'.

Hence the *substance of regional competitiveness*: the economic growth in the region, which growth is generated by both a *high level of labour productivity* and a *high level of employment*. In other words, competitiveness means *economic growth driven by high productivity and a high employment rate*.

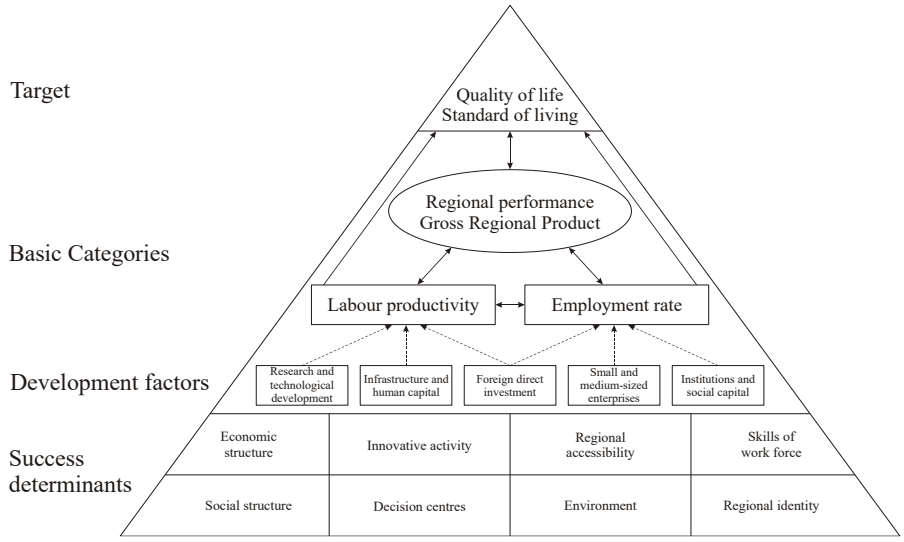
The notion of competitiveness obtained in this way cannot be used, however, to identify factors responsible for regional competitiveness or areas which are to be strengthened or developed by regional development policies and programmes for improved competitiveness. Since the notion of competitiveness can be seen as refining that of economic growth, it can often be observed that proposals for improved competitiveness combine traditional means of economic development with methods based on endogenous development.

The *pyramidal model of regional competitiveness* seeks to provide a systematic account of these means and to describe the basic aspects of improved competitiveness (*Figure 2*). 'This model is useful to inform the development of the determinants of

economic viability and self-containment for geographical economies' (Pike et al, 2006a, p. 26). 'This is an aggregate notion, …, in a regional context, labour productivity is the outcome of a variety of determinants (including the sort of regional assets alluded to above). Many of these regional factors and assets also determine a region's overall employment rate. Together, labour productivity and employment rate are measures of what might be called 'revealed competitiveness', and both are central components of a region's economic performance and its prosperity (as measured, say, by GDP per capita), though obviously of themselves they say little about the underlying regional attributes (sources of competitiveness) on which they depend' (Gardiner – Martin – Tyler 2004, p. 1049).

The standard of living, prosperity of any region depends on its competitiveness (Begg 2002). Factors influencing regional competitiveness can be divided into two groups of *direct* and *indirect* components. Of particular importance are programming factors with a direct and short-term influence on economic output, profitability, labour productivity and employment rates (Huggins 2003, Lengyel 2004). But social, economic, environmental and cultural processes and parameters, the so-called 'success determinants', with an indirect, long-term impact on competitiveness are also to be taken into account (Enyedi 1996, Jensen–Butler 1999).

Figure 2. The pyramidal model of regional competitiveness



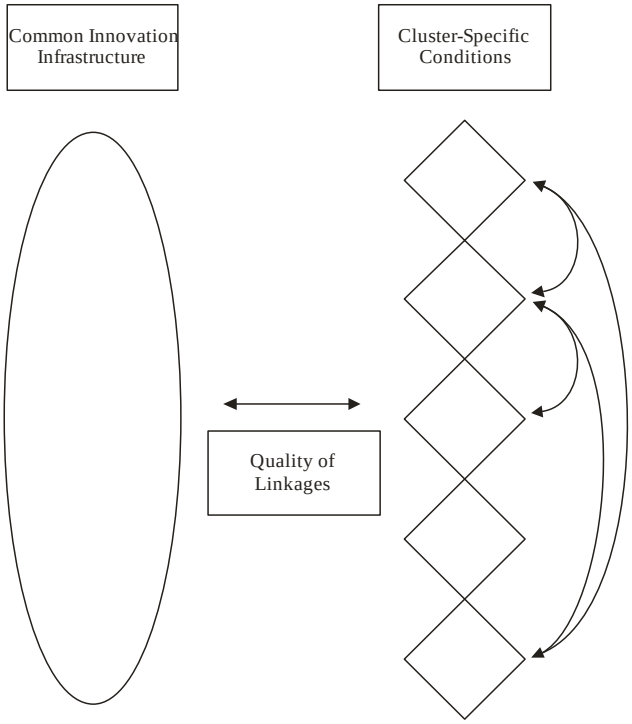
Source: Lengyel (2000, 2004)

The elements of regional competitiveness are systematized by the pyramidal model, which reduces the components of economic development to connected factors (Enyedi 2009, Pike et al 2006b). Can competitiveness be improved by developing the

same factors in all kinds of regions? What determines the success a regional development strategy?

The vitality of regional development strategy in a region is depend on regional innovative capacity. 'This capacity is not simply the realized level of innovation but also reflects the fundamental conditions, investments, and policy choices that create the environment for innovation in a particular location" (Porter–Stern 2001, p. 5). The regional innovative capacity depends on three broad elements: common innovation infrastructure, cluster-specific conditions, and quality of linkages (*Figure 3*). *Porter* has argued that traded regional clusters are capable of improving competitiveness and therefore proposed a cluster-based approach to regional economic development (Porter 2003b).

Figure 3. Elements of regional innovation capacity



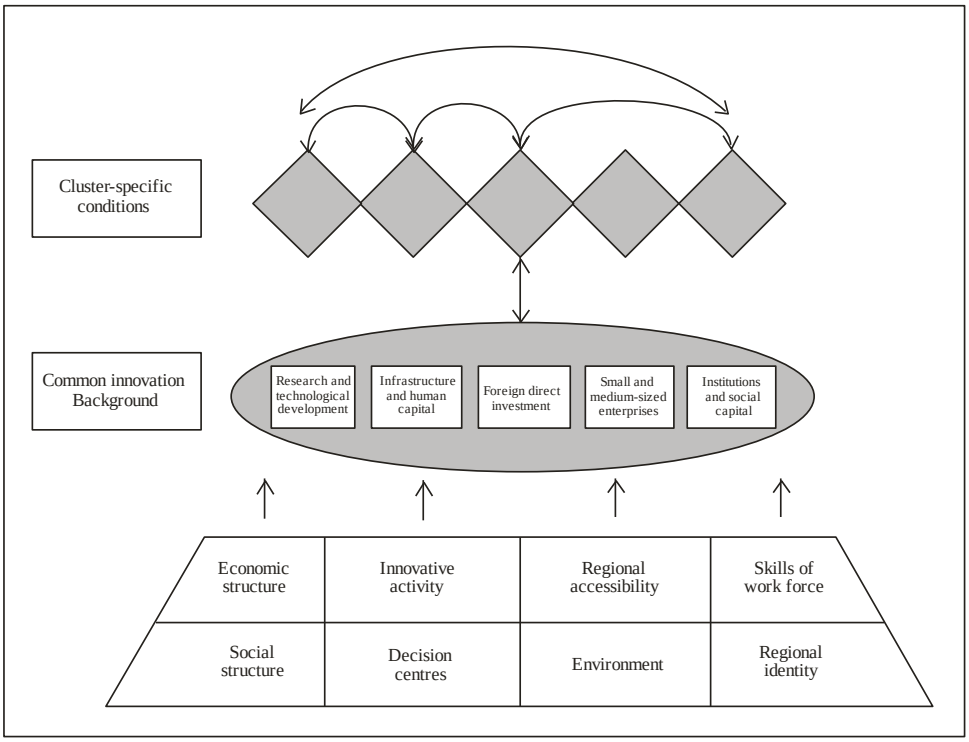
Source: Porter – Stern (2001, p. 5)

In line with the structure of the pyramidal model and element of regional innovative capacity, we distinguish between four levels of bottom-up regional economic development programmes aiming to improve regional competitiveness

(*Figure 4*): success factors, common innovation background, cluster specific conditions, and linkages. While on the basis of the pyramidal model the competitiveness can be measured and the influencing factors can by systematized, cluster-based development enhances the basic industries of the regions, an by doing so it reinforces specialization necessary for meeting the challenge of global competition.

On the basis of *UFO model* (*U*nconventional *F*ramework of *O*perational programming) we outline the regional economic development ideas aiming to improve the competitiveness of regions with different development types. The UFO model suitable for the systematization of both regional planning and cluster-based regional economic development ideas, consequently it can be also applied for the planning of the economic development strategies of the different subregion (nodal region) types.

Figure 4. UFO-model: the structure of bottom-up regional economic development



Source: own construction

Four levels of UFO model can be distinguished with regard to the objectives of regional development strategies and the various characteristics and factors influencing regional competitiveness (*Figure 4*):

- *Success determinants*: on the basis of the pyramidal models, the reinforcement of certain absent or weak background conditions of region's economy, which are the bottlenecks of regional development. Regarding these actions interregional competition does not emerge, fundamental public utilities and amenities must be guaranteed in the least developed regions as well. Thus within the meaning of cohesion all the regions must be supported that are in need.
- *Common innovation background*: such programmes aiming at the improvement of regional competitiveness, systematized on the basis of the development factors of the UFO model, that further the reinforcement of most of the industries' and enterprises' competitive advantages in the regions. The regional development strategy of the common innovation background depends on the development/competitive type of the region (see next shapter). In connection with the improvement of the common innovation background interregional competition can be observed among the similar regions. This is why the regional organization of bottom-up economic development is important, in order to support solely those regional programmes and projects that are able to improve regional competitiveness the most.
- *Cluster specific conditions*: in more regions it is possible that innovative clusters will emerge. In other regions the emergence of manufacturing and tourism clusters can be expected. Clusters generate very intense interregional competition. To develop similar industries are endeavoured also in other regions of the country, therefore only those regional economic development strategies will be able to succeed that are based on regional consensus and unity and that aim to improve the competitive advantages on the given industry's enterprises.
- *Linkages*: it is essential that there should be interdependence between programmes aiming to improve the common innovation background and clusters, because only this approach can result in the development of regional competitiveness.

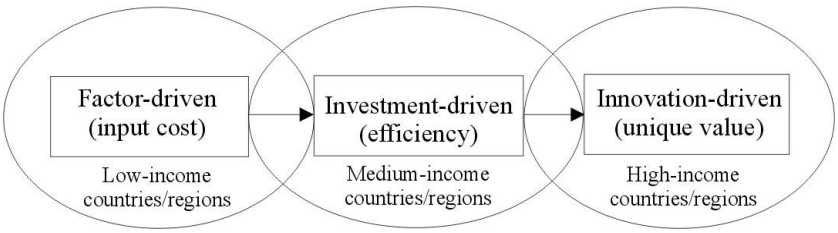
The UFO model can successfully be applied as a demonstration shame in purpose of systematizing development programmes of regions for improving regional competitiveness. Because of the interregional competition, however, in the nodal regions cluster-based programmes must also be developed and constantly managed with the involvement of the concerned enterprises.

5. Competitive regional development

Different 'market places' also occur in the global competition of countries, regions and cities. *Tödtling and Trippl* (2005, p. 1209) describe three types of regions by problem areas and regional innovation deficiencies: peripheral region (organisational thinness), old industrial regions (lock-in), and fragmented metropolitan regions. In 2003 one of the research projects of the EU analysed the factors influencing regional competitiveness and how dominant the elements determining competitiveness are in different region types in order to create the foundation of regional policy between 2007 and 2013. During the research four 'theoretical' region-types were distinguished based on two dimensions, density of population and the growth rate of GDP (Martin et al, 2003 p. 6–23): non-productive regions, regions as production sites, regions as sources of increasing returns, and regions as hubs of knowledge.

Based on the characteristics of *competitive advantages*, Porter (2003b) distinguishes three stages in the countries' development built upon one another. On the basis of the amount of specific GDP and the competition strategies of global industry branches these are (*Figure5*): factor-driven, investment-driven and innovation-driven phases. The three phases of competitive development designed for countries can also be applied in the case of regions (Lengyel 2003a). And these types are very useful to underlie the bottom-up regional development strategies of the regions.

Figure 5. Stages of competitive development of countries/regions



Source: own construction based on Porter (2003b, pp. 26–28)

The division of labour among the subnational regions of a country is different from that of different countries. A region cannot develop own economic policies; instead, its economy specializes as a consequence of market processes and central governmental development decisions. Nowadays, *knowledge-based economy* strongly shapes the specialization patterns of a country's regions with different development levels, and also changing the former characteristics of interregional competition (Grosz – Csizmadia – Rechnitzer 2005, Lengyel, B. – Leyesdorff 2010). Consequently, the three phases of competitive development should be specified based on the processes of the knowledge-based economy by using the specialisation of the *postfordist economy* (Cooke 2001, Lengyel 2003a).

Based on the differences among regions it is preferable to differentiate where knowledge is created and where it is only adapted (Asheim 2001, Bajmócy 2006, Lengyel B. 2005). In the case of competitive regional development only in the innovation-driven phase can it be stated definitely that competitive advantages derive from knowledge creation, while in the investment- and factor-driven phases they originate from the mere adaptation of knowledge. Less developed, lagging regions are in an exposed situation, certain features of the knowledge-based economy are present, but *neofordist characteristics* are decisive (Lengyel 2003a).

In harmony with the phases of competitive development *three types of postfordist regions* must be distinguished (Asheim 2001, Lengyel 2003a, Martin et al 2003):

- *Neofordist region*: factor-driven phase (regions with low income and input cost), regions as production sites,
- *Knowledge transfer region*: investment-driven phase (regions with medium income and efficiency), regions as sources of increasing returns, and
- *Knowledge creation region*: innovation-driven phase (regions with high income and unique value), regions as hubs of knowledge.

Neofordist and knowledge transfer regions differ from knowledge creation regions not only in terms of the sources of competitive advantages, but also because they are economically exposed and fragile, first of all in the transition economies (Enyedi 1996, Papanek – Borsi – Tompa 2008, Rechnitzer 2000). The decision centres of global companies hardy occur in less developed regions, so they demand knowledge less; rather the executive type activities of global companies are present here. Besides assembly plants, units of global companies selling products and performing service activities on the local market, local branches of international banks and insurance companies, and sometimes subsidiaries engaging in minor research activities also operate here. Naturally, most regions are 'mixed', but while neofordist and knowledge transfer activities and companies also exist in knowledge creation regions, the number of firms based on knowledge creation is close to zero in neofordist regions (Lengyel 2003b).

In the course of the debate on interregional competition, it is increasingly acknowledged, that regions with similar state of development compete with each other, while amongst the different types of regions there is rather rivalry (Camagni 2002, Malecki 2004, Polenske 2004, Hall 2001). Competition is especially intense among metropolises, but within the EU or a country there also exist interregional competition amongst nodal regions with similar state of development.

Concerning the three region types reviewed above, different development strategies must be applied, which means that *the improvement of competitiveness demands different measures based on the different types of regions*. These steps correspond to the phases of competitive regional development and at the same time indicate that competitiveness can be improved only with the help of complex programmes. The UFO model systematizes those economic development priorities

that adjust to the real social-economic situation and the achievable (realistic) aims of the different region types. The improvement of regional competitiveness depends on the consistent realisation of these development strategies.

6. Bottop-up economic development with different types of regions

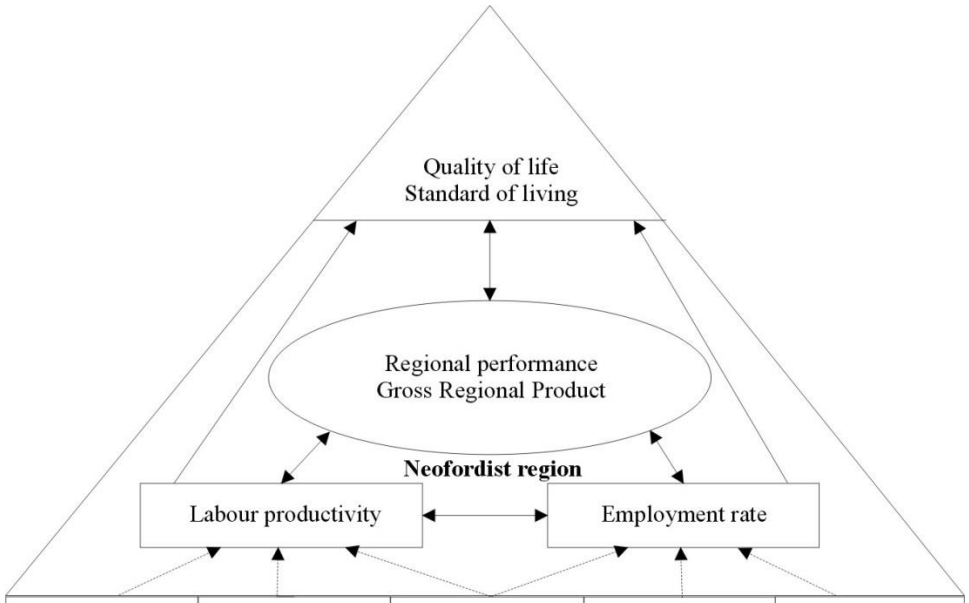
In the course of describing the features of interregional competition we emphasised that those regions compete with one another that have similar economic structure and are at the same level of development. At the same time, it is not enough to measure the competitiveness of regions, but we also need to outline what can be done to improve competitiveness. Furthermore, a special version of the UFO model can be designed, the elements of which are built upon the real opportunities of the given region type and may contribute to improving the competitiveness of the region. The elements of the common innovation background (basic factors of pyramidal model) are different in each sub-type.

The *neofordist region* is underdeveloped, it corresponds to a semi-periphery, the generated income (GDP/habitant) is low, and the economy is typically in the factor-driven phase. The development of infrastructure is insufficient, the education level of the labour force is low, the members of company management are not competitive internationally and part of the qualified labour force and talented young people leave the region (Lengyel 2002). The major goal focuses on developing the technical infrastructure (transportation network, energetics, etc.) and attracting the sites of global companies with prepared industrial areas, low local taxes, low wages, etc.

Regarding the elements of *infrastructure and human capital* as development factors, such regions should concentrate on developing the transportation networks that are usually less established and of low quality. Mainly motorways, airports, railroad systems, ports, logistic centres must be created that are essential for making the divisions of global companies targeting cost advantages settle. It is also advisable to design industrial areas (industrial parks) containing concentrated infrastructure, partly owing to environmental reasons. Vocational training cannot be transformed based on special company needs, but rather the quality of task-oriented schemes offering wide basic training in existing institutes must be improved.

In the case of *investments coming from outside the region*, the divisions of companies must be attracted that are able to generate regional multiplicator effects by establishing a new activity. In the region these divisions and activities can work as the starting points of a structural change, which the local economic sphere is unable to achieve by itself. The embedment of global companies' divisions, the development of local business and personal relations must be encouraged with the help of various events, forums to enable information flow that can also be followed by business transactions later on.

Figure 6. Bottom-up economic development of neofordist region



Source: Lengyel (2003a).

In neofordist regions very few *small and medium-sized enterprises (SMEs)* are present in the traded sector, neither the business environment, nor the preparation level of these companies is enough for global competition. SMEs have insufficient international knowledge; therefore, the wide dissemination of modern entrepreneureal skills and enterprise culture is essential for their development. This should be understood as a *learning process*, SMEs can learn not only at courses but also from one another and from global companies too. One of the most important objectives is for SMEs to become the business partner or contracted supplier of settled global company units, because this way they can win a stable market and gain modern knowledge and business experience.

In a neofordist region the *institutions and social capital* are not market-friendly enough. Public administration organisations must be made to have 'enterprise-friendly' customer services. As for training programmes available in higher education institutions, the technical, business, economic training necessary for the successful operation of enterprises is either missing or is of poor quality, so support must be lent to launch, strengthen and disseminate these programmes, so that modern business training can become part of the curriculum in each higher education scheme.

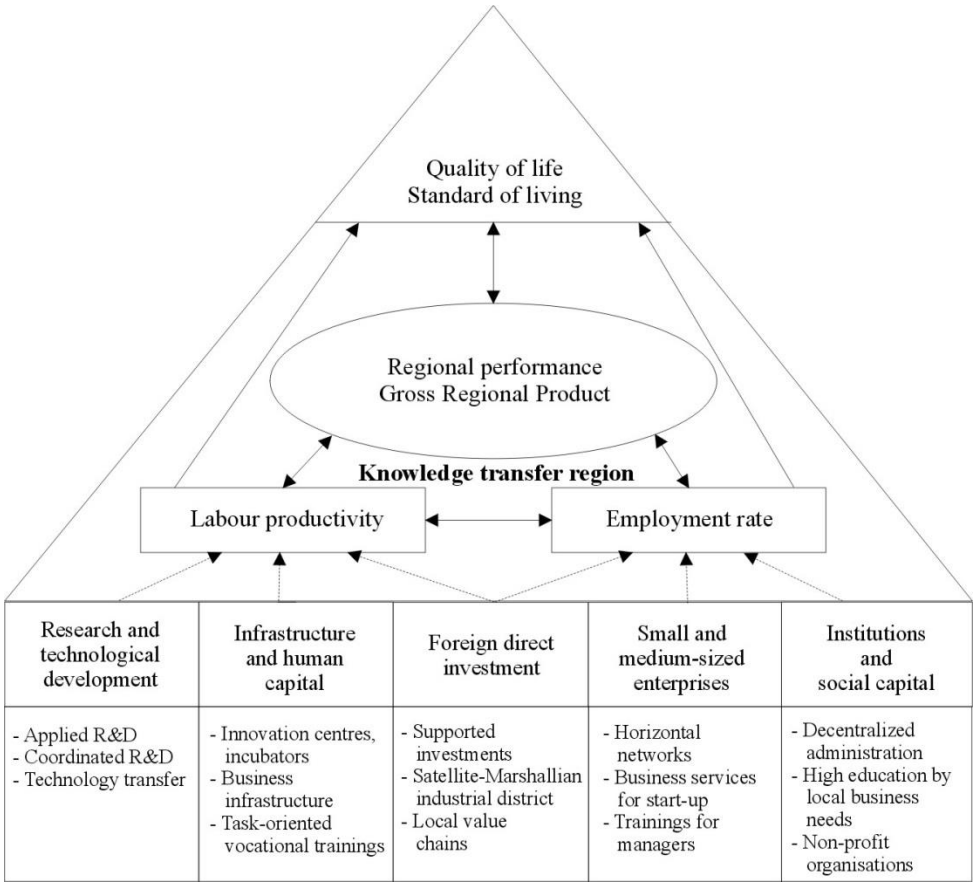
Knowledge transfer regions are usually medium developed, the most important goal of economic development lies in continuing the structural change by keeping existing companies and creating work places with higher added value (*Figure 7*). These regions are in the investment-driven phase, they have traded large companies with local headquarters, which already have a network of local SMEs as their contractors. Transportation infrastructure is developed; therefore, the *improvement of the local business environment* is in focus. The education level of the labour force and the training structure already correspond to the needs of the economic sphere, retraining programmes and courses to improve managerial skills are frequent (Lengyel 2009).

In knowledge transfer regions the need for *research & development* has already emerged, local traded companies also create development units assigning an increasing number of applied research part-tasks to local development companies and research institutes. In the course of economic development, the harmonised research and development activity of companies and institutes must be encouraged. In order to assist smaller companies the establishment of agencies, institutes and other bodies dealing with technology transfer must be facilitated.

Infrastructure and human capital are relatively developed and the transportation network has been established. Support must focus on the institutions and agencies of the business infrastructural background (training institutions, consulting companies, etc.) that satisfy actual company expectations. In harmony with the emerging R&D needs, institutions contributing to the improvement of innovation capacity (innovation centres, incubators) must be created (Bajmócy–Kosztopulosz–Imreh 2007). Strengthening local strategic industry sectors can define their needs precisely concerning the qualification of the labour force, so special training programmes related to these must be developed.

Among the *investments coming from outside* knowledge transfer regions, only those need promotion, whose activities are in harmony with the developing regional strategic industry sectors already present. The embedment of companies with bases outside the region must be encouraged by increasing the circle of SMEs acting as local contractors. This way more and more elements of the global companies' value chain can be present in the region, what not only stimulates the economic growth, but also helps to improve employment.

Figure 7. Bottom-up economic development of knowledge transfer region



Source: Lengyel (2003a).

In knowledge transfer regions more and more *small and medium-sized enterprises* (SMEs) operate in the traded sector, and are prepared for global competition. In order to strengthen these SMEs, the development of their horizontal networks, clusters must be helped. The formation of start-up companies related to the activities of developing strategic industry sectors must also be encouraged mainly with business incubator programmes.

In these regions the role of *institutions and social capital* is increasingly important. Fast and reliable public services are essential for the successful global competition of developing strategic industry sectors and strengthening SME networks. Therefore, it is necessary to decentralise administration, since only regional and local governments present in the region can take measures effectively

and flexibly. Local higher education must be encouraged of design training modules corresponding to the labour force needs of strengthening local strategic sectors this way ensuring the prepared labour force supply for companies.

In knowledge creation regions economic output is high, these regions are in the innovation-driven phase and the regional centres of significant global companies are situated here. Administration is decentralised, a cluster-based economic development is set as an objective partly due to this to improve the business environment necessary to strenghten the competitive advantages of global companies with local headquarters. Developing the background of innovation capacities is in focus, scientific parks, universities, incubator programmes, venture capital and other schemes have an important role.

In knowledge creation regions *research & development* is of high quality, governmental and business R&D performs harmonised research based on the needs of clusters (*Figure 8*). The innovation environment is developed, the institutional system and the local society equally place emphasis on supporting collaboration in the frameworks of research programmes (Török 2006, Varga 2009).

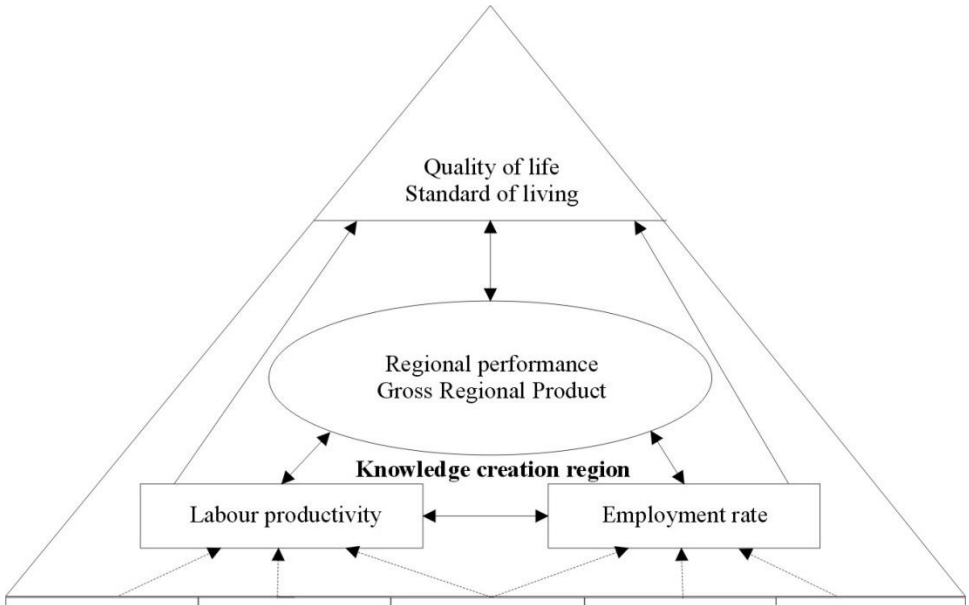
Infrastructure and human capital equally follow innovation expectations. Transportation and business infrastructures are developed, the most important objective lies in improving the scientific infrastructure: to establish scientific parks and communications networks. In the traded sector vocational training, especially retraining must shift from task-oriented to become problem-oriented, since more and more innovative experts are needed who are able to make individual decisions and perform work independently.

Among investments coming from outside the region the most important effort targets attracting the decision centres of international and governmental organisations and global companies. The settlement of supporting and related industries must be encouraged in order to strenghten clusters. To improve employment, support must be lent to cooperations among SMEs and global companies with local headquarters.

The rate of *small and medium-sized enterprises* of traded nature is high, their competitive advantages must be strenghtened by creating clusters. The growing number of innovative SMEs demand various forms of venture capital, therefore, it is important to encourage the creation of such services. Spin-off companies departing from universities and employing creative graduate and doctoral (Ph.D.) students and young lecturers must be assisted with different incubator programmes.

The *institutions and social capital* equally support cluster-based economic development. Higher education satisfies the needs of local strategic sectors and clusters striving to launch training and research programmes of high scientific quality. Regional networks operate effectively and regional identity is strong. Mechanisms have been developed to handle conflicts emerging in the collaboration of the various organisations of the decentralised administration and the private sector, the local economic governments and non-profit organisations.

Figure 8. Bottom-up economic development of knowledge creation region



Source: Lengyel (2003a).

Concerning the three region types reviewed above, different economic development programmes must be applied, which means that *the improvement of competitiveness demands different strategies based on the different types of regions* (Table 1). These steps correspond to the phases of competitive regional development and at the same time indicate that competitiveness can be improved only with the help of complex bottom-up programmes. The UFO systematises those economic development priorities that adjust to the real social-economic situation and the achievable aims of the different types. The improvement of regional competitiveness depends on the consistent realisation of these development programmes.

Table 1. Elements of common innovation background of the distinct types of regions

	Neofordist	Knowledge transfer	Knowledge creation
Research and technological development	Non-business and governmental R&D Separated R&D Laboratories, equipments	Applied R&D Coordinated R&D Technology transfer	Harmonised business and non-business R&D Integrated R&D Innovative milieu
Infrastructure and human capital	Industrial parks Transportation networks Vocational training	Innovation centres, incubators Business infrastructure Task-oriented vocational trainings	Science parks Communication networks Problem-oriented trainings, retrainings
Direct investment outside from region	Location of companies Satellite platform district Local business relations	Supported investments Satellite-Marshallian industrial district Local value chain	Attracting decision centres Hub-and-spoke district Local supporting and related industries
Small and medium-sized enterprises	Networks of suppliers Financial promotion Entrepreneurial skills	Horizontal networks Business services for start-up Trainings for managers	Clusters Venture capital Business incubators for spin-off
Institutions and social capital	Enterprise-friendly administration Business and technical higher education Ability for local cooperation	Decentralized administration Higher education by local business Non-profit organizations	Collaboration among administration and businesses Cluster-oriented higher education Regional identity

Source: Lengyel (2003a)

Every contry is heterogeneous, since it consists of subnational regions with significantly different state of development. Due to the strong interregional competition, bottom-up strategies must be developed in all regions. These should refer to reinforcement of clusters beside the common innovation background. This is the only way that provides an opportunity for the improvement of regional competitiveness.

7. Summary

This study reviewed the most important questions related to interregional competition and regional competitiveness. Globalisation processes, their interregional characteristics and global competition lead to the development of a 'new economic space'. With the emergence of the knowledge-based economy the international division of labour also transforms and the role of regions in the postfordist economy must be reconsidered. Three basic region types can be distinguished that participate differently in the international division of labour. The acceleration of global competition has resulted in the increase of competition among regions, or more precisely, nodal sub-regions.

Due to the special characteristics of global competition, the concept of regional competitiveness must also be defined. There is abundant literature on competitiveness with certain well-known approaches, out of which especially the concept of standard competitiveness common in the European Union seems adequate in case of the regions not only for scientific analyses but also for regional economic political applications. The concept of standard competitiveness is partly linked to the thought of economic growth; therefore, it also leans on theoretical economics, although it also has strong regional political and economic development aspects that brings it close to the questions of business sciences as well.

For the interpretation of regional competitiveness a pyramidal model was established that offers a complex frame for the measurement and improvement of competitiveness. It does not only make a proposal concerning the indicators applicable for measuring competitiveness, but also systematises economic development ideas depending on the types of regions. The logic of bottom-up regional economic development is demonstrated by the UFO model, which connects the approach of competitiveness and the practice of cluster development in the different types of regions.

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5. Competitiveness of Hungarian Urban Micro-regions: Localization Agglomeration Economies and the Regional Competitiveness Function*

Imre LENGYEL – Izabella SZAKÁLNÉ KANÓ

Nowadays, more and more scholars of regional science are interested in the role of agglomeration economies in the knowledge-based economy. This issue can be dealt with from different points of view: different development types of functional or nodal regions with the examination of the factors influencing regional competitiveness. In this paper, we outline our analytical framework: the renewed pyramidal model of regional competitiveness. The renewed pyramidal model is a logical systematization for measuring endogenous regional development and the factors influencing it; the model shall be used to introduce the regional competitiveness function (RCF). After introducing theoretical model and new function, we are going to investigate the competitiveness of Hungarian urban microregions (LAU1), where firms potentially enjoy localization agglomeration economies. The statistical analysis to underline the classification of microregions by competitiveness types is based on multivariate linear regression models.

Keywords: regional competitiveness, pyramidal model, endogenous regional development, regional competitiveness function.

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1. Introduction

Increasing regionalization represents one of the most spectacular processes of the economies that develop and transform as a result of globalization processes; while the (relative) importance of national economies is decreasing, the economic role of regions and cities seems to grow. Global competition has also intensified spatially, especially with the growing importance of the agglomeration economies. Interregional competition, which refers to the competition of regions and cities for scarce resources, educated human labour, investments etc., is increasingly prevalent (Enyedi 2009).

It appears to be generally accepted in regional science these days, that there is some sort of competition among regions, but this may be characterized by different attributes such as the competition among corporations or countries (Batey–Friedrich

2000, Chesire 2003, Malecki 2002). Capello states (2007a, xviii): ‘Regions compete on absolute rather than comparative advantage”. The results of interregional competition are similar to those of the competition among countries: welfare (living standard) improves in the successfully competing regions, employment and incomes (wages) are high, new investments take place, talented young people and successful businessmen migrate there, etc. (Malecki 2004, Polenske 2004). Successfulness in competition, or in other words, competitiveness has been one of the key concepts over the past two or three decades partly due to the sharpening of global competition (Camagni 2002).

Today territorial competitiveness covers both economic growth and economic development. This complex point of view is well demonstrated by the fact that Capello (2007a) emphasizes the connections between territorial competitiveness and local development, as well as regional growth (both for endogenous and exogenous) in her book entitled 'Regional economics'. However, while theoretical approaches of econometric regional growth between 1960 and 1990 were based on increasing productivity and individual welfare indicators as described by traditional neoclassical models, the shift in the 1990s resulted in a definite turn towards strengthening competitiveness (Capello 2007b). In territorial endogenous growth theories, regional growth is the result of partly independent mechanisms (Capello 2007b, pp. 757–758): a competitive process, a socio-relational process, a territorial and spatial process, an interactive process, and an endogenous process.

The modes of improving regional competitiveness and regional economic development strategies are heavily dependent on the type of the given region. This is because regions in different phases of their development are in different positions when it comes to interregional competition. Porter et al (2008) classified these phases as: resource-driven stage, investment-driven stage, and innovation-driven stage. These categories are especially important in understanding regional development in transition economies, where regions are hardly in the innovation-driven phase (Lengyel–Cadil 2009, Lengyel–Leydesdorff 2010, Lengyel 2009b). However, based on agglomeration advantages Budd–Hirmis (2004) points out that metropolitan regions with urbanization agglomeration economies are competing with more emphasis on their comparative advantages, while regions of localization agglomeration economies tend to compete on competitive advantages. McCann (2008) considers that size of regions is a strong influential factor when it comes to the organization of clusters, which play a very important role in interregional competition: pure agglomeration (urban), industrial complex (local but not urban), and social networks (local but not urban).

The next section of this paper covers the pyramidal model of regional competitiveness. This model is a logical systematization for measuring endogenous regional growth and the factors influencing it; the model will be used to introduce the regional competitiveness function (RCF). After introducing the theoretical model, we are going to investigate the competitiveness of Hungarian urban micro-regions

(LAU1) with a population of above 50 thousand citizens. Our statistical analysis to underline the classification of micro-regions by competitiveness types is based on the multivariate linear regression analysis.

2. Pyramidal model and regional competitiveness function (RCF)

Three major issues emerged in the debates aiming at the interpretation of competitiveness (Barkley 2008):

(1) how to define regional competitiveness and its factors;
(2) what indicators should be used to measure it; and
(3) how can regional competitiveness be improved?

These three questions usually lie in the background of other professional debates too; while representatives of regional science concentrate on the first one, the regional economist on the second one, the experts of regional policy tend to focus on the third one.

There were a number of attempts to define the new notion of competitiveness according to new global competition conditions in the mid-1990s. The *standard notion of competitiveness* in the European Sixth Regional Periodic Report of EU (EC 1999): '*The ability of companies, industries, regions, nations and supra-national regions to generate, while being exposed to international competition, relatively high income and employment levels*'. In the European Competitiveness Report (EC 2008, p. 15): "Competitiveness is understood to mean a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment, as possible." In other words 'high and rising standards of living and high rates of employment on a sustainable basis' (EC 2001). Porter (2007) suggests using prosperity, measured by standard of living and inequality for *measuring regional competitiveness*. Prosperity, defined by per capita income is decomposed into two factors: labour productivity and labour utilization.

Factors influencing labour productivity are skills, capital stock, and total factor productivity. Factors of labour utilization are working hours, unemployment, and workforce participation rate (population age profile). Kitson, Martin, and Tyler (2004) use three indicators for measuring competitiveness: regional productivity, employment, and standard of living. They also claim that competitiveness is influenced by hard and soft elements as well. The bases of the regional competitive advantage are: productive capital, human capital, social-institutional capital, cultural capital, infrastructural capital, and knowledge/creative capital. The region-specific economic and social qualities, like social capital, knowledge/creative capital, and territorial capital are gaining more and more in importance (Camagni 2009, Lengyel I. 2009a). Thus, regional competitiveness studies are increasingly influenced by theories of endogenous growth and development. Stimson, Stough, and Salazar (2009)

suggest a new conceptual model framework for *regional endogenous development*. The dependent variable of endogenous growth is measured by two indicators, on one hand by the change of employment or income, on the other hand by an employment-based location quotient (LQ). Explanatory variables include, among others, resource endowments (estimated by 13 indicators) and market fit (measured by 4 indicators). Their model includes several indicators for leadership quality, as well as institutions and entrepreneurship.

The standard notion of competitiveness obtained in this way cannot be used, however, to identify factors responsible for regional competitiveness or areas, which are to be strengthened or developed by regional development policies and programmes for improved competitiveness. Since the notion of competitiveness can be seen as refining that of economic growth, it can often be observed that proposals for
improved competitiveness combine traditional means of economic development with methods based on endogenous development.

The standard definition refers to 'relatively high income'. This can be measured by means of the per capita GDP and the GDP growth rate. A high employment level is in turn indicated by the rate of employment. These two indicators can be measured independently from one another, but per capita GDP can also be expressed as follows, respectively:

$$\frac{GDP}{total \cdot population} = \frac{GDP}{employment} \times \frac{employment}{working-age \cdot pop.} \times \frac{working-age \cdot pop.}{total \cdot population}$$

This formula suggests that measuring regional competitiveness can be traced back to two interdependent economic categories (Lengyel 2004):

Regional income _ Labour productivity _ Employment rate.

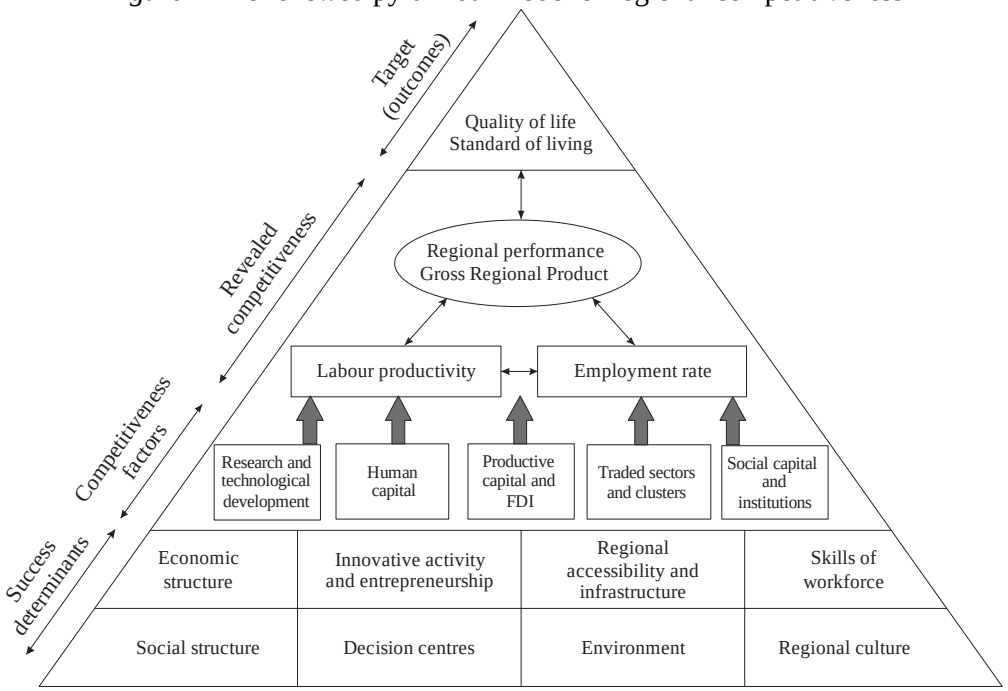
Hence the *substance of regional competitiveness*: the economic growth in the region, which growth is generated by both a *high level of labour productivity* and a *high level of employment*. In other words, competitiveness means *economic growth driven by high productivity and a high employment rate*.

Our study reviewing the competitiveness of Hungarian micro-regions is built on the pyramidal model since it is coherent with the above-mentioned findings, and is established on the basis on the inputs- outputs- outcomes relationship (Figure 1).

The target (outcomes) is the standard of living; the prosperity of any region depends on its competitiveness. Outputs are the *revealed competitiveness* indicators: per capita Gross Regional Product, labour productivity, and employment rate. Sources of competitiveness, inputs influencing regional competitiveness can be divided into two groups of *direct* and *indirect* components. Of particular importance are *competitiveness factors* with a direct and *short-term influence* on economic output, labour productivity, and employment rates. Nevertheless, social, economic, environmental and cultural processes and parameters, the '*success determinants*', with an indirect, *long-term impact* on competitiveness are also to be taken into account.

Three levels can be distinguished with regard to the objectives of regional development programming and the various characteristics and factors influencing competitiveness:

Figure 1 The renewed pyramidal model of regional competitiveness



Source: based on Lengyel, I. (2000, 2004).

– *Revealed competitiveness* (or basic categories) (*ex post* indicators, output): these categories measure competitiveness and include income, labour productivity and employment rate.
– *Competitiveness factors* (*ex-ante* factors): input factors with an immediate impact on revealed competitiveness categories. These can be used to influence regional competitiveness by means of institutions in short-term programming periods.
– *Success determinants* (social, economic, and environmental backgrounds): input determinants with an indirect impact on basic categories and competitiveness factors. These determinants take shape over a longer period and their significance reaches beyond regional policy-making.

The *pyramidal model of regional competitiveness* seeks to provide a systematic account of these means and to describe the basic aspects of territorial competitiveness. 'This model is useful to inform the development of the determinants of economic viability and self-containment for geographical economies' (Pike et al. 2006, p. 26).

'This is an aggregate notion, in a regional context, labour productivity is the outcome of a variety of determinants (including the sort of regional assets alluded to previously). Many of these regional factors and assets also determine a region's overall employment rate. Together, labour productivity and employment rate are measures of what might be called 'revealed competitiveness', and both are central components of a region's economic performance and its prosperity (as measured, say, by GDP per capita), though obviously of themselves they say little about the underlying regional attributes (sources of competitiveness) on which they depend' (Gardiner–Martin–Tyler 2004, p. 1049).

Competitiveness factors of the *renewed pyramidal model* include such constituents of endogenous development theory like social capital and regional specialization, besides traditional factors of production like capital, labour, and technology:

- RTD – *Research and technological development (RTD)*: rapid introduction of innovations and new technologies creates competitive advantages. Innovation may come from outside the region (e.g. technological transfer), but the competitiveness of the region is most effectively advanced by successful R&D activities, innovations and their fast and wide-ranging distribution. The introduction of innovations and creation of patents may be effectively advanced by knowledge-intensive businesses.
- HUM_CAP – *Human capital*: population of active age, size and age structure of the workforce are important growth factors. However, the education level of the workforce is also important, especially the rate of people holding a tertiary degree.
- CAP_FDI – *Productive capital and FDI*: capital is indispensable for improving the competitiveness of a region. Investments from outside the region, especially foreign direct investments, usually create new sectors, markets, new technologies, and new jobs. It also improves labour productivity and can also encourage technological transfer.
- TS_CLUST – *Traded sectors, entrepreneurship, and clusters*: a strong traded (export-oriented) sector is an important source of competitiveness, which may become even more competitive by clustering. Flexible regional specialization may be furthered by entrepreneurship and small and medium-sized enterprises (SMEs). Innovative SMEs are flexible and can quickly adapt to market changes, they are principally responsible for generating employment in the region.
- SOC_CAP – *Social capital and institutions*: economic prosperity also presupposes efficient cooperation among firms, governmental and non-governmental institutions. Successful companies also depend on the level of administrative services and public institutions. Social capital is particularly important: trust, reliability, readiness to cooperate, etc.

In order to investigate the relations between indicators of revealed competitiveness (RC) and competitiveness factors, we intend to introduce the *Regional Competitiveness Function* (RCF):

RC = f (RTD, HUM_CAP, CAP_FDI, TS_CLUST, SOC_CAP).

The basic premise of the study is thatwe assume that there is a relationship between competitiveness factors and revealed competitiveness. Causality is to be determined by multivariate regression. Our dependent variable is revealed competitiveness measured by a calculated index, while the five competitiveness factors are explanatory variables. RCF is an extension of traditional regional growth concepts from the latest work on endogenous growth research. The importance of traded sectors and regional specialization is pointed out by Porter (2003, 2008), Stimson, Robson, and Shyy (2009), while Acs and Szerb (2007), Fischer and Nijkamp (2009) emphasize the significance of SMEs and entrepreneurship, and Varga (2006, 2007) stresses the importance of innovation and knowledge spillover. Sociological research alludes to the importance of social capital (and territorial capital), brought to the attention of regionalists by Camagni (2009), Faggian and McCann (2009), Florida (2002) and Glaeser (2008).

The weight of each RCF competitiveness factor in measuring revealed competitiveness was assessed during our study of Hungarian micro-regions. This assessment excluded the success determinants of the pyramidal model, because we assume that the RCF is mainly useful for describing short-term relationships.

3. Background of competitiveness studies in Hungary

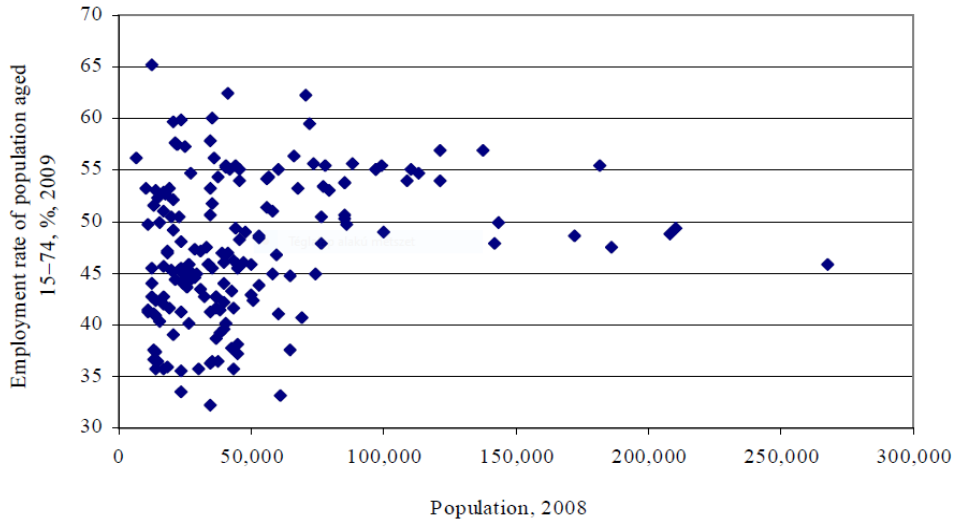
Regional competitiveness studies tend to be relative, i.e. we mostly compare the competitiveness of the chosen regions to each other. It is recommended to choose nodal regions, because workforce commuting, business relationships, etc. rarely adhere to the spatial distribution of normative regions. It is difficult to gather reliable statistical data about nodal (functional) regions, thus Level LAU1 micro-regions were chosen this time. We assume that, except for Budapest, micro-regions are able to provide a good assumption of workforce commute zones (Lukovics 2009, Szakálné Kanó 2011).

In 2008, Hungary consisted of 7 regions (NUTS 2), 19 counties (NUTS 3) and the capital, as well as 174 micro-regions (LAU 1). Statistical data usable for competitiveness investigations are available for these territorial levels. All LAU1 micro-regions have a town centre.

The indicators of *revealed competitiveness* (GDP per capita, employment, labour productivity) show a broad distribution in LAU1 micro-regions. Examining *employment rates* by micro-regions based on their populations, one may get a very diversified distribution (Figure 2). Employment rates in micro-regions with less than

70 thousand inhabitants (four fifth of micro-regions) are distributed evenly, mostly between 35% and 60%. In those 31 micro-regions with more than 50 thousand inhabitants in their town centres (so-called *urban micro-regions*), employment rates vary between 45 and 55% (in Budapest it is 56.6%). It can be established that the critical mass, population as employees and consumers, as well as more sophisticated business and other urban services are crucially important factors in the development of employment (Bajmócy–Szakálné Kanó 2009).

Figure 2 Employment rate and population of LAU1 micro-regions



Source: Calculations of authors based on National Employment Office (http://kisterseg.afsz.hu/index.php) and KSH Territorial Statistical Yearbook.
Note: Without Budapest.

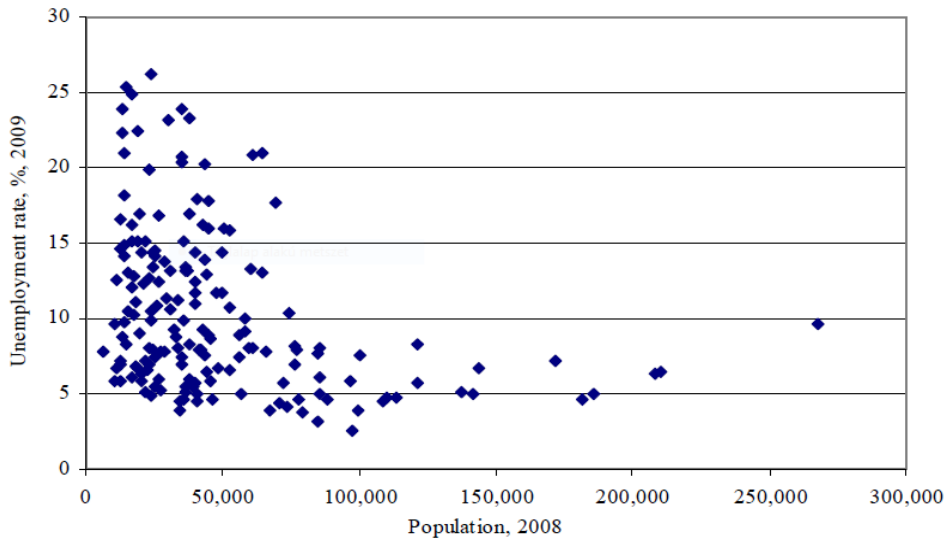
Unemployment rates have an opposite relationship (Figure 3). With this indicator, an important milestone can also be seen at 50 thousand urban inhabitants: more populated micro-regions have unemployment rates of 5 to 10%, while less populated micro-regions have between 7 and 28%. No influence on this situation can be seen in micro-regions with less than 50 thousand urban inhabitants, as these have a similar distribution as larger ones.

Our empirical study includes urban micro-regions, with more than 70 thousand inhabitants (and more than 50 thousand urban inhabitants), potentially able to show *localization agglomeration advantages*. The groups of 174 micro-regions, according to agglomeration economies:

– *Budapest* (population of 2 million): urbanization agglomeration economies (Jacobs' externalities),

– *31 micro-regions with urban centre, as urban micro-regions* (at least 50,000 population of urban centres, sum total 3.6 million population): localization agglomeration economies (Marshall' externalities),
– *142 small (rural type) micro-regions* (sum total 4.4 million population).

Figure 3 Unemployment rate and population of micro-regions



Source: Calculations of authors based on National Employment Office (http://kisterseg.afsz.hu/index.php) and KSH Territorial Statistical Yearbook.
Note: Without Budapest.

Budapest was intentionally left out of this study due to its vastly different characteristics. To sum up, urban micro-regions with potential localization agglomeration economies were studied by using the pyramidal model.

Our empirical study included the competitiveness of 31 urban micro-regions. Goals of the investigation:

– comparison of these micro-regions by competitiveness, ranking, establishment of region types,
– to show how the indicators and indicator groups used influence regional competitiveness.

Our study adheres to the logical construction of the pyramidal model. Revealed competitiveness indicators show recently achieved competitiveness as ex-post indicators. Competitiveness factors point out their contribution to revealed competitiveness. On the other hand, these show 'capabilities' and future possibilities as ex ante indicators: by developing these, we can see how the competitiveness of micro-regions might change in the near future.

Difficulties were liable to occur during the database creation process, because several theoretical categories (like social capital) are not straightforward to operationalize, and it is difficult to obtain reliable and authentic data for all Hungarian micro-regions (Bajmócy–Lukovics–Vas 2010). Computer analysis was done with SPSS-18.1.

The basic idea of our study: we assume that there is a relationship between competitiveness factors and revealed competitiveness. Causality is to be determined by multivariate regression. Our *dependent variable* is revealed competitiveness measured by a calculated index, while the 5 competitiveness factors are explanatory variables.

Our multivariate linear regression model:

$$RC = \beta 0 + \beta 1\ RTD + \beta 2\ HUM\_CAP + \beta 3\ CAP\_FDI + \beta 4\ RS\_CLUST + \beta 5\ SOC\_CAP + \varepsilon.$$

The indicators used were set up based on the pyramidal model (see *Appendix 1*):

- revealed competitiveness (RC) is calculated by 3 indicators,
- competitiveness factors are described by a total of 34 indicators: RTD (5 indicators), HUM_CAP (9 indicators), CAP_FDI (6 indicators), RS_CLUST (6 indicators), SOC_CAP (8 indicators).

To test RCF, we first calculated the value of revealed competitiveness; afterwards we analysed it with multivariate linear regression to determine how far competitiveness factors are able to explain the value of revealed competitiveness.

(a) Revealed competitiveness

Micro-regions may show enormous distortion due to data localization, therefore it might be misleading to calculate GDP, also major companies are calculated as being a onepoint business at their headquarters' location. Therefore we concluded that 3 out of the revealed competitiveness (PIT_INH: taxable income per capita; GVA_EMPL: gross value added per employee; EMPL_RATE: employment rate) shall undergo principal component analysis to determine the principal component (RC), which shall be used later on as the dependent variable*:*

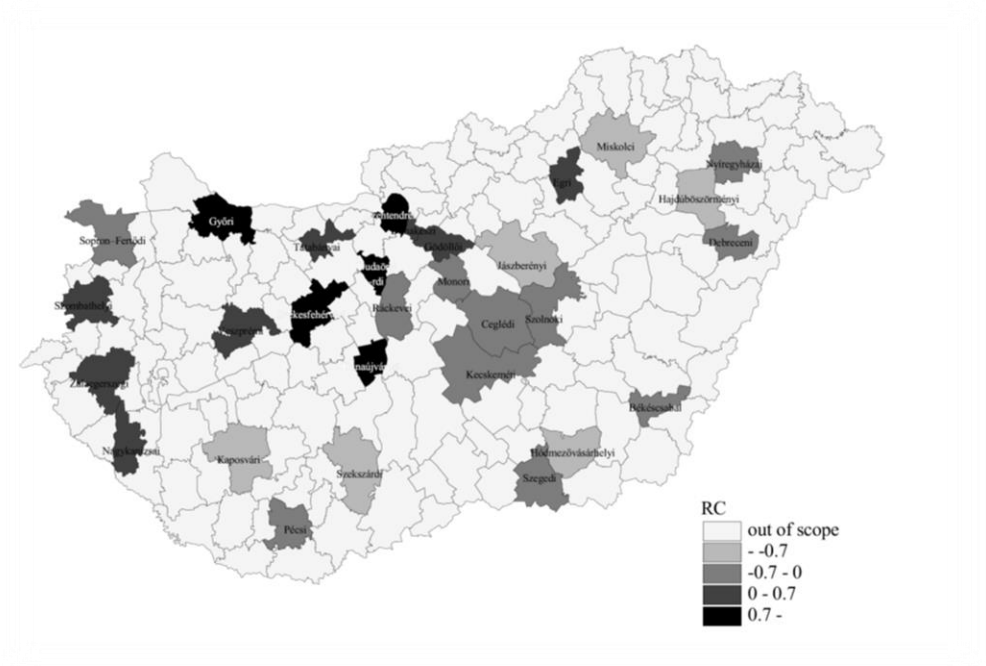
- RC contains 60.7% of the 3 indicators,
- commonalities: PIT_INH 0,835; GVA_EMPL 0,5; EMPL_RATE 0,485.

Based on principal component analysis we found four types of Hungarian urban micro-regions (Figure 4):

- the most competitive 6 micro-regions are found in Transdanubia (Dunaújváros, Győr, Székesfehérvár) with significant foreign-owned manufacturing capacities, as well as in the western agglomeration of Budapest,
- the second type (8 micro-regions) includes all other Northern Transdanubian micro-regions with some further micro-regions to the east of Budapest,

– the third type (11 micro-regions) includes other county capitals, with poor economy and human capital, as well as in the southern agglomeration of Budapest,
– while the least competitive 6 regions are found in the southern and eastern part of the country with some rural settlements.

Figure 4 Types of micro-regions by revealed competitiveness



(b) Relationship between competitiveness factors and RC

The analysis included the effect of the 5 competitiveness factors of the renewed pyramidal model on the dependent variable (RC). Each competitiveness factor was based on 5 to 9 indicators, therefore we performed factor analysis within the indicator group in order to compress information and establish 1 to 2 factors per indicator group:
– RTD (research and technological development): one single factor, including 68% of information,
– HUM_CAP (human capital): two factors, one containing 36.8% (HUM_CAP1), the other 33.6% (HUM_CAP2) of the information,
– CAP_FDI (productive capital and FDI): one single factor, including 68 % of the information,
– TS_CLUST (regional specialization and clusters): two factors, one explaining 39.3% (TS_CLUST1), the other 36.1 % (TS_CLUST2) of the information,

– SOC_CAP (social capital and institutions): two factors, one explaining 31.6% (SOC_CAP1), the other 30.0% (SOC_CAP2) of the information available.

The above-mentioned 8 factors were used in multivariate linear regression, where RC was considered a dependent variable and the forward method resulted in 2 factors: CAP_FDI and SOC_CAP2. These two factors account for 85.2% (R2=0.852) of the dependent variable's (RC) standard deviation.

The model created:

$$RCi = + 0{,}452\ CAP\_FDIi - 0{,}615\ SOC\_CAP2i + ei.$$

The regression model provides adequate explanation for the dependent variable:
– there is no multicollinearity to observe, VIF=1.308,
– residuals show a normal distribution,
– there is no heteroscedasticity to observe.

Based on these results, these two factors explain the competitiveness of micro-regions (Table 1). The first factor (CAP_FDI) only includes positive variables: a foreign direct investment, total assets of enterprises (CONS-INH) and paid-in capital of enterprises in the micro-region (SHARE-INH). In the second factor (SOC_CAP2): the proportion of personal income taxpayers increases, while poverty rate, unemployment rate and disability pensioners reduce competitiveness.

Table 1. Indicators having major influence on the competitiveness of microregions

CAP_FDI	**Component**	**SOC_CAP2**	**Component**
CONS-INH	0.773	PAYER-PIT	-0.653
SHARE-INH	0.936	POOR	0.858
FDI-INH	0.963	CULT	0.029
FDI-CAP	0.962	DIS-PENS	0.731
FDI-EMPL	0.944	DIPL-LOCAL	-0.041
FDI-REV	0.950	CRIME	0.039
		UNEMPL-RATE	0.835
		NONGOV	0.075

Micro-regions may be classified based on *productive capital and FDI* and even their spatial distribution may be determined (Figure 5):
– most competitive 8 micro-regions, similarly to revealed competitiveness, are found in manufacturing centres of Western Transdanubia and in smaller centres around Budapest,
– the next category (8 micro-regions) is also dominated by regions around Budapest, but a few major cities also appear from other regions of the country,

Figure 5 Micro-regions by CAP_FDI factor

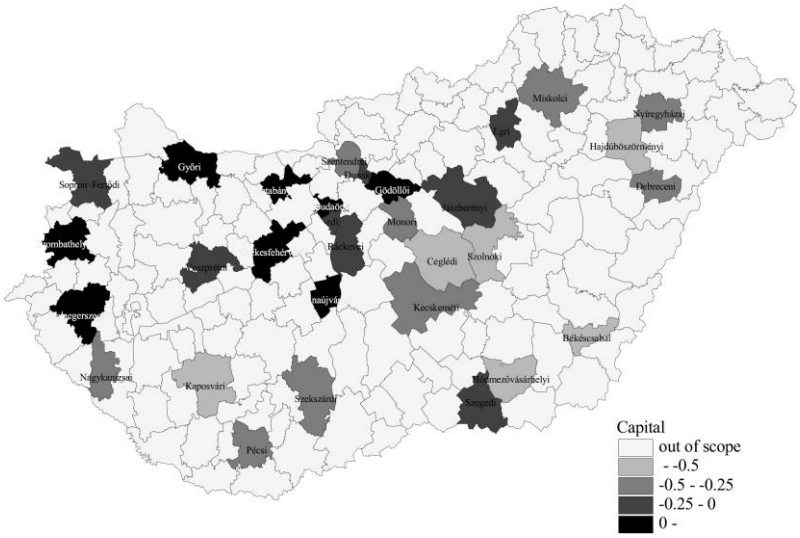
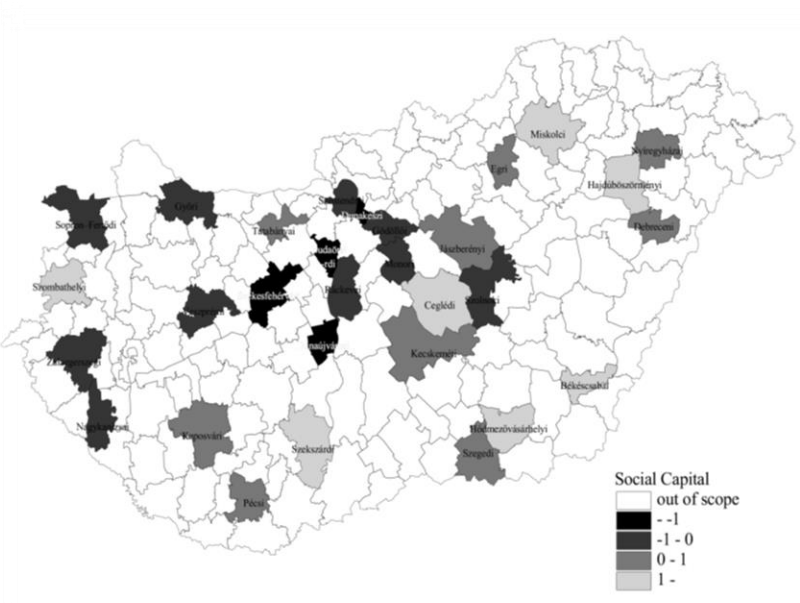


Figure 6 Micro-regions by SOC_CAP2 factor



– the third group (9 micro-regions) is characterized by country capitals from everywhere around the country,
– while the least competitive 6 micro-regions are found in the south and the east part of Hungary.

Classification of micro-regions based on *social capital* is similar to the previous ones (Figure 6). Social capital is quite strong around the capital and in western parts of the country, while it is practically missing in other regions. It has to be noted, that variables included in the factor, like unemployment rate, poverty rate, number of disability pensioners under retirement age, etc. not only describe social capital, but may also be linked to human capital.

(c) Relationship between RC and the factors created from the indicators

There may be multicollinearity among the indicator groups of the five competitiveness factors. Therefore we used a different methodology to review and test the relationship between the RC dependent variable and each of the 34 indicators considered: we performed factor analysis on the 34 indicators to generate independent factors. These factors were used in multivariate linear regression. This was especially beneficial because it enabled us to test the structure of the pyramidal model. However, it bears the disadvantage that one has to find an explanation afterwards for each factor based on the indicators included.

Factor analysis was performed for 34 variables with 4–5–6–7–8 factors; obviously, the higher the number of factors better explains the standard deviation (Table 2). We performed multivariate linear regression in each case, and found the best alignment for 5 factors:
– there is no multicollinearity to observe,
– residuals show a normal distribution,
– there is no heteroscedasticity to observe.

Table 2 Factor weights for 34-indicator factor analysis

Factors	4 factors	5 factors	6 factors	7 factors	8 factors
1	23.58	22.26	22.15	22.31	22.34
2	21.53	20.76	20.46	20.19	20.30
3	16.13	16.47	14.61	14.91	14.82
4	9.85	9.58	8.95	8.89	8.66
5	-	8.15	8.75	8.78	6.56
6	-	-	6.42	4.98	5.52
7	-	-	-	4.45	4.89
8	-	-	-	-	4.38
Total	**71.09**	**77.22**	**81.34**	**84.51**	**87.47**

These five factors account for 81.1 % (R2=0.811) of the dependent variable's (RC) standard deviation. Our calculations resulted in the following multivariate linear regression model:

$$RCi = + 0{,}213\ F1i + 0{,}665\ F2i + 0{,}421\ F3i + 0{,}301\ F4i + 0{,}236\ F5i + ei.$$

The interpretation is complicated by the fact that each indicator may be present in more than one factor; therefore, it is recommended to consider components with an absolute value greater than 0.5 (Table 3).

Table 3 Factor components

Factor1		**Factor2**		**Factor3**		**Factor4**		**Factor5**	
DIPL_EMPL	0.887	FDI_EMPL	0.940	MIGR	0.885	EXP_GVA	0.794	CULT	0.692
SERVICES	0.876	FDI_REV	0.939	BIRTH_MORT	0.795	CLUST_PROP	0.787	SEC_EMPL	0.677
SELF_EMPL	0.863	FDI_INH	0.933	VITALITY	0.694	PAYER_PIT	0.656		
MANAG_EMPL	0.850	FDI_CAP	0.931	PATENT_OUT	0.595	EXP_INH	0.636		
DIPL-LOCAL	0.817	SHARE-INH	0.918	SME_INH	0.660				
KIMS	0.791	CONS-INH	0.725	KIBS	0.569				
NONGOV	0.716	EXP_INH	0.626	YOUNG_INH	0.527				
R&D_INH	0.594	KIBS	0.559	POOR	-0.518				
CRIME	0.515	SME_INH	0.505	ENTRE	-0.520				
SCHOOL	-0.752			DIS_PENS	-0.650				
				UNEMPL_RATE	-0.688				

Indicators of the pyramidal model's competitiveness factors appear in several calculated factors as components (Table 4). The pyramidal model's research and technological development competitiveness factor (RTD) is only linked to one factor; we attribute this to the fact that among the studied 31 micro-regions, there is research and development only in a few university towns. Indicators of human and social capital appear in several factors, especially because these are difficult to operationalize.

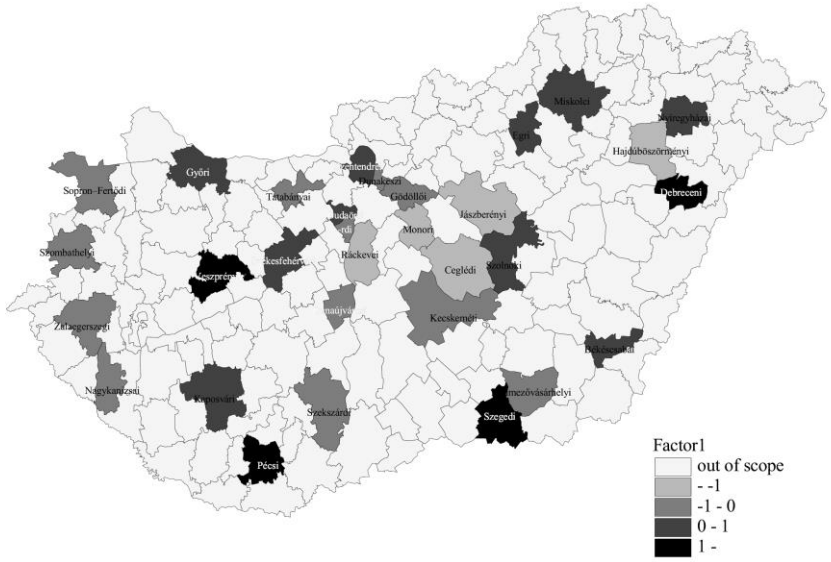
Revealed competitiveness is most broadly influenced by the Factor2, dominated by productive capital and FDI, as well as regional specialization (entrepreneurship). This factor expresses one of the elements to the pyramidal model (Productive capital and FDI), complemented by a few indicators of other elements. Spatial distribution of microregions based on this factor shows exact conformity with Figure 5.

Table 4 Relationship between the competitiveness factors and the calculated factors

Competitiveness factors	Factor1	Factor2	Factor3	Factor4	Factor5
Research and technological development	x				
Human capital	x		x		x
Productive capital and FDI		x			
Regional specialization and clusters		x		x	
Social capital and institutions	x		x		x

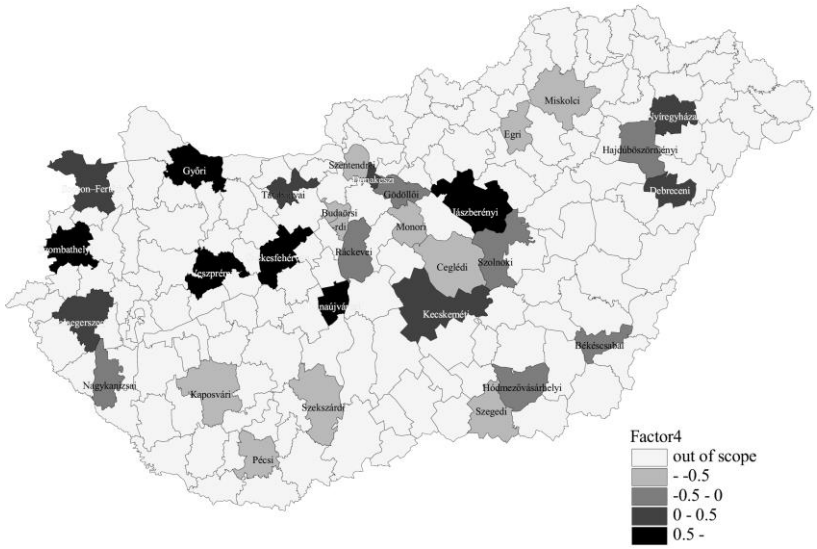
Factor1 contains research and technological development, human capital and social capital indicators (Figure 7). Micro-regions that are strong on this factor are distributed quite evenly around the country; usually in university towns, sometimes even being the centres of less developed regions. Compared to previous results it is salient that highly competitive micro-regions of Transdanubia show weak competitiveness on human capital and RTD values.

Figure 7 Factor1: research and technological development, human capital, and social capital and institutions



Factor4 is linked to the pyramidal model's regional specialization and clusters element. This indicates the spatial distribution of Hungarian manufacturing industries (Figure 8). It is interesting to see that manufacturing industries with export capabilities are located in Northern Transdanubia and beyond the daily commute zone of Budapest's agglomeration.

Figure 8 Factor 4: Regional specialization and clsuters



The RCF was tested for 31 Hungarian micro-regions based on the pyramidal model. In our opinion, both analyses rendered useful results for regional policy-makers and for fine-tuning the model itself.

4. Summary

The aim of this study was to apply the pyramidal model of regional competitiveness and perform a study of LAU1 micro-regions with potential localization agglomeration economies. The pyramidal model rests on endogenous growth factors, and it reflects on competitiveness advantages and disadvantages besides measuring competitiveness itself.

Influencing factors of competitiveness have been modelled by the Regional Competiveness Function, created by multivariate linear regression models. Hungary has shown slow economic growth for about a decade, and employment figures have been falling behind the EU-average. These factors together demonstrate that the

Hungarian economy is lacking competitiveness. Data shows that the area around Budapest is still growing dynamically, well exceeding the EU-average, while other parts of the country are able to stagnate at best. Regional differences in the country are enormous, among the major ones in the EU. Our research was based on the question as to why these provincial regions are unable to gain more competitiveness.

The aim of our empirical study was to analyse those provincial LAU1 micro-regions, which have an urban population of at least 50,000. The Regional Competitiveness Function was estimated in two ways, because in our opinion, both methods are useful and are able to amend each other in regional competitiveness studies. In the future, however, it will be more beneficial to examine nodal regions, which are a much better representation of business and institutional relationships.

Our empirical results show a good representation of Hungarian region types in their specific developmental phases:

- *Budapest and micro-regions around it*: this region, housing about 3 million inhabitants, is developing quickly, offering wide-ranging urbanization advantages.
- *Manufacturing micro-regions*: significant FDI and export, high employment, weak RTD and human capital. These regions are located at the north-western border and are well integrated into the EU economy, however, their labour productivity is low and foreign-owned companies do not have a wide supply base in the region. These are remote controlled regions unable to vitalize their own economies, because their human capital and innovation capacity required for higher value-added products and services and innovation is quite weak.
- *University towns*: excellent human capital and state-financed RTD, but a low level of export capabilities in the business sector, low levels of productive capital, labour productivity, and employment. These micro-regions are distributed around the country. They are unable to vitalize the economy of their broader region because there are no significant enterprises in the region.
- *Stagnated urban micro-regions*: weak human capital, low levels of export capability, usually encircled by rural settlements. The weak performance in the Hungarian economy is partially an outcome of inadequate regional policy. There is an enormous need for decentralized territorial development in order to strengthen the competitiveness of provincial urban regions, which should also enable them to execute bottom-up development strategies more strongly adhering to the unique characteristics of each micro-region.

There is still a long way to go towards the establishment of a Regional Competitiveness Function. The road is full of conceptual and methodological barriers. However, there is an explicit need for a better understanding of regional development in less prospective European countries. We believe that the synthesis of endogenous growth theories and regional competitiveness studies would benefit a more refined framework for empirical analyses to do this. The potential outcome is a better policy framework.

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Appendix 1

Indicators of the competitiveness study

Revealed competitiveness

Incomes (well-being):

PIT-INH Taxable income per capita, HUF, 2007

Labor productivity:

GVA-EMPL Gross value added per employee, thousand HUF, 2007

Employment:

EMPL-RATE Employment rate, %, 2008

Competitiveness factors

Research and technological development:

R&D-INH R&D expenditures per 1000 inhabitants, thousand HUF, 2008

PATENT Number of patents between 2006 and 2009 per 10000 inhabitants

PATENT-OUT Intensity of outbound relations (what percentage of co-invention relationships are held by the region), between 2006 and 2009

KIBS Number of registered high-tech enterprises per 1000 inhabitants, 2008

KIMS Number of knowledge-intensive and financial service providers, KIMS + KIFS per 1000 inhabitants, 2008

Human capital:

MIGR Net migration rate as an average of the years between 2000 and 2008 per 1000 inhabitants

YOUNG-INH Percentage of population below 18 years of age in the entire permanent resident population, 2008

BIRTH-MORT Birth rate/mortality rate, 2008

VITALITY Vitality index, 2008

DIPL-EMPL Rate of employees with tertiary education in the entire workforce, 2008

MANAG-EMPL Rate of managerial and intellectual employees in the entire workforce, 2008

SEC-EMPL Rate of employees above 18 years of age, holding a secondary education diploma in the entire workforce of this age category, 2008

SELF-EMPL Self-employment rate in the entire workforce, 2008

SCHOOL Rate of population between 18 and 24 years of age, holding only primary education certificates, 2001

Productive capital and FDI:

CONS-INH Total assets of enterprises in the microregion per 1000 inhabitants, 2007

SHARE-INH Paid-in capital of enterprises in the microregion per 1000 inhabitants, 2007

FDI-INH Equity held by foreign enterprises, per inhabitant, 2007

FDI-CAP Foreign equity in foreign-owned enterprises, per inhabitant, 2007

FDI-EMPL Statistical workforce of foreign-owned enterprises, per 1000 inhabitants, 2007

FDI-REV Net revenue of foreign-owned enterprises, per inhabitant, 2007

Traded sectors, entrepreneurship and clusters:

CLUSTER-PROP Rate of workforce employed by clusters of at least 500 employees in comparison to the microregion's entire workforce, 2005

EXP-GVA Rate of exports in comparison to gross value added, 2007

EXP-INH Net export income per inhabitant, 2007

SME-INH Number of registered small enterprises (1 to 49 employees) per 1000 inhabitants, 2008

ENTRE Number of newly registered enterprises/number of dissolved enterprises, 2008

SERVICES Rate of service industry workforce in comparison to the entire workforce, 2008

Social capital and institutions:

UNEMPL-RATE Rate of unemployment, 2008

NONGOV Number of registered non-profit organizations per 1000 inhabitants, 2008

CRIME Number of revealed felonies per 1000 inhabitants in regards of the perpetration's location, 2008

DIPL-LOCAL Number of locally employed workforce holding tertiary education per 1000 inhabitants, 2001

DIS-PENS Number of disability pensioners in the entire workforce below the official retirement age, 2008

CULT Number of cultural institutions per 1000 inhabitants, 2008

POOR Poverty rate (where the annual family income is below 600 thousand HUF), 2007

PAYER-PIT Number of personal income taxpayers per 1000 inhabitants, 2007

6. Competitiveness of Regions of Central and Eastern European Countries*

Imre LENGYEL

Nowadays the competition between regions and consequently the examination of regional competitiveness has become a research question of outstanding importance. In our study we will first look at the definition of competitiveness and the frames of interpretation related to its definition, then we will focus on the models of competitiveness and the questions of its measurement. We update the pyramid model of regional competitiveness, which rests on endogenous development theories, and integrate the viewpoints of the region's key sectors, clusters, so that it may be applied in case of car industry as well. Afterwards we will proceed to analyse the competitiveness of 93 NUTS2 level regions of 8 East-Central European countries with the help of an empirical data base, using multivariable statistical methods.

Keywords: regional competitiveness, endogenous development, human capital

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Note: The starting database was compiled by the Car industry and Spatial Economic Research Group (JÁTÉK) working in the project entitled TAMOP-4.2.1/B-09/1/KONV-2010-0003: Mobility and Environment: Car industry, Energetic and Environmental Researches in the Central- and West-Dunántúl Region.

1. Introduction

Nowadays the increase of global competition can be observed in almost all markets, as a consequence of which the economic role of countries has weakened in comparison to how it used to be, and the value of functional (nodal) regions has been raised. The companies of the global industrial sectors plan in groups of countries with respect to product markets, sales; while in course of the organization of input markets and production they are thinking in sub-national regions, generally cities and their surrounding areas. The companies taking part in global competition have realized that the sources of their competitive advantages are concentrated in space; therefore they have to take steps to strengthen these advantages locally. This competition of industrial sectors resulted in the raising of the value of the economic role of regions,

which can be observed on the one hand in the rivalry, special competition between regions, and on the other hand in the increased business capitalization of the agglomeration advantages resulting from spatial concentration. Holding one's ground permanently in the competition between regions emphasized the concept of competitiveness.

Nowadays the investigation of the competition between regions has become one of the major questions of regional science, generating vivid disputes. According to the well-known opinion of *Krugman* (1994) there is no competition between countries, since in the specialization of labour emerging according to comparative advantages, all countries will be winners with the standard of living improving everywhere. Therefore also in case of regions, the increasing rate of productivity and not competitiveness is going to be the determining factor. On the other hand, according to *Porter* (2007) the competition between regions can be observed, but even here, similarly to the competition of industrial sectors, the competitive advantages, in other words, absolute advantages became important, since nowadays the comparative advantages hardly prevail. As he states: "Competitiveness depends on the productivity with which a location uses its human, capital, and natural resources. Productivity sets the sustainable standard of living" (*Porter* 2008, 3).

It seems to be an accepted fact in regional science that the competition between regions exists, but its characteristics differ both from the competition between companies and the competition between countries (*Batey–Friedrich* 2000; *Chesire* 2003; *Malecki* 2002). *Capello* (2007a, xviii) states that "regions compete on absolute rather than comparative advantage". The consequences of regional competition are similar to the result of the competition between countries: the standard of living, employment and wages increase in the successfully competing regions, new investments appear, talented and creative young people, businessmen move there, etc. (*Malecki* 2004; *Polenske* 2004). Due to the recognition of these factors success in competition and the examination of competitiveness have become major research questions in the recent decades.

In our study we will first look at the definition of competitiveness and the frames of interpretation related to its definition, then we will focus on the models of competitiveness and the questions of its measurement. We will update the pyramid model of regional competitiveness, which does not rest only on endogenous development theories, but also integrates the viewpoints of the region's key sectors, clusters, so that it may be applied in case of car industry as well. Afterwards we will proceed to analyse the competitiveness of 93 NUTS2 level regions of 8 East-Central European countries with the help of an empirical data base, using multivariable statistical methods.

2. Definition of competitiveness

Nowadays the definition of competitiveness overlaps the theoretical and the practical, economic-political categories of both economic growth and economic development (*Camagni–Capello* 2010; *Lengyel* 2009a). Besides the many theoretical works which would be able to fill a library, it is sufficient to mention the surveys dealing with the countries' competitive rankings appearing in yearly publications (*IMD* 2010; *WEF* 2010), and one of the key areas of the EU's regional policy (one of the aims of the 2007–2013 programming period is to improve regional competitiveness and employment), the European Regional Competitiveness Report first published in 2010 (*Annoni–Kozovska* 2010).

It seems that a kind of joint "rebirth" of the concepts of economic growth and development lies behind the "fashion" of the concept of competitiveness: competitiveness is an economic growth which entails sustainable social and environmental development. This new, complex view is well presented by the fact that *Roberta Capello* (2007a) in her textbook entitled 'Regional Economics' associates the various modern trends of local development and regional growth with territorial competitiveness as a key concept. Whereas in the period of 1960–1990, in case of the traditional growth models, growth was measured by the indicators of wages and employment, or productivity and standard of living, from the 1990s onwards the improvement of competitiveness was unequivocally considered. Competitiveness unifies the idea of productivity (as economic effectiveness) favoured by *Krugman* and *Porter* with the expectation of the joint improvement of employment and standard of living.

With the increase of globalization the socio-economic background conditions have changed, the effects of which the traditional neoclassical trends were no longer able to describe properly. It is important to note that the non-traditional factor availability (innovation, territorial capital), and the endogenous territorial elements have become major growth factors, partly as a consequence of regional competition (*Capello* 2007b; *Camagni* 2009; *Rechnitzer – Smahó* 2011). It is also important that *competitiveness* has unequivocally become the key concept in the interpretation of regional economic growth. It also follows from this that although in certain cases (Keynesian) central governmental interventions are necessary, beyond this, to improve competitiveness unique, *multi-sectored, integrated economic development strategies have to be developed, organized bottom-up,* and built on endogenous characteristics in every region (*Lengyel* 2009b).

Competitiveness is an umbrella term difficult to define, it expresses a tendency to compete, ability for competition, and a capacity for gaining a position and maintain permanent stand in competition, which is primarily indicated by success (measured in some way), the size of market share, and the increase of profitability. Regional economic development essentially means the programs aimed at the improvement of a particular region's competitiveness, the encouragement of especially those workplaces which come into being in the business sector meeting demands outside of the region (*Lengyel* 2009a).

In the course of the years many concepts of competitiveness were formed which spring from diverse opinions. From an economic point of view, the competitiveness of territorial units, i.e. countries and regions can be measured by the productivity of the inputs, as *Krugman* (1994) and *Porter* (2008) also said. Competitiveness of regions and cities may be well described by the widely recognized definition of *Storper* (1997, 20): "*The ability of an (urban) economy to attract and maintain firms with stable or rising market shares in an activity while maintaining or increasing standards of living for those who participate in it*." However, definitions of competitiveness are elusive, since they usually cover forms of regional economic growth accompanied by rising standards of living in the region.

However, as opposed to the economic view, in *regional science* it can be considered generally accepted that the competitiveness of regions, cities is more than the productivity of inputs, since it essentially means a regional economic growth, as a result of which the average standard of living in the region improves (*Camagni* 2002; *Lukovics* 2009; *Malecki* 2002). Labour productivity can be also high if many people work for very low wages (e.g. in mining industry), or if the number of permanently unemployed people is high, like it can be observed in dual-structured developing countries. This however means only short term success, because the social expense of one-sided economic production will be very high in a few years' time. The recognition that welfare should be extended to everyone, not only its participants, has already been made in the study of the countries' competitiveness. Welfare can extend to a greater part of society if the employment rate is high, since *sustainable and high standard of living can only be attained with high employment rate*. Therefore besides the total factor (capital and labour) productivity which demonstrate economic growth, employment rate is also an important measure of competitiveness.

On the basis of the above, nowadays regional competitiveness consists of two different, contradictory economic categories; expressing the joint expectation of productivity and employment. Built on this approach, the *standard notion of competiveness* is widely accepted as (*EC* 1999, 75): "*the ability of companies, industries, regions, nations and supra-national regions to generate, while being exposed to international competition, relatively high income and employment levels".* In other words "*high and rising standards of living and high rates of employment on a sustainable basis"* (*EC* 2001, 37). The *European Competitiveness Reports* also adopt this approach (*EC* 2008, 15): "*competitiveness is understood to mean a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment, as possible.*".

In our study we also apply the standard concept of competitiveness, on which the pyramid model we took as a basis is built. This model systematizes the impact factors of exceedingly complex processes affecting welfare, labour productivity and employment. In our empirical study we also apply the pyramid model updated on the basis of the results of the newest theoretical trends.

3. The measurement of competitiveness

Productivity and employment are the two basic indicators of regional competitiveness, but these well-known economic categories as certain the results of past processes, and do not refer to ability, i.e. the prospective future change of competitiveness. Therefore we also have to investigate those factors on which the future growth of both productivity and employment depends in the middle and long run.

In case of standard competitiveness *relatively high income* (measured by GDP per capita) and *relatively high employment level* (shown by the employment rate) constitute the two major factors. These two factors can be measured separately as well, but a connection between them can be demonstrated in a well-known way, since the GDP per capita can be divided into three multiplication components.

It follows from the above that *regional competitiveness has no single accentuated indicator*, cannot be described with one factor; it rather means an *aggregation of* relatively well measurable and obvious *economic categories* which are closely related to each other. The categories include the economic growth expected by economists (GDP/capita) and labour productivity, as well as employment held important by regionalists. Not only the current magnitude of the indicators is of interest, but also their change in time. If we set aside the consideration of the age composition of a given region, three basic indicators remain:

- the magnitude of the regional *GDP per capita*, and its rate of growth;
- *labour productivity* in the region, and its rate of growth;
- *employment rate* in the region, and its change.

It is generally accepted that in case of the above indicators not only the absolute level, but also the rate of change shall also be taken into consideration, as a result of which competitiveness is:

- from the *static approach:* the magnitude of the three economic categories in a given year;
- from the *dynamic approach:* the rate in which the three categories change in a given period of time.

It is also accepted that the approach of regional competitiveness is primarily *relative*, i.e. regional units are correlated to each other. A region may also be correlated to one of its former situations observed in an earlier time period, but the change measured in comparison to its former position will not show whether in comparison to the other competing regions this is much or little.

The improvement of a region's competitiveness is not an objective, but a means of economic development. Namely the logical structure of a region's development is the following:

- *Target:* to increase the population's quality of life, standard of living, prosperity, welfare;

– *Means:* to strengthen a region's competitiveness, which requires the improvement of productivity;
– *Basis:* to utilize and strengthen the capabilities, abilities of a region.

The rate of growth of productivity primarily depends on *technological change*, partly on the development of innovations, and partly on the implementation of innovations (technology transfer), which enable companies to strengthen and stabilize their competitive advantages (*Vas* 2009). The growth of productivity, and therefore the improvement of competitiveness are based decisively on the abilities of a region. It is not important in which industrial sectors the regions compete, what is important is *how they compete*, what company and industrial sector strategies they use (*Porter* 2008). In this line of thought *competitiveness is only a means*, which promotes the permanent improvement of the quality of life, the average standard of living of a region's population.

Our study reviewing the competitiveness of East-Central-European regions is built on the *pyramidal model* since it is coherent with the above-mentioned findings, and is established on the basis on the inputs- outputs - outcomes relationship (*Lengyel* 2004, 2009a). Outcomes are the standard of living, the prosperity of any region depends on its competitiveness. Outputs are the basic competitiveness indicators: per capita Gross Regional Product (GRP), labor productivity and employment rate. Sources of competitiveness, inputs influencing regional competitiveness can be divided into two groups of *direct* and *indirect* components. Of particular importance are *competitiveness factors* with a direct and *short-term influence* on economic output, labor productivity and employment rates. But social, economic, environmental and cultural processes and parameters, the so-called 'success determinants', with an indirect, *long-term impact* on competitiveness are also to be taken into account.

Three levels can be distinguished with regard to the targets of regional development programming and the various characteristics and factors influencing competitiveness:
– *Revealed competitiveness* (or basic categories) (*ex post* indicators, output): these output categories measure competitiveness and include income, labor productivity and employment rate.
– *Competitiveness factors* (*ex ante* factors): input factors with an immediate impact on revealed competitiveness categories. These can be used to influence regional competitiveness by means of institutions in short-term programming periods.
– *Success determinants* (social and environmental backgrounds): input determinants with an indirect impact on basic categories and competitiveness factors. These determinants take shape over a longer period of time and their significance reaches beyond regional policy-making.

The pyramidal model has been adopted by many authors in international literature (*Berumen* 2008; *Gardiner–Martin–Tyler* 2004; *Resch* 2008; *Sinabell* 2011; *Snieska–Bruneckiené* 2009), since "*this model is useful to inform the development of the*

determinants of economic viability and self-containment for geographical economies" (*Pike–Champion–Coombes–Humphrey–Tomaney* 2006, 26). "*This is an aggregate notion, …, in a regional context, labour productivity is the outcome of a variety of determinants (including the sort of regional assets alluded to above). Many of these regional factors and assets also determine a region's overall employment rate. Together, labor productivity and employment rate are measures of what might be called 'revealed competitiveness', and both are central components of a region's economic performance and its prosperity (as measured, say, by GDP per capita), though obviously of themselves they say little about the underlying regional attributes (sources of competitiveness) on which they depend*" (*Gardiner–Martin–Tyler* 2004, 1049). As it can be perceived in the pyramidal model, "more recent analytical review has sought to identify the interrelated factors that drivel competitiveness" (*Pike–Rodrígues-Pose–Tomaney* 2006, 112).

Kitson, Martin and *Tyler* (2004) also measure regional competiveness by the three related indicators: productivity, employment and standard of living. According to them competitiveness is both influenced by *hard and soft elements*. Hard elements consist of well-measurable economic, demographic, infrastructural, etc. factors, while soft elements include quality, hard to measure characteristics. In systematizing the sources of a region's competitive advantages they highlighted six factors, in case of which the frame of interpretation is provided by the concept of "capital": productive capital, human capital, social-institutional capital, cultural capital, infrastructural capital, intellectual/creative capital. While productive capital is relatively well-measurable, serious disputes of interpretation and measurability can be expected in case of human capital. Furthermore, not only the measurement but also the definition of cultural capital, or social-institutional capital is yet in the experimental phase. It is also of importance that it is not enough to look at the measurable factors in case of the particular capital types, it would also be good to estimate the quality elements (network relationships, trust etc.), because in today's knowledge-based economy these have become the motive forces of development.

We have renewed the pyramidal model on the basis of the above thoughts, starting from the growth theory, and taking into account the thoughts of *Porter* (2007), *Parkinson* (2006), as well as those of *Kitson, Martin* and *Tyler* (2004). Growth theories are traditionally based on the dual factors of capital and labour, to which technology and the human factor were added later. Nowadays, however, other viewpoints have also emerged in the analysis of *endogenous growth and development*, which are becoming increasingly important in regional trends.

Stimson, Robson and *Shyy* (2009) modelled regional endogenous growth in the non-metropolitan regions of Australia. They considered 27 independent variables in five factor groups: the structure and size of an industrial sector, unemployment, human capital and income, occupational shifts and know-how, effects of choosing coastal and island locations, and proximity to the metropolitan area.

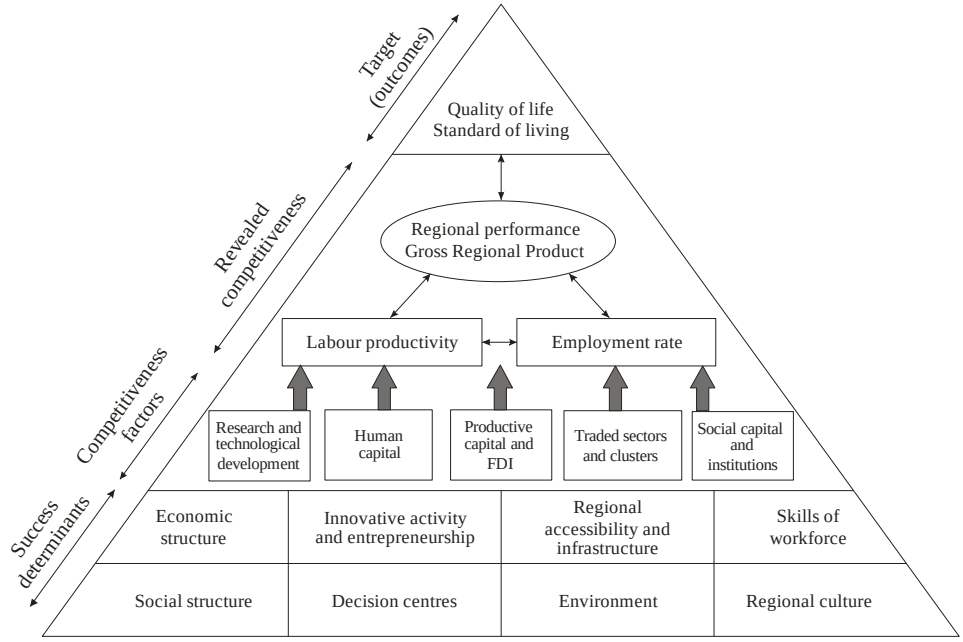
Stimson, Stough and *Salazar* (2009) suggested a new conceptual model framework for regional endogenous development. Endogenous development as a dependent variable is measured by two indicators, on the one hand by the change of employment or income, and on the other hand by the changing of the employment-based location quotient (LQ). Explanatory variables include the *availability of resources*, estimated by 13 indicators, and *market fit*, measured by 4 indicators. In their model they use more indicators to consider the *quality of leadership*, *institutions* and *entrepreneurship* as well.

In my opinion, in the theoretical literature on regional competitiveness and in regional political documents besides the well-measureable, hard economic and infrastructural indicators, hard-to-measure, soft indicators are increasingly gaining ground, especially innovation and knowledge (*Lukovics* 2006; *Rechnitzer* 2008). Similar to the way described in case of the theories of growth, regional competitiveness studies are increasingly influenced by endogenous growth and development theories, in which human capital, social capital play an important part (*Lengyel* 2011).

The modifications of the pyramid model can be traced back to endogenous growth and development theories, and consist of the redefinition of the competitiveness factors *(Figure 2)*:

a) *Research and technological development (RTD):* determines the competitiveness of companies in a decisive way, because innovations and the introduction of new technologies and new products can become competitive advantages. Innovations can come from outside of a region (technology transfer, know-how), or they can be the own developments of the companies operating in the region. The permanent growth of a region's competitiveness is primarily facilitated by the effective R&D activity in the region.
b) *Human capital (HC):* an efficient educational and training system determining the standard, qualification of human capital, as well as the related entrepreneurship has become important in the formation of the differences in regional competitiveness. Not primarily the quantitative characteristics of the work force, but rather its know-how, attitude, risk-taking have become of critical importance. As a consequence of quick technological and market changes, frequent re-trainings, life-long studying became prominent, which calls attention to the importance of the adaptability of human capital.
c) *Productive capital and foreign direct investments (PC-FDI)*: The regions' economic development is strongly connected to their ability to draw and sustain a successful production activity. The existing working capital is one of the depositaries of productivity. Incoming FDI increase employment (one of the basic categories of regional competitiveness) on the one hand in a direct way, by generating new productive capacity, and on the other hand in an indirect way, by improving the competitiveness of local companies working as suppliers, subcontractors, outside workers, sub-agents.

Figure 2 The renewed pyramidal model of regional competitiveness



Source: based on Lengyel (2004, 2011)

d) Traded sectors and clusters (TSC): the income flowing into the region is generated in the traded sector, therefore these sectors are of major importance, as the economic base (export base) model also states. But local sectors also contribute as subcontractors, local business partners to the success of the companies participating in global competition, i.e. the formation of networks and clusters increases regional competitiveness, income, and improves employment.

d) *Social capital and institutions (SCI):* are of basic importance in regional economic growth, since besides "tangible" elements (such as infrastructure for example), intangible assets also play a part in development. *Social capital* is especially important from the point of view of regional development, which is built on the characteristics of inter-company cooperation, cultural traditions and attitudes, aggregated experience, behavioural patterns, risk management, creativity etc. An efficient economy requires not only institutions (economic organizations, the organizations of employees, administrative institutes) in general, but also an *efficient system of relationships built on trust* between them, which can be strengthened by civil social organizations (e.g. churches, non-profit organizations).

The renewed pyramidal model builds both on endogenous growth and development theories. The factors taken as a basis in case of endogenous growth theories appear in the model, as well: capital (productive capital and FDI in the model), labour (human capital in the model), and technology (research and technological development in the model). However, the social capital stated in endogenous development theories, and the clusters playing an important part in the updated economic base model also came to be included in the pyramidal model's competitiveness factors.

Similarly to the regional growth theories, for the investigation of the relations between revealed competitiveness (RC) and the competitiveness factors, it is possible to draw up the *Regional Competitiveness Function* (RCF):

$$RC = f\,(RTD, HC, PC\text{-}FDI, TSC, SCI)$$

RCF fundamentally expresses the relationships between revealed competitiveness (RC) measured by three basic categories and the competitiveness factors influencing it, complementing the thoughts of traditional regional economic growth with the newest findings of endogenous growth and development trends. The importance of the traded sector and clusters in regional specialization was pointed out by *Porter* (2003, 2008), *Stimson, Robson* and *Shyy* (2009). In the meantime, sociological research called the attention to social capital (and territorial capital), which among others was also specially highlighted by *Camagni* (2009), *Faggian* and *McCann* (2009), *Florida* (2002) and *Glaeser* (2008).

In the course of the empirical study of the regions of East-Central European countries the renewed pyramidal model is taken as a starting point. Not only basic categories, revealed competitiveness shall be analysed with the help of multivariable statistical procedures, but also the background processes described by the competitiveness factors.

4. Empirical study of the regional competitiveness

In the course of the empirical study the competitiveness of the NUTS2 level regions of eight countries has been analysed, altogether 93 regions, touching on 91 car and motor factories operating there. The distribution of the 93 regions between the countries is disproportioned, since Germany's 39 regions represent an outstanding proportion, whereas the number of Slovenia's regions (2) is very small:

- Austria 9 regions (6 car and motor factories);
- Czech Republic 8 regions (11 car and motor factories);
- Poland 16 regions (16 car and motor factories);
- Hungary 7 regions (4 car and motor factories);
- Germany 39 regions (46 car and motor factories);
- Romania 8 regions (4 car and motor factories);

- Slovakia 4 regions (3 car and motor factories);
- Slovenia 2 regions (1 car and motor factory).

The objectives of the empirical study:

- the typifying of regions on the basis of their similarity;
- the comparison of regions according to their competitiveness, accentuating the possible role of car factories;
- the demonstration of the extent to which the utilized indicators, indicator groups influence regional competitiveness.

Our study follows the rationale of the renewed pyramidal model. The basic categories show the competitiveness attained in the past period, as ex post indicators. On the one hand, the competitiveness factors express their contribution to the basic categories. On the other hand, they refer to the 'ability', the future potential, as ex ante indicators: how regional competitiveness is expected to be modified by their development in the near future. We tried to compile the *database* of the empirical analysis according to the redefined pyramidal model. Unfortunately, as it often occurs in the course of international studies, the data supply of the countries differs, e.g. Germany provides the data related to qualifications for NUTS1 level regions, instead of NUTS2.

In many cases the supply of data is also incomplete, or in case of the appearance of new regions there are no older data. A part of soft type information (e.g. information related social capital) is not included in public and verifiable databases. Only partial information is available about the car industry, the number of car factories per region. As a result of the above we were not able to conduct a full-scale analysis of all the competitiveness factors with indicators following the rationale of the pyramidal model. In spite of this, we are of the opinion that regional competitiveness can be investigated with the existing indicators, and interesting and important correspondences can be pointed out. In the course of the gathering of data[1] we primarily relied on the Eurostat database and the publicly released indicators of cohesion reports no. 4 and 5. For the computerized investigations the SPSS-18 program pack was used.

Our database utilized for the empirical study consists of (*Table 1)*:

- 4 indicators expressing *basic categories*;
- 21 indicators describing *competitiveness factors*.

In the course of the examination of empirical data more methods were used:

- *standardization*: with hierarchical clustering and multidimensional scaling;
- *principal component analysis*: to form a common scale from the 3 basic categories;

Table 1 Indicators of empirical investigation

Code	Denomination	Source
	Basic categories	
eugdp08	Regional gross domestic product (PPS per inhabitant in % of the EU 27 average), 2008, %	Eurostat
empr1509	Employment rate of the age group 15–64, 2007, %	Eurostat
dispinc07	Disposable income of private households (Purchasing power standa based on final consumption per inhabitant), 2007	Eurostat
labprod07	Labour productivity in industry and services (GVA per employee, in the average of EU27), 2007, %	CR5
	Research and Technological Development	
gerd07	Total intramural R&D expenditure (GERD), percentage of GDP, 200 %	Eurostat
emphigh08	Employment in high-technology sectors within the number of tot employed, 2008, %	CR5
fp707	7th Framework Program, average funding per head (EU27= 100), %	CR5
pat1607	Patent applications to the European Patent Office (EPO), averag 2006–2007, per inhabitant	CR5
lisbind08	Lisbon Index (0–100), 2008	CR5
	Human Capital	
adedu08	Population aged 25–64 with tertiary education (ISCED 5–6), 2008,	CR5
tertedu34	Population aged 30–34 with a tertiary education (ISCED 5–6), 200 %	CR5
age25–64	The proportion of people aged 25–64 in the total population, 2004,	CR4
weeklyh10	The number of average weekly hours worked (in full-time job), 201 hour	Eurostat
mwork78	That proportion of people from the active age population who move into the region from outside in the past two years (from within the EU, 2007–2008, %	CR5
	Productive Capital and FDI	
gfcf07	Gross fixed capital formation per inhabitant (all NACE activities 2007, Euro	Eurostat
	Traded Sectors and Clusters	
indust05	Employment in industry (% of total employment), 2005, %	CR4
serv05	Employment in services (% of total employment), 2005, %	CR4
	Social Capital and Institutes	
adedutr08	Participation of adults aged 25–64 in education and training, 2008,	CR5
eudev07	EU Human Development Index (0–100), 2007, %	CR5
povrisk08	The proportion of the population subjected to poverty even after receiving social benefits, 2008, %	CR5
unempr09	Unemployment rate, 2009, %	Eurostat
lowedu08	Population aged 25–64 with low education, (ISCED 1-2), 2008	CR5
lunempr09	Share of long-term unemployment (12 months and more), percentag of total unemployment, 2009, %	Eurostat
unempy08	Youth unemployment rate, 2008, %	CR5
unhump07	UN Human Poverty Index (between 0–100), 2007	CR5

- *factor analysis*: to filter dominant factors on the basis of the competitiveness factors;
- *multivariable linear regression*: to demonstrate the competitiveness factors influencing regional competitiveness.

5. The classifying of regions

The groupings generated on the basis of the similarities of the 93 regions, the typifying of the regions was examined by clustering and multidimensional scaling. In both cases 25 indicators were used (see *Appendix*), i.e. 4 basic competitiveness categories and 21 competitiveness factors were considered, performing standardization per indicator.

In case of cluster analysis a hierarchical procedure was chosen, which contracts similar regions on the basis of one tree structure until only one group remains; the steps of the procedure can be illustrated in a dendrogram. In the course of this procedure we can choose in a slightly arbitrary way the groups at which step shall be considered as the subject of our study, in this case the 6 types were accepted after step 10 *(Table 2)*. There was one outlier: Voralberg (AT 34) which constituted an independent type until the very last step.

The six clusters form characteristic types:

Cluster 1: all Hungarian, Polish, Czech and Slovakian regions, except the capital regions, with 31 car factories in 31 regions,

Cluster 2: the Romanian regions, except the capital region, with 4 car factories in 7 regions,

Cluster 3: the Czech, Slovakian, Hungarian, Polish Romanian capital regions, with 3 car factories in 5 regions,

Cluster 4: German metropolitan (Hamburg, Bremen etc.) regions and the region of Vienna, with 11 car factories in 6 regions,

Cluster 5: East-German (post-socialist) regions, 10 car factories in 9 regions,

Cluster 6: the two Slovenian, and the rest of the Austrian and German regions, with 32 car factories in 34 regions.

On the basis of the *spatial separation of regional types* established by clustering, the use of the 25 indicators compiled for the study of regional competitiveness, it can be stated that the types are determined by national characteristics (*Figure 3*). The regions of the post-socialist countries (except Slovenia and Romania) are present only in two clusters, in clusters 1 and 3, with the capital regions belonging to the latter. The regions of Romania, except the capital, have unique characteristics, creating a separate group (Cluster 2). The German, Austrian and Slovenian regions also constitute graphically separate groups, the 'East-German post-socialist' regions belong to the independent Cluster 5, while the rest are very similar to each other, except a few metropolitan regions (Cluster 4).

Table 2 Types of hierarchical clustering for regions

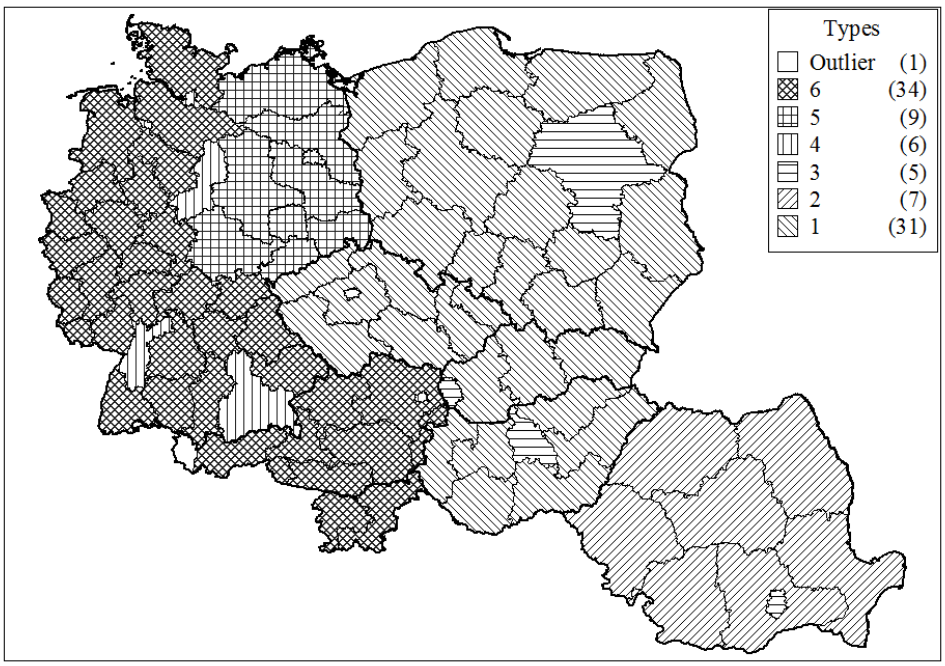
1	2	3	4	5	6
SK03	RO11	CZ01	DE60	DE42	SI01
SK04	RO42	SK01	AT13	DEG0	SI02
HU31	RO12	HU10	DE50	DED1	AT11
HU32	RO21	PL12	DE12	DE80	AT12
HU33	RO41	RO32	DE21	DEE0	AT21
HU23	RO22		DE91	DE41	AT22
PL11	RO31			DED2	AT31
PL21				DED3	AT33
PL63				DE30	AT32
PL42					DE93
PL51					DEF0
PL43					DE92
PL61					DEA1
PL62					DEA5
PL41					DEC0
PL31					DE73
PL52					DEB1
PL22					DE94
PL33					DEA3
PL32					DE22
PL34					DE27
CZ03					DE24
CZ05					DEA4
CZ06					DE71
CZ07					DEA2
CZ02					DE11
HU21					DE14
HU22					DE13
CZ08					DE23
SK02					DE72
CZ04					DEB3
					DE26
					DE25
					DEB2

Source: Own compilation.

Clustering highlights similarity, so on the basis of the 25 indicators similar historical courses seem to show up, picturing the long-term dominance of the socio-cultural-historical roots between countries. A *powerful spatial separation* can be observed; the regions making up the individual clusters constitute “bands” from west to east. The regions of the post-socialist countries, including the East-German provinces, detach themselves from the rest, with the only exceptions of Slovenia and

Romania. The Hungarian regions are in Cluster 1, except for Central-Hungary, which is listed in Cluster 3. The effect of the *urbanization agglomeration advantages* can also be observed (*Capello* 2007a, *Lengyel–Rechnitzer* 2004), on the one hand, the capital regions of the post-socialist countries constitute a separate group, and on the other hand the German (Hamburg, Bremen etc.) and Austrian (Vienna) metropolises also detach themselves (Clusters 3 and 4) from the rest. The 25 indicators describing competitiveness and the factors influencing it probably indicate basic institutional and social settlement, which can change only in the course of a longer time period.

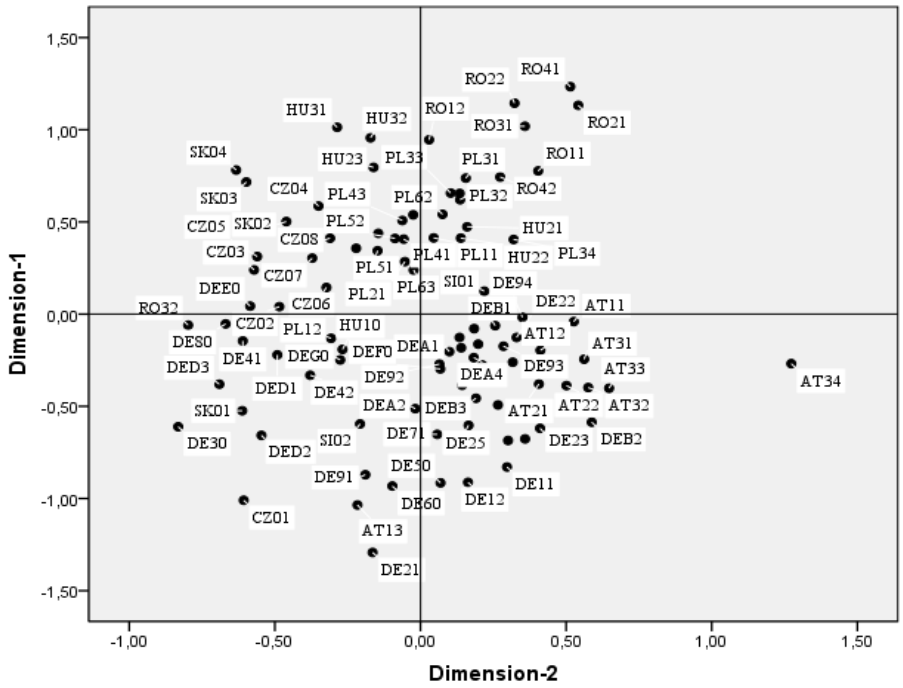
Figure 3 Types of clustering for regions



Source: Own compilation.

The similarities between regions were also examined by *multidimensional scaling*, using a PROXSCAL procedure. In a two dimensional point figure mainly similar shapes can be observed for hierarchical clustering, whereas the different types' relationship to each other, their location, proximities and similarities are also pictured *(Figure 4)*.

Figure 4 Position of regions by multidimensional scaling



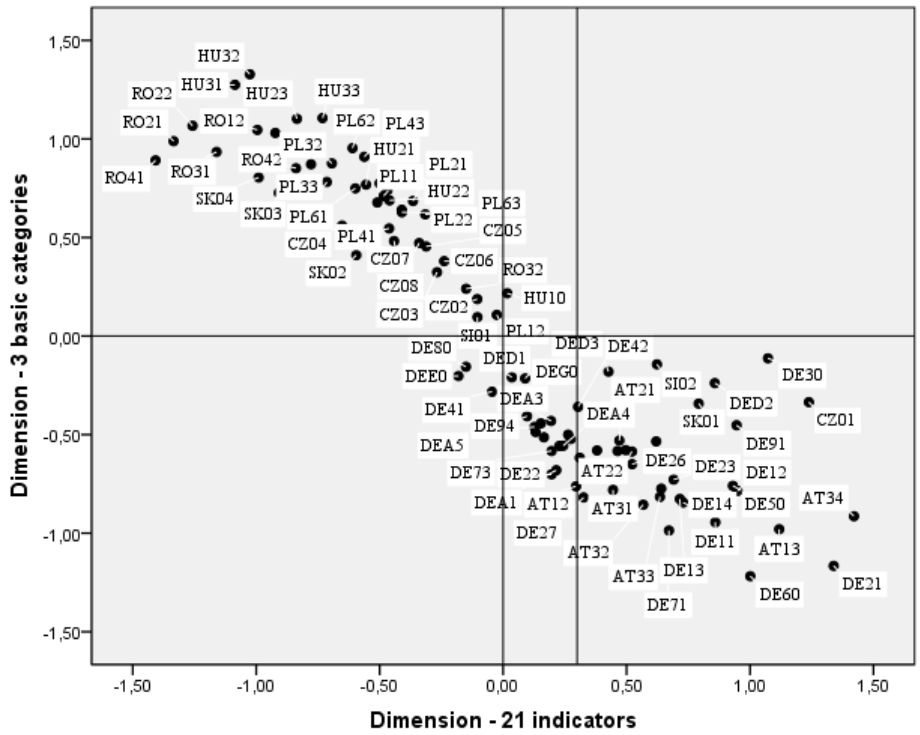
Source: Own compilation.

In the figure the regions of the post-socialist countries detach themselves from the German and Austrian regions (Voralberg, AT34 is an outlier here as well), only the Slovenian regions integrate into the latter, and the capital regions got close to them (Prague, CZ01 "positioning" from outside). The multidimensional typifying made on the basis of 25 indicators pictures different courses of development, and similarly to clustering, it pinpoints the socio-economic-historical background and past impact still subsisting today. It is very important to note that the regions do not mix, the regions within the same country showing similar characteristics are located in each other's proximity, only the capitals are detached. That is to say that the characteristics, institutional background, etc. of a given country still determine regional characteristics. The differences between countries are stronger than the differences within the countries.

The Hungarian regions can be found in three groups: Central-Dunántúl (HU21) and West-Dunántúl (HU22) together with certain Polish regions got close to German and Austrian regions. Central-Hungary (HU10) is also on the border between the post-socialist countries' regions and those of Germany, while the remaining four Hungarian regions form a separate group, which is the farthest from that of the

developed German regions. While in the course of clustering six Hungarian regions were classified in one cluster, multidimensional scaling has thrown light on the *Hungarian regions' different path of development*: the characteristics of the Central-Dunántúl (HU21) and West-Dunántúl (HU22) regions are close to those of certain German, Austrian and Slovenian regions, as well as to those of Central-Hungary. While South-Dunántúl (HU23), North-Hungary (HU31), North-Alföld (HU32) and South-Alföld (HU33) constitute a separate group, they differ most from the German and Austrian regions. This confirms the results of other studies: while the economics of three Hungarian regions integrated into the economy of the EU, the other four regions are still very far from this (*Lengyel–Leydesdorff* 2011).

Figure 5 Positions of regions by one-dimensional scaling



Source: Own compilation.

In the pyramidal model the basic categories are the effects, and the competitiveness factors are the causes, however, they are in obvious interaction with each other. Calculating separately and illustrating together the *one dimensional scaling* of the 21 competitiveness factors and the four basic categories it is possible to see whether the

specific characteristics of the regions are prevalent, i.e. whether there are dominant background processes, or the results of the two different scaling are randomly diffused *(Figure 5)*.

There seems to be a strong connection between the two scales calculated from the two different indicator groups: the one dimensional projection of the regions according to basic categories resulted in a figure similar to that of the scaling calculated from the 21 competitiveness factors. The linear correlation of the two data rows is -0,906, which means that they move closely together. The polynomial regression curve fitting on the points is:

$$y = 0{,}1754\, x^2 - 0{,}9529\, x - 0{,}0771, \text{ where } R^2 = 0{,}8359.$$

On the basis of the results of typifying and scaling utilizing competiveness indicators it is probable that regions form groups in the long run on the basis of their specified social-historical characteristics. These types are not random: the regions of a country generally cluster in one place, are similar to each other, and only partly mix with the regions of other countries. Only the capitals of the post-socialist countries and the Slovenian regions can get close to the German and Austrian regions. The distribution of car factories, as it was shown in the course of clustering, is not dependent on regional types, since there are divisions in every group, in about every second region.

6. Revealed competitiveness

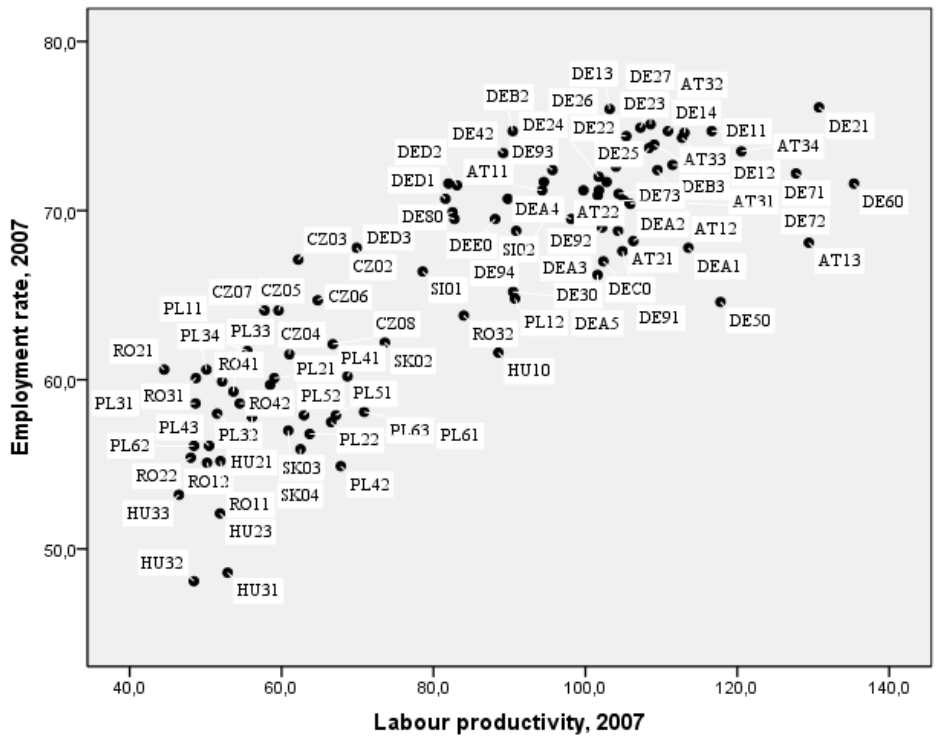
Revealed competitiveness is measured by basic categories. As it was demonstrated GDP per capita can be broken down using the decomposition method: to the product of labour productivity, employment rate and age composition (the latter is usually left out). The available income of the households is also listed among these indicators (as it appears in the reviewed up-to-date specialised literature), which shows the level of welfare, standard of living of those living in the given region. These indicators determine competitiveness not separately, but together. As mentioned before, competitiveness can be regarded as the renewal and augmented interpretation of economic growth, since in the latter case generally only one indicator, the GDP is taken as a basis.

From the decomposition of the GDP it follows that labour productivity and employment are the two basic indicators of competitiveness. On the basis of these two indicators the situation of the 93 regions shows interesting, although well-known and anticipated correspondences *(Figure 6)*. The linear correlation of the two data rows is +0,842, which means that they move closely together. The regression curve fitting to the points is:

$$y = 19{,}443 \ln(x) - 19{,}477, \text{ where } R^2 = 0{,}7376.$$

On the basis of labour productivity and employment the two groups of regions can be well divided into groups above and below the CZ02 – SI01 – RO32 – HU10 line. The group above the line includes all German and Austrian regions, as well as the Czech, Romanian, Hungarian, Polish and Slovenian capital regions, and the two Slovenian regions. While the group below the line consists of all the other regions of the post-socialist countries. Similar spatial correspondences were pointed out on the basis of these indicators like in the course of typifying, certain regional types distinctly detach from each other, especially depending on the characteristics of the countries.

Figure 6 Connection between employment rate and labour productivity



Source: Own compilation.

It is also demonstrated that among the post-socialist countries employment is high, about 65%, in the Czech regions, followed by several Polish regions, while in the Romanian and Hungarian regions employment is much lower even in case of similar labour productivity. Among the 93 regions, *employment rate* is the lowest in four Hungarian regions: North-Alföld (48,1%), North-Hungary (48,6%), South-Dunántúl (52,1%) and South-Alföld (53,%). While in the other two regions, in Central-Dunántúl (57,8%) and West-Dunántúl (59,7%) employment is a little higher, but even so it

qualifies as very low. With respect to *labour productivity* (which is compared to the average of EU=27 on purchase power parity) the 5 regions of the lowest value include two Romanian, two Hungarian (South-Alföld 46,5% and North-Alföld 48,4%) and one of the Polish regions. Neither Central-Dunántúl (56,1%) nor West-Dunántúl (58,5%) reaches 60% of the EU-average. Consequently, according to both basic indicators of competitiveness, the competitiveness of four Hungarian regions is very weak, while the other two regions (Central-Dunántúl and West-Dunántúl) are in a slightly better position only due to their higher employment rate.

It is a basic question whether the car and motor factories of the regions influence the employment rate and the level of labour productivity. The *correlation* between the number of car factories and the other two indicators (0.14 with employment rate, and 0.12 with labour productivity) shows that they are not moving together. I.e. the influence of car industry is not detectable either in employment or labour productivity. There must obviously be some influence, but on the one hand, the number of car factories is not sufficient to demonstrate this, and on the other hand, in the regions where there is no car industry, other industries play a key role in the development of both employment and labour productivity.

To perform further calculations a common competitiveness indicator is formed from the three basic categories, and to contract the information contained by the basic categories *principal component analysis* is applied (*Lengyel* 2011). From the four basic categories, GDP per capita will be ignored. With the help of the three indicators on the right side of the decomposition equation, labour productivity (labprod07), the employment rate of people aged 25–64 (empr1509) and the available income of households (dispinc07), a principal component (RC) is established with the use of principal component analysis, which shall later be considered as a *dependent variable*:

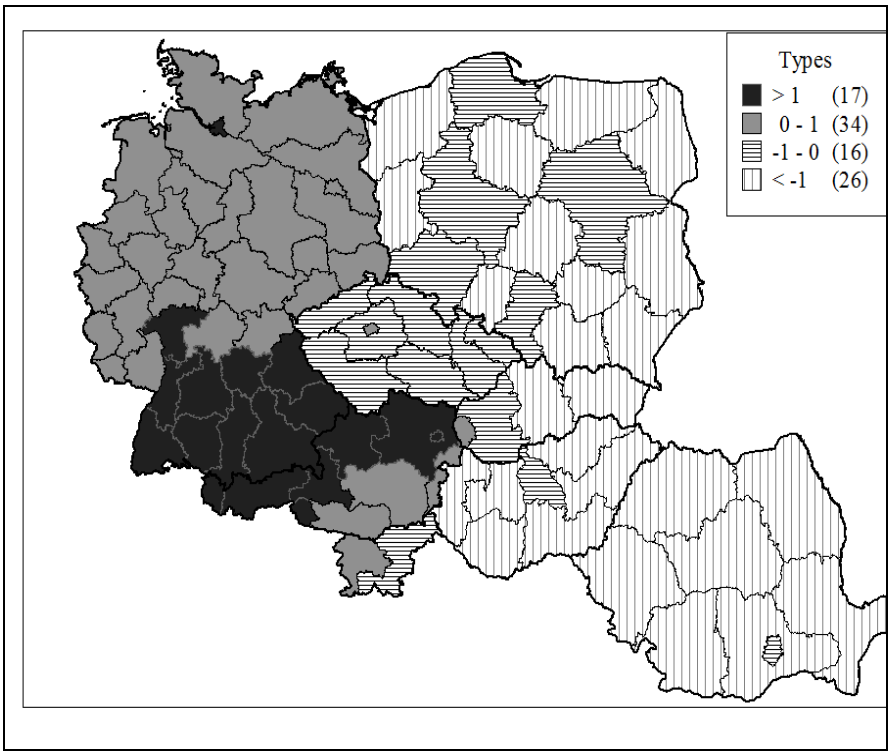
- RC contains 92,8% of the information of the 3 indicators;
- Communalities: labprod07: 0,938; empr1509: 0,883 and dispinc07: 0,961.

This principal component shall hereinafter be referred to as *competitiveness principal component*, an indicator of revealed competitiveness (RC). The indicator values are dispersed around the interval of zero, therefore the regions of negative values may be regarded as regions of weak competitiveness, while those of positive values are considered as regions of strong competitiveness.

The values of regions according to the competitiveness principal component, as types specified by factor values, show sharp spatial characteristics (*Figure 7*). A coherent area, the 'Alps-area' can be observed, which consists of South-German and North-Austrian regions of the strongest competitiveness. The other German and Austrian (and one of the Slovenian) regions, which may be regarded as the "middle mountains" connected to the Alps, constitute the second group (including Prague and Bratislava), which can still be regarded as being of strong competitiveness. The "hill-country" situated east from the Alps comprise the third group, consisting of mainly Czech regions, which means just one or two smaller hills the further we get from the Alps. The fourth group is the plain, with regions of very weak competitiveness. The

competitiveness principal component shows that the competitiveness of the regions depends strongly on their geographical proximity and distance from the "core".

Figure 7 Types of regions by competitiveness principal component



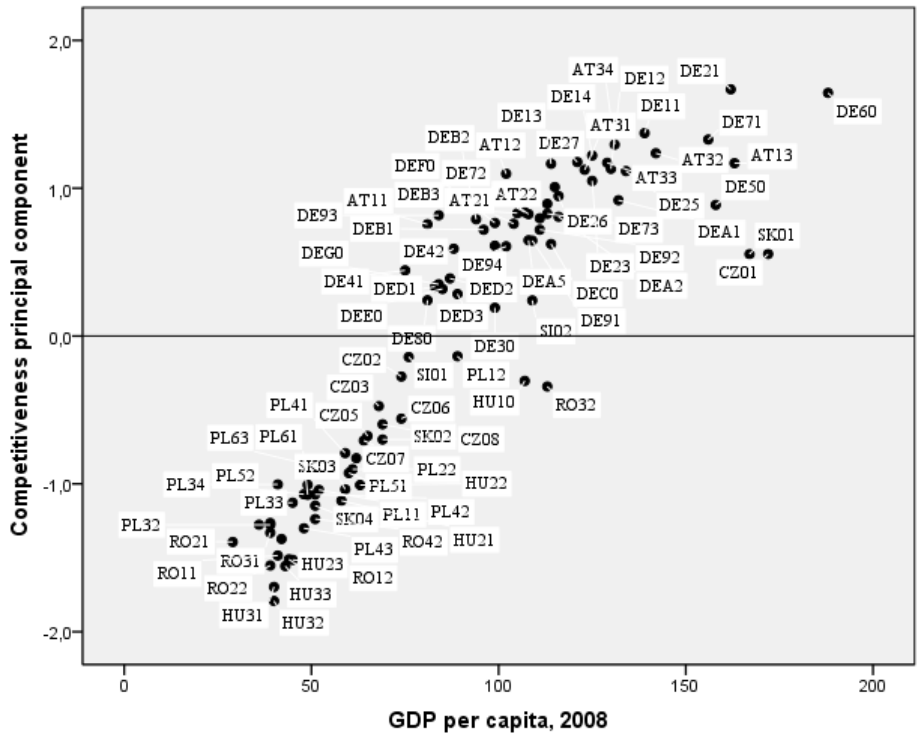
Source: Own compilation.

The majority of the post-socialist countries' regions (except Slovenia and the Czech Republic), comprising a coherent area, can be found in the fourth type of regions with the weakest competitiveness, only the capitals and some industrial regions could make it into the third type. On the basis of the factor values North-Alföld, North-Hungary and South-Alföld stand at the three last positions among the 93 regions, followed by two Romanian regions and South-Dunántúl. Consequently, these four Hungarian regions are numbered among the weakest, the last six regions with respect to revealed competitiveness, as well.

The competitiveness principal component and the level of economic development (GDP/capita) are strongly related *(Figure 8)*: the linear correlation of the two data rows is +0,8752, showing that they move strongly together. The regression curve fitting to the points is:

$$y=2{,}0706 \ln(x) - 9{,}0873, \text{ where } R^2=0{,}8752.$$

Figure 8 Connection between competitiveness principal component and GDP per capita



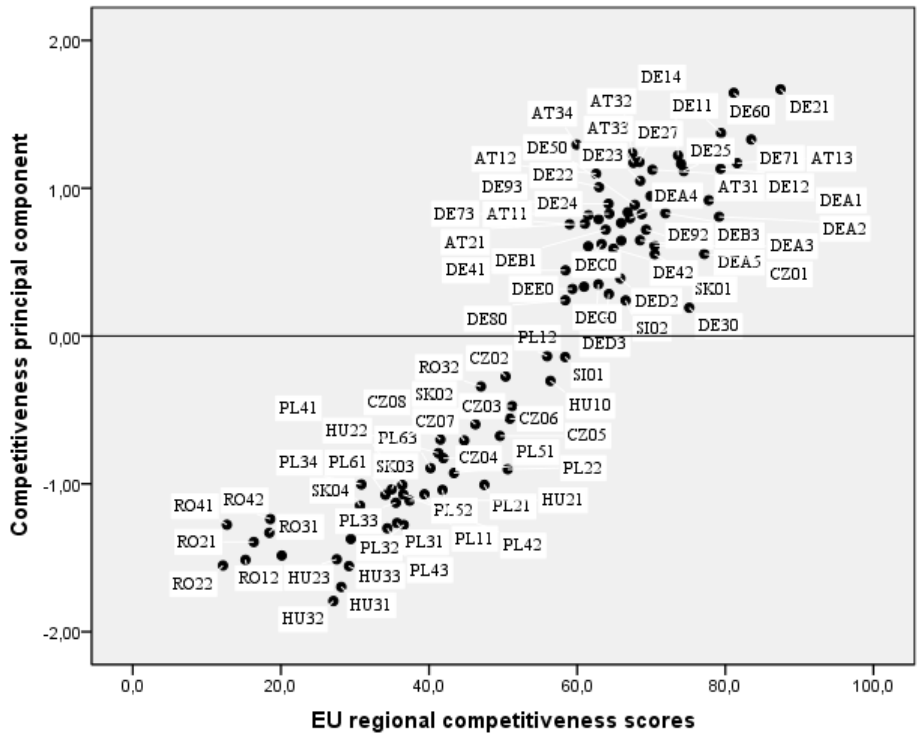
Source: Own compilation.

Examining the regions together on the basis of the two indicators, the *competitiveness principal component and the level of economic output* (GDP/capita) it can be also pointed out that the German and Austrian regions detach themselves from the other regions. The least developed regions of the weakest competitiveness include both Central-Hungary and the other six Hungarian regions, located in the bottom left quarter in the company of Romanian and Polish regions.

The *EU regional competitiveness index* also publishes the relative competitiveness positions of the 27 member states' regions on a scale of 0–100 (*Annoni–Kozovska* 2010). There is a very close relationship between the competitiveness principal component and the EU's competitiveness index *(Figure 9)*: the linear correlation of the two data rows is +0,8738, meaning that they move closely together. The linear regression line fitting to the points is:

$$y = 0{,}0499\,x - 2{,}7014, \text{ where } R^2 = 0{,}8738.$$

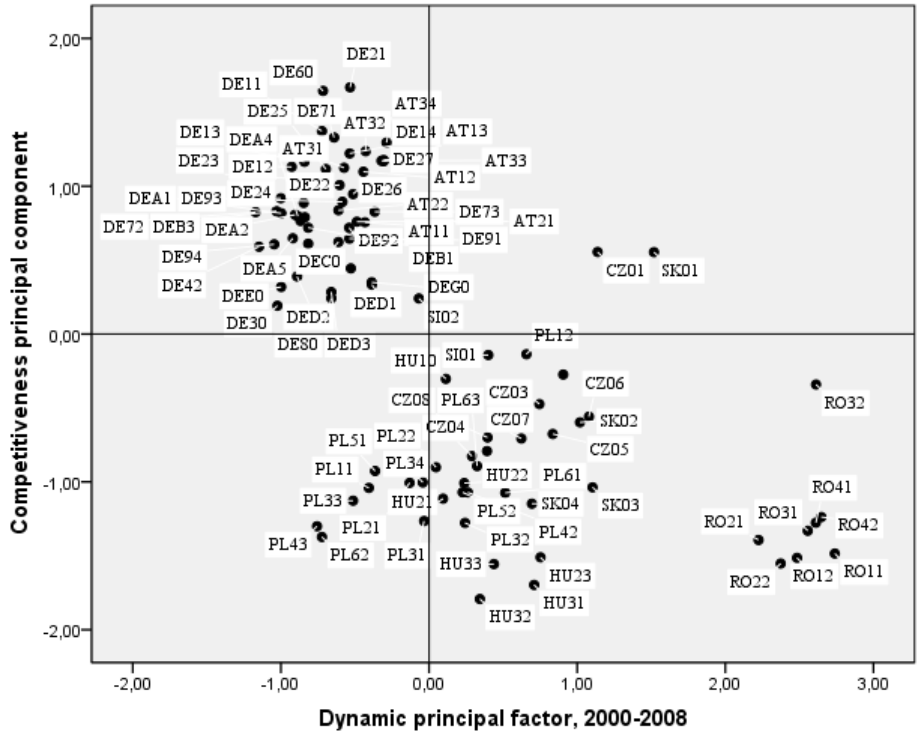
Figure 9 Connection between competitiveness principal component and EU regional competitiveness index



Source: Own compilation.

There are differences between the competitiveness principal component and the EU regional competitiveness index, but the closeness of the correlation is showed by the fact that these differences are not considerable. The competitiveness principal component assigns greater importance to the employment rate, while the EU regional competitiveness index processes a multitude of indicators (e.g. infrastructure, institutional system, etc.) following *Porter'*s methodology (*Annoni–Kozovska* 2010). However, the earlier observations can be repeated here as well: the competitiveness of the German and Austrian regions separate from the rest, followed by the other countries' capital regions and the Slovenian regions (one of the two is obviously a capital region here as well). The EU's regional competitiveness index of the four Hungarian regions of less competitiveness is between 27–29% on the scale of 0–100, while Central-Dunántúl and West-Dunántúl scored 36,4% and 37,4% respectively, and even Central-Hungary attained only 56,4%, besides several Romanian regions.

Figure 10 Connection between static and dynamic competitiveness principal component



Sources: Own compilation

Up to now we have demonstrated the competitiveness of regions on the basis of data available for last year, i.e. from a static approach. It is worth to examine the change of the three basic categories, as *dynamic indicators*: the changes in the employment rate of people aged 20–64, in 2000–2008 (empl08–00), the growth of productivity within the sector (in the EU27's average), in 2007/2000 (prodgr07/00), the available income of households (PPCS, on the basis of the final consumption per capita), in 2007/2000 (disp07/06). A principal component was generated by principal component analysis, which we regard as dynamic dependent variable:

- The principal component contains 75,4% of the information of the 3 dynamic indicators;
- Communalities: empl08–00: 0,66; prodgr07/00: 0,777 and disp07/06: 0,826.

In the upper left quarter there are German and Austrian regions of strong position, but weak dynamics *(Figure 10).* The change of the indicators of German and Austrian regions with strong competitiveness is much less than that of the other regions, which is understandable, because high level employment for instance cannot be continuously

increased. The regions of Prague and Bratislava are located in the upper right quarter, which can be considered strong according to both dimensions, but the regions of Warsaw and Budapest (Central-Hungary) are not far from the border of this quarter either. The bottom left quarter, which is considered weak according to both dimensions, includes the Polish regions and Central-Dunántúl (although on the edge of the quarter), the positions of which worsened in the past decade, as it was shown by several studies. In the bottom right quarter there are five Hungarian regions of weak competitiveness, which however have somewhat improved their situation, noting that the dynamic value of West-Dunántúl is only 0,24. The Romanian regions are the most dynamic, who started obviously at a very low value, but their growth accelerated in 2000–2008.

7. Factor and regression analysis

The five competitiveness factors of the pyramidal model could be characterised by a very different number of indicators, therefore the relations between the competitiveness factors and revealed competitiveness shall not be examined separately. It may be noted that multicollinearity can also occur among the indicators of the five competitiveness factors, which makes correct statistical analyses more difficult (*Szakálné Kanó* 2008).

Instead of considering which indicator belongs to which basic factor, independent factors were formed by compacting the information included in the 21 indicators by factor analysis, among which there is no multicollinearity, the remaining members are distributed normally, and there is no homoscedasticity either. Then a multivariable linear regression analysis was performed with these factors, taking into consideration the competitiveness principal component (RC), as dependent variable calculated from the three basic categories. It is the advantage of this method that it makes the testing of the pyramidal model's structure possible, as well. Its disadvantage is that the meaning of the individual factors generated in the process has to be explained afterwards with the help of the indicators included in them, and the factor structure can differ from the competitiveness factors of the pyramidal model.

By performing a factor analysis on the basis of the 21 indicators five factors were generated, which contain 81,5% of the information included in the indicators. Varimax rotation was applied on the factors to form the components of the individual indicators. From among the rotated components of the factors in the absolute value the values above 0,5 were taken into consideration *(Table 3).*

The economic interpretation and factor weight of the 5 factors are the following:

Factor 1: Human capital: human development, workforce attraction and patents (HCD), factor weight: 18,873. Human development, people moving in, high patent announcements shape this factor positively, while the proportion of people of active age and the number of hours worked affect it negatively.

Table 3 Factors and their components

Factors	Denomination	Components
Factor 1: HCD	*Human capital: human development, workforce attraction and patents*	
eudev07	EU Human Development Index (0–100), 2007, %	0,701
mwork78	That proportion of people from the active age population who moved into the region from outside in the past two years (from within the EU, 2007–2008, %	0,684
pat1607	Patent applications to the European Patent Office (EPO), average 2006–2007, per inhabitant	0,614
age25–64	The proportion of people aged 25–64 in the total population, 2004, %	-0,819
weeklyh10	The number of average weekly hours worked (in full–time job), 2010, hour	-0,906
Factor 2: RTD	*Research and Technological Development*	
fp707	7th Framework Programme, average funding per head (EU27= 100), %	0,866
gerd07	Total intramural R&D expenditure (GERD), percentage of GDP, 2007, %	0,820
emphigh08	Employment in high-technology sectors within the number of total employed, 2008, %	0,642
lisbind08	Lisbon Index (0–100), 2008	0,602
gfcf07	Gross fixed capital formation per inhabitant (all NACE activities), 2007, Euro	0,544
Factor 3: SCP	*Social Capital: Poverty*	
povrisk08	The proportion of the population subjected to poverty even after receiving social benefits, 2008, %	-0,733
lowedu08	Population aged 25–64 with low education (ISCED 1-2), 2008, %	-0,869
unhump07	UN Human Poverty Index (between 0–100), 2007	-0,915
Factor 4: SCU	*Social Capital: Unemployment*	
lunempr09	Share of long-term unemployment (12 months and more), percentage of total unemployment, 2009, %	0,965
unempr09	Unemployment rate, 2009, %	0,955
unempy08	Youth unemployment rate, 2008, %	0,688
Factor 5: HCH	*Human Capital: High Education*	
tertedu34	Population aged 30-34 with a tertiary education (ISCED 5-6), 2008, %	0,741
adedu08	Population aged 25-64 with tertiary education (ISCED 5-6), 2008, %	0,684
indust05	Employment in industry (% of total employment), 2005, %	-0,881

Factor 2: Research and technological development (RTD), factor weight: 17,901. The high share of the expenses spent on R&D, the high proportion of people employed in the high-tech sector, and high fixed capital generation constitute this factor.

Factor 3: Social capital: *poverty* (SCP), factor weight: 17,224. The factor comprising high poverty ratio, low education.

Factor 4: Social capital: unemployment (SCU), factor weight: 15,265. This factor is made up of the unemployed, among them the high ratio of permanently unemployed and young unemployed people.

Factor 5: Human capital: high education (HCH), factor weight: 12,306. The high ratio of highly qualified people has a positive effect on this factor, while the ratio of people employed in industry has a negative effect on it.

From the 21 indicators 19 are connected to one of the factors, two were left out: the proportion of the people employed in services and the proportion of people participating in education and courses from the population aged 25–64. The three competitiveness factors of the pyramidal model appeared also in the factors: research and technological development, human capital and social capital (the latter divided into two-two parts respectively). From the competitiveness factors those two were not represented to which the appropriate number of measurable indicators was not found: working capital and FDI, and the traded sectors and clusters (one of their indicators joined a connected factor). Only Factor 1, human capital: human development and the proportion of people of inactive age factor became "mixed", into which one indicator of social capital and one of research-development were also included besides the characteristics of human capital. Consequently, the pyramidal model seems to be appropriate for the systemization of factors influencing competitiveness.

The results of the factor analysis can be analysed in themselves as well, however, our main aim at present is to demonstrate to what extent the competitiveness principal component (RC) as dependent variable is explained by the 5 factors as independent variables. In case of the *multivariable linear regression* the 5 factors explain 93,5% (R^2=0,935) of the dependent variable's (RC) dispersion. Examining integration the Durbin-Watson test is 1,571, which signifies weak negative autocorrelation by a 5% significance level.

On the basis of the calculations the following model was generated:

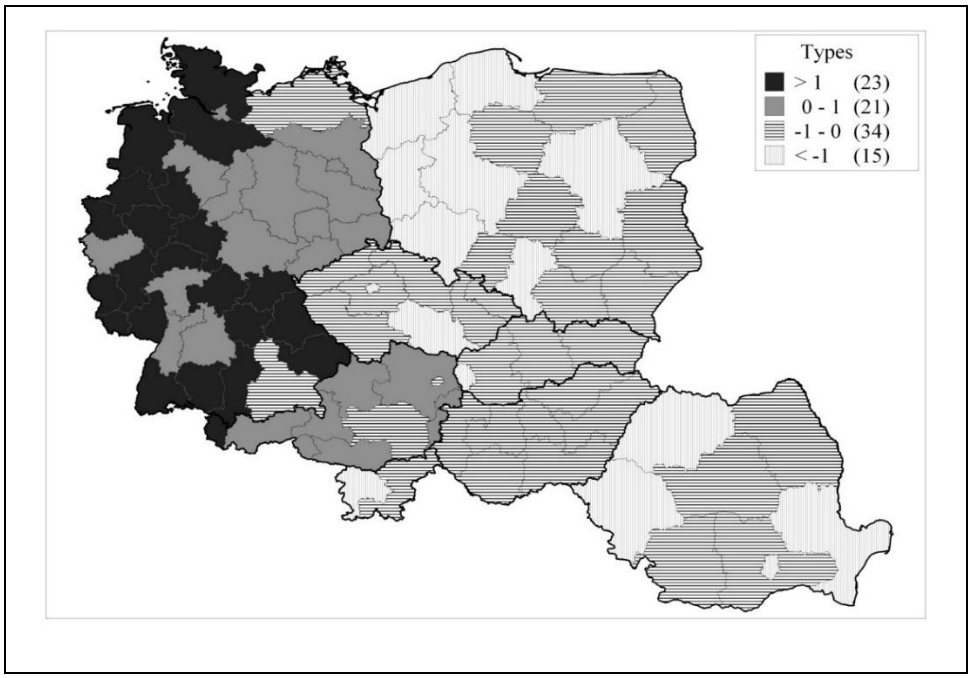
$$RC_i = + 0{,}691\ HCD_i + 0{,}439\ RTD_i + 0{,}322\ SCP_i - 0{,}334\ SCU_i + 0{,}22\ HCH_i + E_i$$

The regression coherence shows what effect a factor has on regional competitiveness, e.g. one unit improvement of HCD results in 0,691 improvement of the dependent variable (RC). The equation demonstrates that regional competitiveness is largely determined by human capital and research-development. While in case of social capital poverty moves in a similar direction to competitiveness, it moves in inverse ratio to unemployment. This relationship also shows that regional competitiveness is really close to the field of endogenous development, since it is moved by slow spatial social processes. While the proportion of people with high qualifications may improve in a decade or two, the modification of more

characteristics of the social capital in a given case requires a time period of more generations.

Factor 1 (human capital: human development, workforce attraction and patents) *exerts the greatest influence* on regional competitiveness. This means the high standard of human capital, since in Europe the developed metropolises are generally the destinations of migration, which provide workplaces and high income. However, Factor 1 is influenced in inverse direction by the proportion of active aged people (25–64 years old) and the average weekly hours worked, probably because there are less working hours in the competitive regions, and the proportion of young and elderly people is higher.

Figure 11 Types of regions by human capital factor

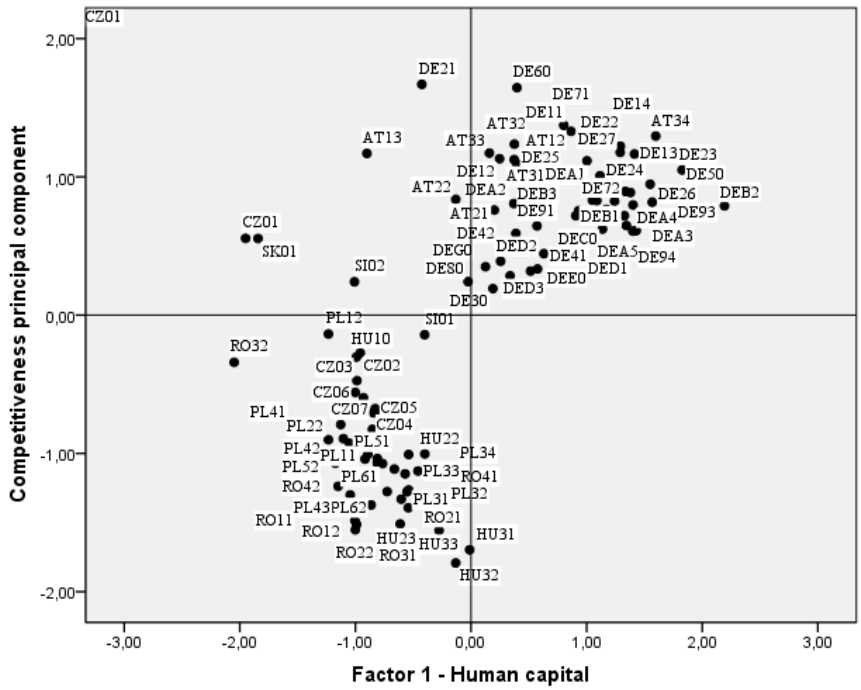


Source: Own compilation

The spatial distribution of the values of Factor 1 (human capital: human development, workforce attraction and patents) shows a west-east slope (*Figure 11*). Here, too, the German regions are at the top, but in a different way compared to that of the competitiveness principal component: almost two thirds of the German regions constitute the strongest group, especially in the western and central parts of the country. The second group also includes German and Austrian regions, while in the third group German and Austrian regions (Vienna and Carinthia) appear besides the

regions of post-socialist countries. The weakest type consists of Polish and Romanian regions, but Czech (including Prague), Slovakian (Bratislava) and the Slovenian region also belong here. It becomes also apparent that there is hardly any difference between the 7 Hungarian regions according to Factor 1, from the international point of view regional differences perceived in Hungary are less conspicuous in this indicator group. Car factories are relatively evenly distributed in the regional types according to human capital factor: in the 23 regions of the first type of strong competitiveness there are 19 car factories, in the second type's 21 regions there are 27, in the third type's 34 regions there are 30, while in the fourth type's 15 regions there are 16 factories.

Figure 12 Connection between competitiveness principal component and human capital factor

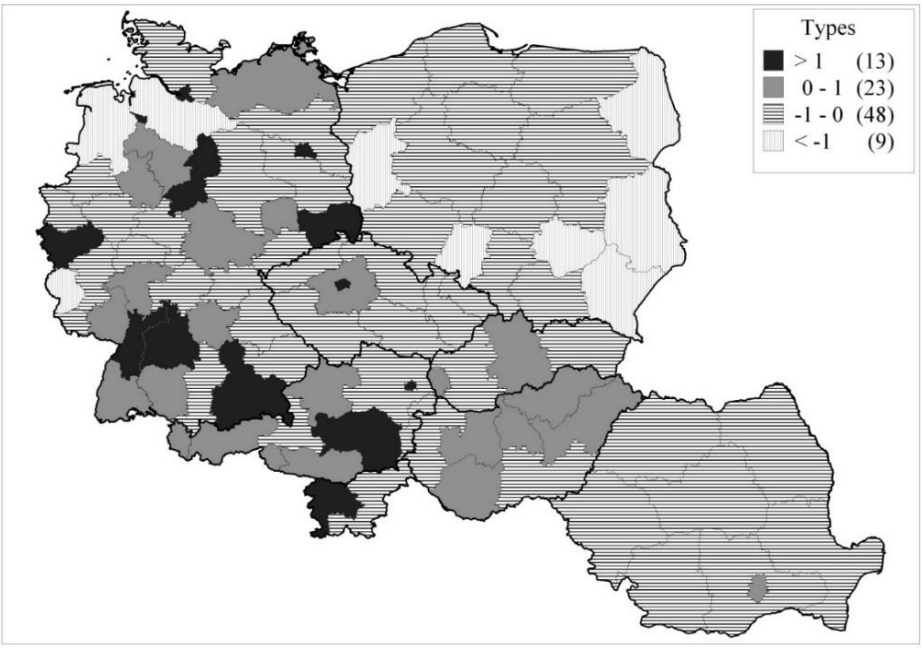


Source: Own compilation

Examining the relation between the competitiveness principal component and Factor 1 results in the delineation of two types of regions *(Figure 12).* In the right upper quarter there are only German and Austrian regions, while in the left bottom quarter there are the regions of the post-socialist countries (with the exception of a few capital regions). This also means that the previously observed two regional types, moving on two different tracks of development, detach from each other even

according to Factor 1. Considering Factor 1, the Hungarian regions are in a much better position in comparison to their revealed competitiveness, since they come directly after the German and Austrian regions. Consequently, the human factors at home are more developed than what is shown by revealed competitiveness (*Lengyel – Ságvári* 2011).

Figure 13 Types of regions by R&D factor

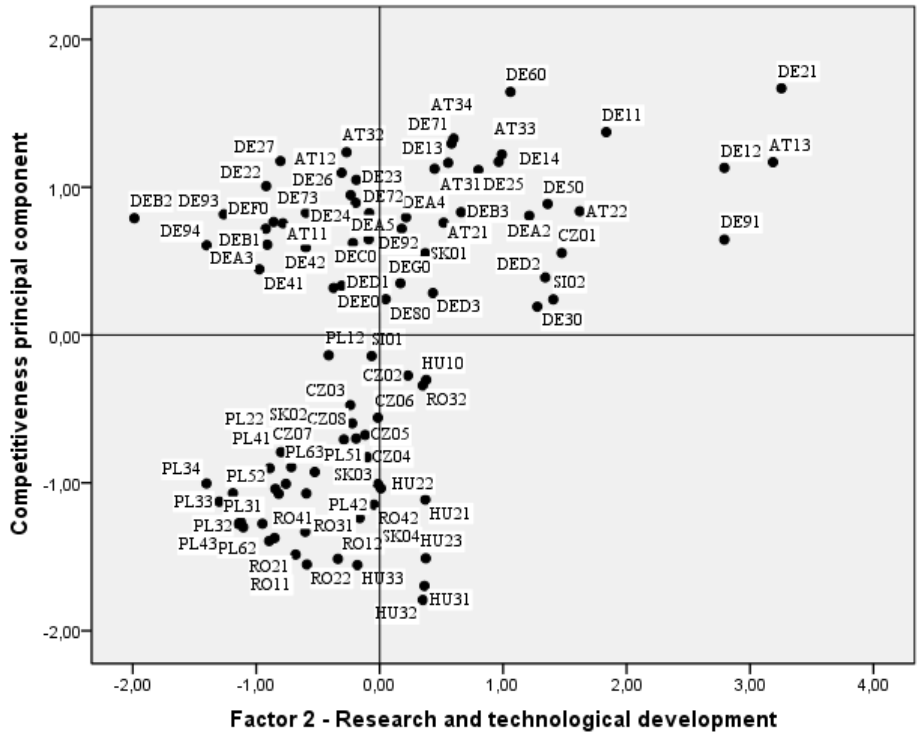


Source: Own compilation

Factor 2 also has a serious impact on regional competitiveness: assistances won from the EU research funds, gross expenses spent on R&D, the number of people employed in the high-tech sectors. It can be unequivocally stated that regional competitiveness depends largely on the magnitude of R&D, the expansion of knowledge-based, innovative economies (*Bajmócy – Szakálné Kanó* 2009). The types of regions according to the human capital factor are spatially much more dispersed than they used to be *(Figure 13).* It can be observed here as well, that the German and Austrian regions are at the top (with Prague and one Slovenian region), but they are much less in number, and form an "island", not a block. The German and Austrian regions dominate also in case of type 2, plus out of the 7 Hungarian regions 5 are listed here (together with Bucharest and Vienna), and 2 out of 4 Slovakian regions, too. The third type can be found almost consistently in all countries, while the fourth group includes Polish and German regions.

Examining the connections between the competitiveness principal component and Factor 2 results in a spatial structure slightly different than what it used to be earlier *(Figure 14)*. The German and Austrian regions of strong competitiveness are dispersed in a very wide band according to Factor 2, and part of them is even in a situation similar to the regions of the post-socialist countries. The latter regions can rather be found in a block, in the bottom left quarter. Considering the 93 regions the Hungarian regions are situated in the middle, leading the field among the post-socialist countries' regions. Consequently, considering Factor 2, the Hungarian regions are in a much better position in comparison to their revealed competitiveness, overtaking among others German and Austrian regions.

Figure 14 Connection between competitiveness principal component and R&D factor



Source: Own compilation

The investigation of the 21 factors influencing competitiveness with the help of factor analysis and regression analysis points out that human capital and research and technological development have a very serious influence on regional development. Whereas considering human capital the German and Austrian regions excel, on the basis of research and technological development more regions of the post-socialist

countries reach the middle field. According to these two factors the Hungarian regions belong to the middle field, the leading group of the post-socialist countries' regions.

8. Summaries

In our study the newest trends connected to regional competitiveness were reviewed, from which the theories of endogenous growth and development were highlighted. Nowadays these trends describe the growth and development taking place under the conditions of global competition, therefore in the course of economic development aimed at the improvement of regional competitiveness, the development of a strategy built on local characteristics, organized from below is required. Human capital and social capital constitute the most important factors, which though may be centrally encouraged, are intrinsically connected to a specific place and may be exploited locally.

The redefinition of the pyramidal model was introduced to interpret, measure the concept of regional competitiveness and demonstrate its influencing factors, in which besides human and social capital, traded sectors are also included. Multivariable statistical procedures were applied to demonstrate the correspondences, examine the database compiled from the data of the 93 regions of the 8 East-Central European countries. Due to the difficulty of obtaining international data, the database generally contains data from the years 2008 and 2007, i.e. shows the situation before the global crisis.

From the results we point out that the competitiveness of the German, Austrian and Slovenian regions is in every respect considerably stronger than that of the other countries' regions, only the capital regions may be numbered among them. Regions of strong competitiveness cluster spatially, and the regions of the following type are located in their neighbourhood, in their geographical proximity. With respect to the Hungarian regions, with the exception of Central-Hungary all the other Hungarian regions belong to the regions of the weakest competitiveness in almost every respect. Four of our regions (South-Dunántúl, North-Hungary, North-Alföld and South-Alföld) constitute a separate group, they are the lasts not only in employment, but they are of the weakest competitiveness according to the competitiveness principal component, falling behind even the Romanian and Polish regions. The situations of Central-Dunántúl and West-Dunántúl are slightly better; their competitiveness approaches that of the medium Czech regions. The spatial distribution of car factories is more or less even in the three stronger types, whereas there are few factories in the regions of the weakest competitiveness.

The results of the factor analysis and the regression analysis show that although the competitiveness of the domestic regions is weak, on the basis of human capital and R&D, the factors determining future competitiveness, there is hope for their situation to improve quickly. In other words, although both employment and labour

productivity are of a low level in the domestic regions, the network of research institutes and the preparedness of the work force would enable a significantly quicker rated economic growth. The revealed competitiveness of the Hungarian regions lags behind in comparison to the regions of the post-socialist countries, but overtakes them on the basis of the mentioned potential development factors. Consequently, the potential conditions of the improvement of regional competitiveness are given; the question is whether the national economic, regional development policy can properly take advantage of them.

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Appendix 1 Codes and names of the NUTS2 regions

Code	Regions	Code	Regions	Code	Regions
CZ01	Praha	DE94	Weser-Ems	AT34	Vorarlberg
CZ02	Střední Čechy	DEA1	Düsseldorf	PL11	Łódzkie
CZ03	Jihozápad	DEA2	Köln	PL12	Mazowieckie
CZ04	Severozápad	DEA3	Münster	PL21	Małopolskie
CZ05	Severovýchod	DEA4	Detmold	PL22	Śląskie
CZ06	Jihovýchod	DEA5	Arnsberg	PL31	Lubelskie
CZ07	Střední Morava	DEB1	Koblenz	PL32	Podkarpackie
CZ08	Moravskoslezsko	DEB2	Trier	PL33	Świętokrzyskie
DE11	Stuttgart	DEB3	Rheinhessen-Pfalz	PL34	Podlaskie
DE12	Karlsruhe	DEC0	Saarland	PL41	Wielkopolskie
DE13	Freiburg	DED1	Chemnitz	PL42	Zachodniopomorskie
DE14	Tübingen	DED2	Dresden	PL43	Lubuskie
DE21	Oberbayern	DED3	Leipzig	PL51	Dolnośląskie
DE22	Niederbayern	DEE0	Sachsen-Anhalt	PL52	Opolskie
DE23	Oberpfalz	DEF0	Schleswig-Holstein	PL61	Kujawsko-Pomorskie
DE24	Oberfranken	DEG0	Thüringen	PL62	Warmińsko-Mazurskie
DE25	Mittelfranken	HU10	Közép-Magyarország	PL63	Pomorskie
DE26	Unterfranken	HU21	Közép-Dunántúl	RO11	Nord-Vest
DE27	Schwaben	HU22	Nyugat-Dunántúl	RO12	Centru
DE30	Berlin	HU23	Dél-Dunántúl	RO21	Nord-Est
DE41	Brandenburg - Nordost	HU31	Észak-Magyarország	RO22	Sud-Est
DE42	Brandenburg - Südwest	HU32	Észak-Alföld	RO31	Sud - Muntenia
DE50	Bremen	HU33	Dél-Alföld	RO32	Bucureşti - Ilfov
DE60	Hamburg	AT11	Burgenland (A)	RO41	Sud-Vest Oltenia
DE71	Darmstadt	AT12	Niederösterreich	RO42	Vest
DE72	Gießen	AT13	Wien	SI01	Vzhodna Slovenija
DE73	Kassel	AT21	Kärnten	SI02	Zahodna Slovenija
DE80	Mecklenburg-Vorpommern	AT22	Steiermark	SK01	Bratislavský kraj
DE91	Braunschweig	AT31	Oberösterreich	SK02	Západné Slovensko
DE92	Hannover	AT32	Salzburg	SK03	Stredné Slovensko
DE93	Lüneburg	AT33	Tirol	SK04	Východné Slovensko

7. Competitiveveness of the Counties in Transition Economies: The Case of the Visegrad Post-socialist Countries*

Imre LENGYEL

During the last few years research in regional economics has shown an eager interest in regional competitiveness. Increasingly, the aims of policy have also focused on improving regional competitiveness. The notion of regional competitiveness can be seen as defining that of economic growth. However, one can often observe that proposals for improved competitiveness combine traditional economic policy means derived from endogenous growth theories with regional policies, primarily place-based economic development strategies. Thus, there is a great need for synthesizing regional competitiveness and endogenous growth theories and also providing an empirical framework for policy-oriented analyses.

This paper first provides an overview about the definition and distinct interpretation frames of regional competitiveness. In a next step, we focus on the models of competitiveness and propose a renewed pyramid model of regional competitiveness as a synthesis of endogenous regional growth theories. In the empirical application, we are going to analyze the competitiveness of 93 NUTS3 level regions of 4 Central European countries (Czech Republic, Hungary, Poland, Slovakia) with the help of the pyramid model and regional competitiveness function based on this model. In my opinion, it has become a research question of outstanding importance in the Central European post-socialist countries, because there is a certain gap within the European Union between former members and countries joining in 2004.

Keywords: pyramid model, regional competitiveness function, uncompetitive regions

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1. Introduction

Competitiveness has today become a widely used and popular concept as one of the consequences of globalization processes. It signifies the inclination and skill to compete, and the ability to gain and permanently maintain position in the competition, which is indicated primarily by successfulness (measured in some way) and the ability to succeed. The competitiveness of countries or regions refers to successes to date, as

well as to recent economic growth, and also envisions the ability to develop in the near future. Competitiveness has become the favourite term not only of academic studies but also of regional political documents. Due to its broad theoretical and economic policy background, various approaches have emerged on the concept and interpretation of competitiveness (Annoni and Dijkstra, 2013; Bristow, 2010; Camagni, 2002; Gardiner et al., 2004; Huggins et al., 2013).

From an economic point of view, the competitiveness of territorial units – that is, countries and regions – can be measured by their total factor productivity (Krugman, 1994). Porter (2008, pp. xiii–xiv) states that 'competitiveness arises from the productivity with which firms in a location can use inputs to produce valuable goods and services. The productivity and prosperity possible in a given location depend not on what industries its firms compete in, but how they compete'.

In regional studies it is generally accepted that the competitiveness of regions and cities is more than the productivity of inputs. It essentially incorporates regional economic development, as a result of which the average standard of living in the region improves (Camagni and Capello, 2010; Huggins et al., 2014; Malecki, 2002; Zenka et al., 2014). Competitiveness of regions and cities may be described by the widely recognized definition of Storper (1997, p. 20): 'The ability of an (urban) economy to attract and maintain firms with stable or rising market shares in an activity while maintaining or increasing standards of living for those who participate in it'. The European Competitiveness Reports also adopt this approach (European Commission, 2008, p. 15): 'competitiveness is understood to mean a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment as possible'.

The regional competitiveness approach is characterized as being a 'dual concept' (Huggins et al., 2014, p. 28), 'that explains relative differences in rates of economic development across regions, as well as an understanding of the future economic growth trajectories of regions at a similar stage of economic development'. According to endogenous growth theories, the present and future level of the knowledge base, research and development (R&D), innovation milieu, clusters and networks, human capital, trust, and so on are crucial in the improvement of regional competitiveness.

The theoretical and practical studies dealing with the investigation of regional competitiveness can be classified under three main topics, which are built upon one other in an integrated, complex approach to competitiveness (Barkley, 2008; Lengyel and Szakálné Kanó, 2012): (1) How can we define competitiveness and the factors that influence it (conceptualization)? (2) By what indicators can competitiveness and its factors be measured (operationalization)? (3) How can regional competitiveness be improved (regional policy)?

Based on the literature discussed above, the acknowledged schools concerned with the competitiveness of regions consider competitiveness as sustained economic growth which also takes account of the social and ecological factors of development in some way. It may be concluded that competitiveness exceeds the common

interpretation of economic growth, incorporating some main endogenous features of social progress and sustainable development, but still holding a more economic perspective. The standard understanding of regional competitiveness is: economic growth which derives both from the improvement of labour productivity and the high level of employment, and in which growth improves the standard of living and well-being of the region's population. Competitiveness and its causes in transition economies have become a research question of outstanding importance in the Central European post-socialist countries, because there is a considerable gap within the European Union between longer-term members and those countries joining in 2004.

In section 2 this chapter provides an overview of the definition and distinct frames of interpretation of regional competitiveness. As a next step, it focuses on the models of competitiveness and proposes a renewed pyramid model of regional competitiveness as a synthesis of endogenous regional growth theories. In an empirical application, the chapter analyses the competitiveness of 93 Nomenclature of Units for Territorial Statistics (NUTS) 3 level regions of four Central European countries (the Czech Republic, Hungary, Poland and Slovakia) with the help of the pyramid model and a regional competitiveness function based on this model. The data and methods used are laid out in section 3. Section 4 presents the results of this analysis. The conclusions of the chapter are then outlined in section 5.

2. Regional endogenous growth and competitiveness

Since the notion of regional competitiveness can be seen as refining that of sustainable economic development, it can often be observed that proposals for improved competitiveness combine traditional means of endogenous growth with strategies based on regional policies. There are a number of attempts to define the model of regional competitiveness (Aiginger et al., 2013; Huggins, 2003; Gardiner et al., 2004; Porter, 2007). Studying the elements of economic growth, Porter (2007) interpreted the factors affecting the quality of life, standard of living and welfare. The population's welfare, as the objective of the improvement of competitiveness, is dependent upon the income per capita, which is determined by labour productivity and the utilization of the workforce (essentially, employment).

Kitson et al. (2004) also measure regional competiveness using the three related indicators: productivity, employment and standard of living. According to the authors, competitiveness is influenced by both hard and soft elements. The hard elements consist of measurable economic, demographic, infrastructural and other factors, while soft elements are associated with quality aspects and other hard-to-measure characteristics. In systematizing the sources of a region's competitive advantages they highlight six factors, in case of which the frame of interpretation is provided by the concept of 'capital': productive capital, human capital, social-institutional capital, cultural capital, infrastructural capital, and intellectual and creative capital.

Stimson et al. (2009) suggest a new conceptual model framework for regional endogenous development, where the dependent variable is measured by two indicators: the change of employment or income, and the changing of the employment-based location quotient (LQ). Explanatory variables include the availability of resources, estimated by 13 indicators; and market fit, measured by four indicators. In addition the model incorporates further indicators to consider the quality of leadership, institutions and entrepreneurship as well.

Aiginger (2006) defines competitiveness as 'the ability of a country or location to create welfare' (p. 161). He classifies two types of approaches to the measurement and conceptualization of competitiveness: outcome (output) evaluation and process evaluation. Outcome competitiveness, as a sort of welfare function, can be traced back to three factors: income per capita, a set of social and distributional indicators and a set of ecological indicators. While the factors of process competitiveness are: physical capital (*K*), labour (*L*), technical progress (*TFP*), capabilities (*C*), institutions (*I*) and trust (*T*). He proposes a four-level method to measure and operationalize competiveness.

Huggins and Thompson (2013) compiled a three-factor model to prepare the United Kingdom Local Competitiveness Index, which differentiates between input, output and outcome factors. Input factors include economic activity rates, business start-up rates, number of businesses per capita, proportion of working-age population with NVQ Level 4 or higher, and proportion of knowledge-based businesses. Output factors relate to how these inputs are used to generate economic outputs captured by gross value added (GVA) per head at current basic prices, labour productivity and employment rates. The final group, outcome factors, are those associated with the standard of living benefits felt by the population through gross weekly pay and unemployment rates.

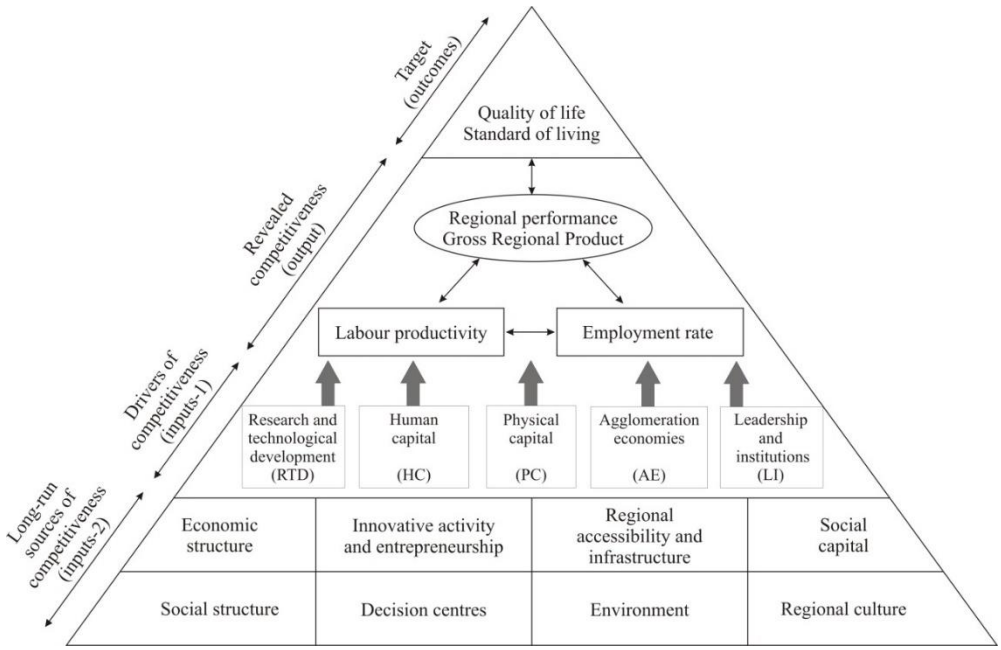
In the case of the World Competitiveness Index of Regions (WCIR) for the inputs Huggins et al. (2014) classify fourth-wave (employment in automotive and mechanical engineering, number of managers, per capita expenditures on R&D, and so on) and fifth-wave (employment in infirmation technology and computer manufacturing, employment in biotechnology and chemicals, and so on) knowledge capital.

The original pyramid model of regional development and competitiveness seeks to provide a systematic account of the standard means of competitiveness and to describe the drivers of improved competitiveness (Lengyel, 2004, 2009; Lengyel and Rechnitzer, 2013a). This model has been adopted by many scholars (Gardiner et al., 2004; Komlósi and Fujii, 2012; Parkinson et al., 2006; Thissen et al., 2013), since 'this model is useful to inform the development of the determinants of economic viability and self-containment for geographical economies' (Pike et al., 2006a, p. 26). As can be perceived in the pyramid model, 'more recent analytical review[s] [have] sought to identify the interrelated factors that drive competitiveness' (Pike et al., 2006b, p. 112).

The renewed pyramid model is established on the basis of the inputs–outputs–outcomes relationships, similarly to three-factor models (Figure 1):

- *Outcomes* are the standard of living, the prosperity and well-being.
- *Outputs* are the revealed competitiveness indicators (*ex post* indicators): labour productivity, employment rate, and so on.
- *Inputs-1* are drivers of competitiveness with a direct and short-term influence on economic output; in the renewed pyramid model there are five categories (*ex ante* indicators).
- *Inputs-2* are long-run sources of competitiveness with an indirect impact on outputs and inputs-1; in the renewed pyramid model there are two levels with eight categories.

Figure 1 The renewed pyramid model of regional competitiveness



Source: Based on Lengyel (2000, 2004, 2009) and Gardiner et al. (2004)

In order to investigate the relations between output indicators of revealed competitiveness (RC) and drivers of competitiveness (inputs-1), we intend to introduce the regional competitiveness function (RCF):

$$RC = \mathrm{f}\,(RTD, HC, PC, AE, LI)$$

where *RTD* is the research and technological development (technical process); *HC* is human capital (labour); *PC* is physical capital; *AE* are agglomeration economies

(and regional specialization); and *LI* represents leadership and institutions. To test the RCF, we first calculated the value of revealed competitiveness (outputs); afterwards we analysed it with multivariate linear regression to determine to what extent drivers of competitiveness (inputs-1) are able to explain the value of revealed competitiveness. Our multivariate linear regression model:

$$RC = \beta 0 + \beta 1\ RTD + \beta 2\ HC + \beta 3\ PC + \beta 4\ AE + \beta 5\ LI + \varepsilon$$

The basic premise of the pyramid model is that we assume that there is a relationship between inputs-1 and outputs (revealed competitiveness). The *RCF* is an extension of regional growth concepts from the latest work on endogenous growth research. The traditional factors of endogenous growth theories are involved in the model: capital (*PC* as *K*), labour (*HC* as *L*) and technical progress (*RTD* as *TFP*). Moreover, agglomeration economies (*AE* and regional specialization), emphasized by smart specialization strategies are also included in the renewed pyramid model's inputs, and leadership and institutional effects (*LI*) emphasized by new endogenous development theories (Huggins et al., 2013).

3. Database and methodology

This chapter tests the renewed pyramid model; at the same time we analyse the competitiveness of the regions of four countries: the Czech Republic, Hungary, Poland and Slovakia. These four post-socialist countries joined the European Union in 2004; they have similar economic structures resulting from their history and geographical proximity. Besides testing the pyramid model, our research aims to classify the regions by type based on their competitiveness and analyse the factors forming the particular types. Regional competitiveness studies tend to be relative: that is, we mostly compare the competitiveness of the chosen regions to each other.

We have selected the county – that is, the NUTS 3 level – as the territorial unit of our study. In the Eastern and Central European countries motorway networks have been only partially constructed. This means that urbanization processes are also belated compared to Western European countries. This means that the NUTS 3 territorial level is closer to the actual spatial structure of the economy than NUTS 2 regions. In all four countries the capital cities constitute a separate county, which we handle collectively with the neighbouring counties representing their agglomeration, but we also combine seven further urban counties of Poland (Appendix 1).

Thus the chapter analyses 13 counties in the Czech Republic, 19 counties in Hungary, 54 counties in Poland (Nowicki, 2012) and seven counties in Slovakia, giving 93 counties in total. The average population of the developed territorial units is 690 000 people, the smallest county has a population of 200 000, while the largest has a population of 3 280 000.

We analyse the three levels of the pyramid model and their relations, similarly to the three-factor regional competitiveness framework of Huggins et al. (2013) (Appendix 2). Outcomes are measured with three indicators: disposable income per capita (*DI*), the unemployment rate (*UR*) and GDP per capita, in purchasing power standard (PPS) (*GP*). In order to define a common outcomes index principal component analysis is utilized. The common index contains 67.6 per cent of the information from the three indexes (KMO test 0.486; components: *DI* 0.83; *UR* – 0.672; *GP* 0.942).

The outputs (revealed competitiveness) are measured utilizing three indicators: labour productivity (*LP*), employment rates (*ER*) and gross value added (*GVA*) per capita (GA), measured in euros. Again principal component analysis is used to develop a common output index. It contains 75 per cent of the information from the three indexes (KMO test 0.425; components: *LP* 0.851; *ER* 0.754; *GA* 0.977).

The RCF refers to the connection between the output as the dependent variable and the indicators of input-1 as explanatory variables. In the renewed pyramid model we distinguish five input-1 factors. For four of the input-1 factors relevant data are available in all four countries, allowing them to be captured in a comparable manner. In order to measure the drivers of competitiveness we used several indicators for each input-1 factor. An overall factor measure was generated for each using principal component analysis.

The RTD principal component, research and technological development (technical process), uses two indicators: patent applications to the European Patent Office (EPO), and the presence of research employment. It compresses 79 per cent of the information of the two indicators (KMO test 0.51; components: 0.89). The HC principal component, human capital (labour) again is based on two indicators, students in higher education institutes, and the proportion of the population with tertiary education. It contains 85 per cent of the information of the two indicators (KMO test 0.51; components: 0.919). The PC principal component, physical capital, is based on a single indicator, gross fixed capital formation. The AE principal component, agglomeration economies (and regional specialization), uses three indicators: population density, share of town population and GVA per capita in PPS. It compresses 62.4 per cent of the information of the three indicators (KMO test 0.666; components in order: 0.76, 0.814 and 0.794).

The above-mentioned four principal component factors as explanatory variables were used in multivariate linear regression, where *RC* was considered a dependent variable. The estimated relationship is given by (heteroskedasticity-robust standard errors in parentheses):

$$RC_i = +\,0.279\,RTD_i - 0.091\,HC_i + 0.193\,PC_i + 0.618\,AE_i + e_i.$$
$$\qquad\quad (0.086) \qquad (0.085) \qquad (0.012) \qquad (0.059)$$

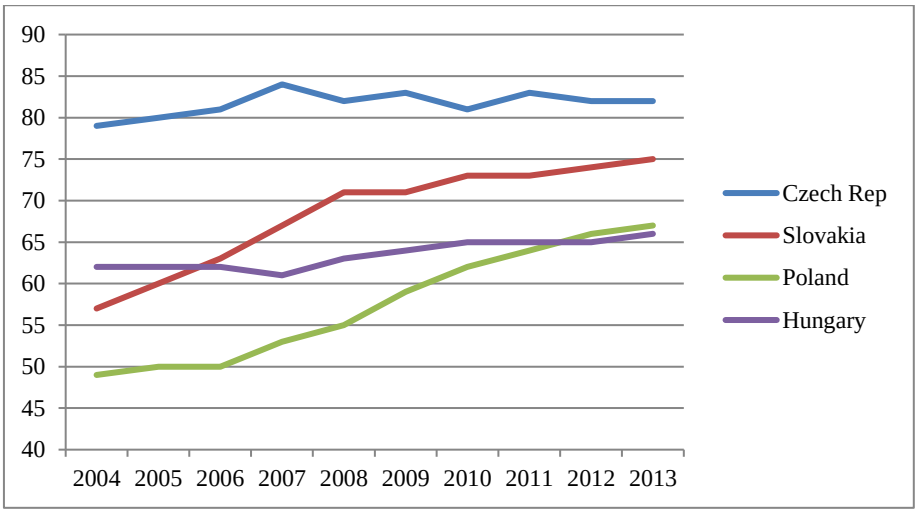
The model meets the standard regression assumptions with residuals following a normal distribution (Doornik–Hansen test, p-value = 0.151); variables are free of multicollinearity, so that the variance inflation factors (VIF) are all less than 2.5; and it fulfils linearity and specification tests (with p-values of 0.197 and 0.700).

In the counties of the four examined countries, the revealed competitiveness is influenced substantially by two inputs: agglomeration economies, and research and development. Evidently other factors may also have a significant effect on the competitiveness of counties, not only the factors based on the pyramid model; for example, the migration of young graduates to Western Europe, the economic policy of each country (budget deficits, indebtedness, and so on), their monetary policy (out of the four studied countries, only Slovakia is a member of the eurozone), and their regional development policy.

4. Empirical results

In these post-socialist countries the competitiveness of regions is strongly influenced by the economic performance of the national economies as a whole, and changes in this (Lengyel and Leydesdorff, 2011; Lengyel and Rechnitzer, 2013b; Nevima, 2012). The gros domestic product (GDP) per inhabitant of the four countries has evolved differently from 2004 onwards, following accession to the European Union (EU). The economies of two countries have grown dynamically, and those of the other two countries have displayed relative stagnation (Figure 2).

Figure 2 GDP per capita, PPS, per cent (EU28=100)

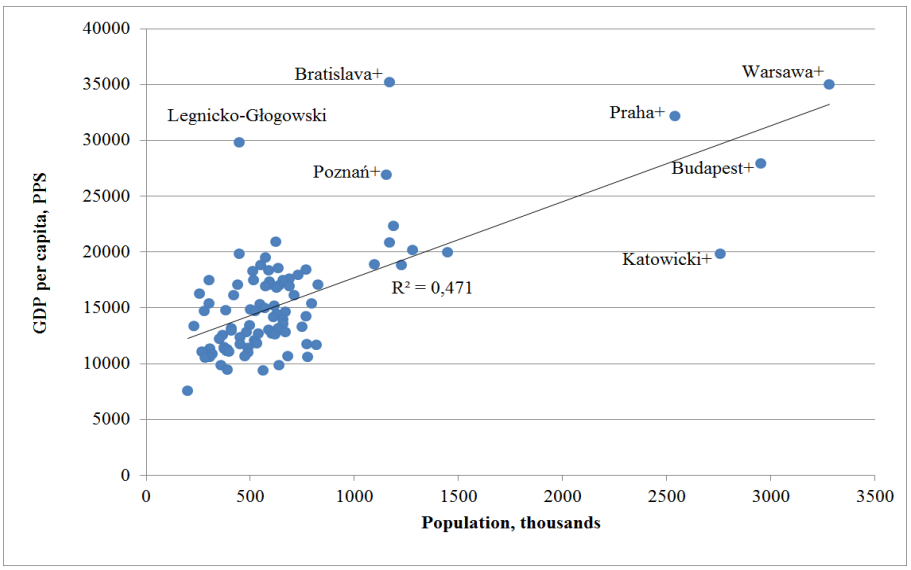


Source: Eurostat, table_tec00114

The relative positions of the Czech Republic and Hungary within the EU have hardly changed over almost a decade; that is, substantive convergence has not taken place. The Czech GDP per capita has fluctuated at between 80 and 85 per cent of the EU average, while the Hungarian economy has always remained within the limits of 62–66 per cent of the EU average. On the other hand, Slovakian and Polish economic output over this period has increased dynamically, by 20–25 percentage points, thereby the earlier differences between the four countries decreased by 2013. The different development trajectories can be explained by economic policy differences, but also the efficiency of the grants arriving from the EU Structural Funds in improving and serving the regional competitiveness has differed greatly.

The economic output of regions is also affected by the settlement structure of the countries. Institutions and service provider organizations within national networks are generally concentrated in metropolitan regions, exploiting agglomeration economies (Figure 3). The economic output of the 12 city regions with a population of at least 1 million is outstanding. At the same time, the economic performance of the remaining 80 regions is much weaker (Legnicko-Głogowski is an outlier). They constitute a distinct group with a population of 200 000–800 000 and output per capita of €10 000–€20 000 (PPS GDP per capita). This represents between 40 and 75 per cent of the €26 600 PPS EU-28 average. These regions are essentially the regions in need of the EU's convergence support. Only six counties have unit output above the EU-28 average: the four capital counties and two additional Polish counties (Poznan and Legnicko-Głogowski).

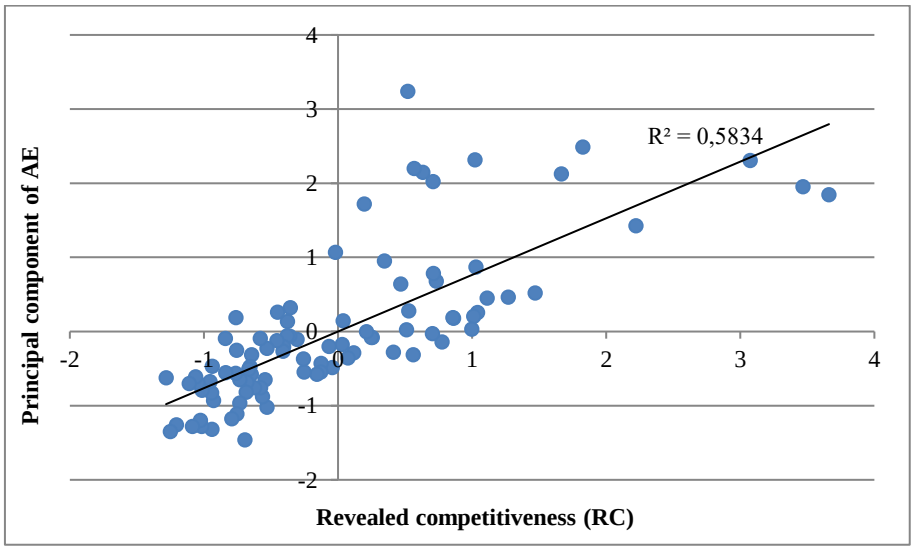
Figure 3 GDP per capita (PPS) and population of counties, 2012



Analysis is conducted with regard to the competitiveness of counties, relying on the pyramid model, on the basis of the principal components of the different index groups of inputs-1. The statistical explanatory power of the principal component calculated based on the outcomes indexes is not strong enough, however, we consider that the revealed competitiveness (RC) principal component calculated based on the output can be taken as the basis for further analyses.

The regression analysis indicated that the RC is actively affected by the principal component of agglomeration economies (AE factor), which can be captured by the size of the population and spatial concentration of the regions (Figure 4). It is indeed observable that the larger regions have higher RC values, but the size of this correlation can only be considered medium (linear correlation 0.76). However, it can be stated categorically that in the counties with lower RC the agglomeration effects are also low.

Figure 4 Revealed competitiveness (RC) and principal component of AE

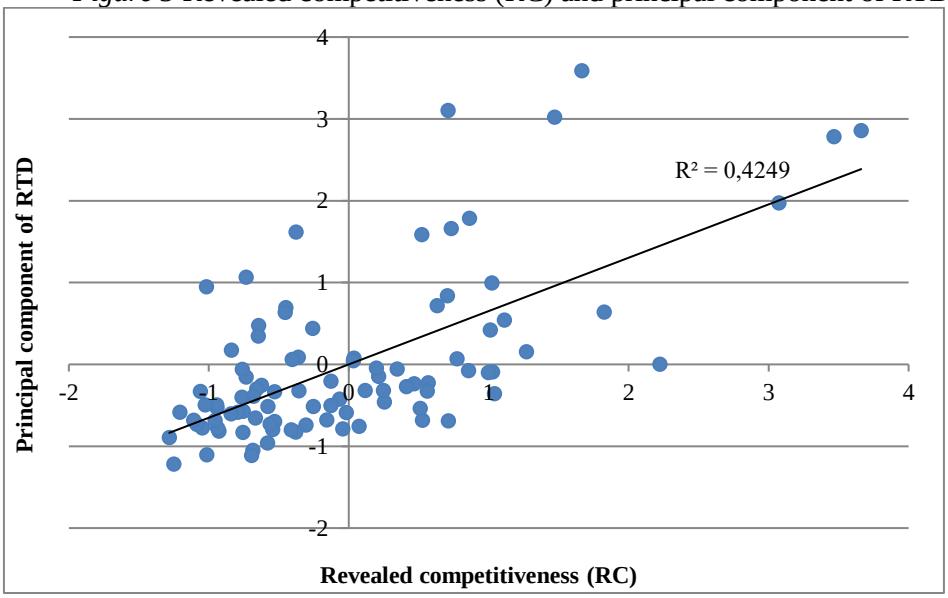


In the regression analysis the other relevant explanatory variable was research and development (RTD) (Figure 5). In this case the correlation with RC is lower (linear correlation 0.65), patenting activity is found in counties with weaker competitiveness and there remains employment in R&D within these regions, probably due to the researchers in higher education. It also shows that the more competitive counties are also characterized by stronger research and development activity.

Based on the RC values we categorized the counties in four groups (Figure 6): (1) strong competitive counties, of which there are 14 such counties: eight Czech counties, the other three capital counties and three more Polish metropolitan regions;

(2) rising competitive counties are those counties connected to metropolitan regions, close to the German and Austrian markets; there are 24 counties in this group of which five are Czech, four are Slovakian, five are Hungarian, and ten are Polish; (3) weak competitive counties include two Slovakian, nine Hungarian and 20 Polish counties; (4) uncompetitive rural counties account for the remaining four Hungarian and 20 Polish counties.

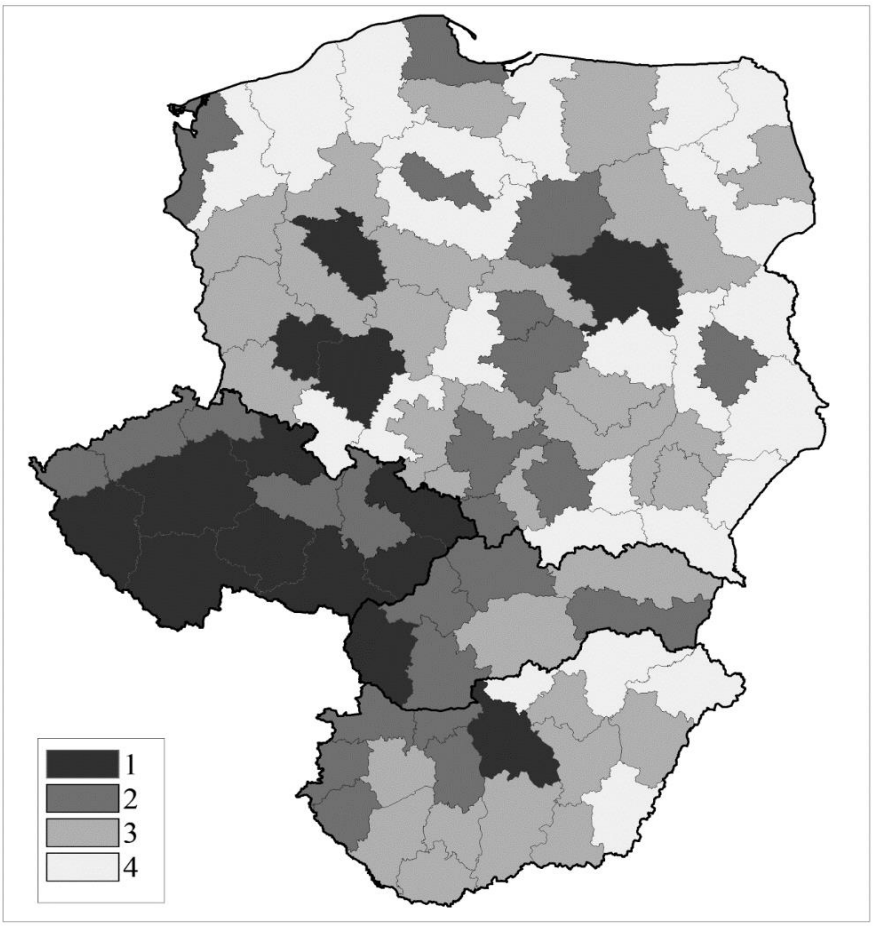
Figure 5 Revealed competitiveness (RC) and principal component of RTD



The competitiveness types of counties are also organized spatially, along a west–east gradient, with the exception of Poland, where the more competitive regions are located in a more mosaic-like pattern. It is probable that the competitive economy first emerged in the metropolitan growth poles in the rapidly expanding Polish economy. With the exception of the Polish border, there are counties with similar competitiveness level on the borders of the other three countries. This can be contrasted with an outcome measure: unemployment.

The unemployment rate is increasingly higher towards the east, in addition to those Polish counties which are located in the northern and border regions of the country (Figure 7). It can also be observed that in the Czech, Slovakian and Hungarian counties close to the Austrian border the unemployment rate is low, while it is high in the eastern Slovakian counties relatively distant from the Austrian border. It should be noted that the metropolitan regions of the Czech, Slovakian and Hungarian capitals are located close to the western part of the country, and there are no metropolitan cities in the eastern part of these countries.

Figure 6 Types of counties by revealed competitiveness (RC)

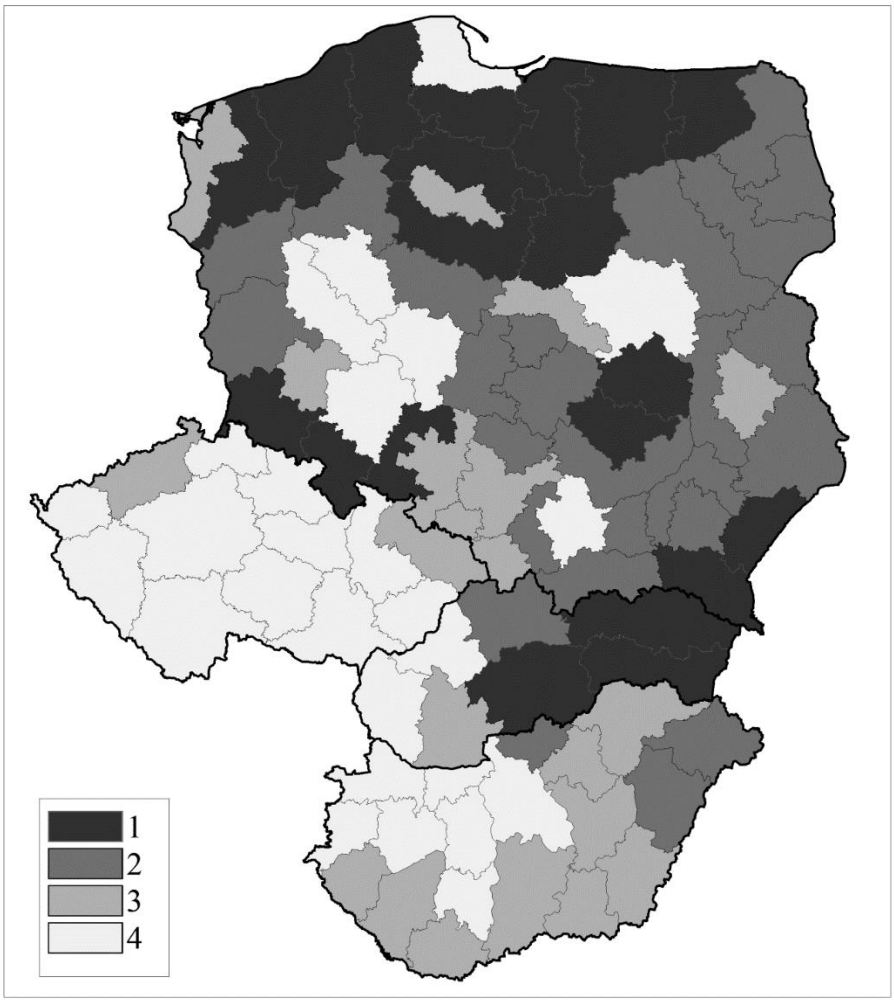


Note: 1= strong; 2= rising; 3= weak, 4= uncompetitive

The four types developed based on the RC are also distinct according to the indexes related to the levels of the pyramid model. According to Michael Porter's competitive development stages theory (Annoni and Dijkstra, 2013; Porter 1990), the four types are characterized as summarized in Table 1, and discussed in more detail below:

1. *Strong competitive counties* (14 counties), as potential innovation-driven regions. Incomes are much higher than the average of the four countries, such that the GDP per capita is almost one and a half times the average level. The employment rate and labour productivity, as well as the proportion of graduates and researchers, are also high. Many people study in these counties' universities. In these regions unemployment is low, the population is high and increasing, and the proportion of people employed in services and industry is high.

Figure 7 Unemployment rates of counties, 2013



Note: 1= - > 17.0%; 2= 16.9-13.5%, 3= 13.4-10.0%, 4= - < 9.9%

2. *Rising competitive counties* (24 counties), as efficiency-driven regions. Incomes, the unit GDP, labour productivity, employment rate, number of patents, and proportion of graduates and researchers are only slightly above the average of the four countries. The unemployment rate is also found to be high. The population of the counties is around the average for these countries and slightly decreasing over time. The proportion of people employed in manufacturing sectors is high.
3. *Weak competitive counties* (31 counties), as transitioning from resource-driven to efficiency-driven regions. Incomes, the unit GDP, labour productivity,

employment rate, number of patents, proportion of graduates and researchers are slightly lagging the average of the four countries. The unemployment rate is high, whilst the population of the counties is around the average and decreasing at a rapid pace. In these counties the proportion of the population employed in agriculture and manufacturing sectors is high

Table 1 Main indicators of counties by competitiveness types

Indicator	Unit	Total	Strong	Rising	Weak	Uncomp
Disposable income of households per capita	thousand PPS per capita, 2013	8.5	9.5	8.8	8.4	7.7
GDP per capita	thousand PPS per capita, 2012	15.6	24.4	17.6	13.5	11.1
Unemployment rate	%, 2013	13.4	8.2	11.0	13.9	18.1
Employment rate	%, 2013	57.0	68.8	60.8	54.0	50.0
Labour productivity	thousand GDP per capita, PPS, 2012	41.1	53.5	43.7	38.4	34.9
Population	thousand persons, 2013	687.1	1285.0	744.3	527.3	487.4
Population change	%, 2011/2001	98.4	102.9	99.8	97.2	96.0
Patent, EPO	per 100 thousands persons	2.3	4.3	2.9	1.6	1.4
Researchers	%, 2013	0.4	0.7	0.4	0.3	0.3
Qualified employees	tertiary education, %, 2013	17.1	19.9	17.8	16.6	15.5
Students	per thousand persons	24.7	45.9	33.9	20.5	8.5
Employed in agriculture	%, 2013	14.3	4.1	6.9	15.7	25.9
Employed in industry	%, 2013	30.5	33.8	34.3	30.0	25.3
Employed in services	%, 2013	55.2	62.0	58.7	54.4	48.9

Note: See details of indicators in Appendix 1.

4. *Uncompetitive counties* (24 counties), as resource-driven rural regions. Incomes, the unit GDP, labour productivity, employment rate, number of patents, proportion of graduates and researchers significantly lag behind the average of the four countries. The unemployment rate is high, the population of the counties is around the average and rapidly decreasing. The proportion of people employed in agriculture is high.</list>

5. Conclusions

This chapter has studied the relative competitiveness of the counties at the NUTS 3 territorial level in four Central and Eastern European post-socialist countries based on the renewed pyramid model of regional competitiveness. The pyramid model, in a similar fashion to the three-factor model, follows the inputs–outputs–outcomes logistical framework. The renewed process of the model aimed to incorporate the new findings of regional endogenous growth theories, thereby including the agglomeration economies signifying spatial concentration.

The empirical study used relevant data to represent the majority of the model elements. In the model testing process indexes were developed from the connected indexes applying principal component analysis, of which the revealed competitiveness (RC) index expressing output meets the statistical requirements. The relations between the RC index and the inputs was expressed by a regional competitiveness function (RCF). This function was tested with regression analysis; thereby it could be shown that the revealed competitiveness is affected by research and technological development, as well as agglomeration economies in a statistically verifiable way.

Based on the RC, four types of the counties were differentiated according to their competitiveness. These types can also be described in accordance with Michael Porter's typology: strong competitive counties, as potential innovation-driven regions (metropolitan city-regions); rising competitive counties, as efficiency-driven regions (with strong manufacturing sectors); weak competitive counties, as transitioning from resource-driven to efficiency-driven regions; and uncompetitive counties, as resource-driven rural regions.

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Appendix 1

Codes and names of the NUTS 3 regions (counties)

Code	Counties	Code	Counties
CZ010	Praha+ Středočeský	PL22A	Katowicki+ Bytomski+ Gliwicki + Sosnowiecki+ Tyski
CZ031	Jihočeský	PL311	Bialski
CZ032	Plzeňský	PL312	Chełmsko-zamojski
CZ041	Karlovarský	PL314	Lubelski
CZ042	Ústecký	PL315	Puławski
CZ051	Liberecký	PL323	Krośnieński
CZ052	Královéhradecký	PL324	Przemyski
CZ053	Pardubický	PL325	Rzeszowski
CZ063	Vysočina	PL326	Tarnobrzeski
CZ064	Jihomoravský	PL331	Kielecki
CZ071	Olomoucký	PL332	Sandomiersko-jędrzejowski
CZ072	Zlínský	PL343	Białostocki
CZ080	Moravskoslezský	PL344	Łomżyński
HU101	Budapest+ Pest	PL345	Suwalski
HU211	Fejér	PL411	Pilski
HU212	Komárom-Esztergom	PL414	Koniński
HU213	Veszprém	PL415	M. Poznań+ Poznański
HU221	Győr-Moson-Sopron	PL416	Kaliski
HU222	Vas	PL417	Leszczyński
HU223	Zala	PL422	Koszaliński
HU231	Baranya	PL423	Stargardzki
HU232	Somogy	PL424	M. Szczecin+ Szczeciński
HU233	Tolna	PL431	Gorzowski
HU311	Borsod-Abaúj-Zemplén	PL432	Zielonogórski
HU312	Heves	PL514	M. Wrocław+ Wrocławski
HU313	Nógrád	PL515	Jeleniogórski
HU321	Hajdú-Bihar	PL516	Legnicko-Głogowski
HU322	Jász-Nagykun-Szolnok	PL517	Wałbrzyski
HU323	Szabolcs-Szatmár-Bereg	PL521	Nyski
HU331	Bács-Kiskun	PL522	Opolski
HU332	Békés	PL613	Bydgosko-Toruński
HU333	Csongrád	PL614	Grudziądzki
PL113	M. Łódź+Lódzki	PL615	Włocławski
PL115	Piotrkowski	PL621	Elbląski
PL116	Sieradzki	PL622	Olsztyński
PL117	Skierniewicki	PL623	Ełcki
PL121	Ciechanowsko-płocki	PL631	Słupski
PL122	Ostrołęcko-siedlecki	PL633	Trójmiejski+ Gdański
PL127	M. Warszawa+ Warszawski-wschodni+ Warszawski-zachodni	PL635	Starogardzki
PL128	Radomski	SK010	Bratislavský+ Trnavský
PL213	M. Kraków+ Krakowski	SK022	Trenčiansky
PL215	Nowosądecki	SK023	Nitriansky
PL216	Oświęcimski	SK031	Žilinský
PL217	Tarnowski	SK032	Banskobystrický
PL224	Częstochowski	SK041	Prešovský
PL225	Bielski	SK042	Košický
PL227	Rybnicki		

Appendix 2

Indicators of empirical analysis by renewed pyramid model

Indicators of outcomes		
Name	Denomination	Source
Disposable income per capita, DI	Real adjusted gross disposable income of households per capita (recalculated by wages of counties), PPS, 2013	Eurostat, Statistical Office of V4 Countries
Unemployment rate, UR	Registered unemployment rate of age group 15–64, %, 2013	Statistical Office of V4 Countries
GDP per capita, GP	GDP at current market prices by NUTS 3 regions [*nama_10r_3gdp*], recalculated by PPS, 2012, and Population on 1 January by broad age group, sex and NUTS 3 region [*demo_r_pjanaggr3*], 2012	Eurostat
Indicators of outputs		
Name	Denomination	Source
Labour productivity, LP	Gross domestic product (GDP) at current market prices by NUTS 3 regions [*nama_10r_3gdp*], million euro, 2012, and employed persons, 2012	Eurostat, Statistical Office of V4 Countries
Employment rate, ER	Employment rate of age group 15–64, %, 2013	Statistical Office of V4 Countries
Gross value added (GVA) per capita, euro, GA	Gross value added at basic prices by NUTS 3 regions [*nama_10r_3gva*], 2012, million euro, and Population on 1 January by broad age group, sex and NUTS 3 region [*demo_r_pjanaggr3*], 2012	Eurostat
Indicators of inputs-1		
Research and technological development, RTD		
Name	Denomination	Source
Patent applications to the EPO	Patent applications to the EPO by priority year by NUTS 3 regions [*pat_ep_rtot*], 2010+ 2011+ 2012 per 100 000 persons	Eurostat
Researchers	Percentage of employed persons, %, 2013	Statistical Office of V4 Countries
Human capital (labour), HC		
Name	Denomination	Source
Students	Students of higher education institutes, full-time, per thousand population, 2013	Statistical Office of V4 Countries
Qualified population with tertiary education	Population by educational attainment (according to the LFSS), 15+ years, %, 2013	Statistical Office of V4 Countries
Physical capital, PC		
Name	Denomination	Source
Gross fixed capital formation	Gross fixed capital formation (GFCF, formerly gross domestic fixed investment), 2010+ 2011 +2012 in per cent of GDP, %	Statistical Office of V4 Countries
Agglomeration economies (and regional specialization), AE		
Name	Denomination	Source
Population density	Population density, persons/km^2, 2013	Statistical Office of V4 Countries
Share of town population	Share of town population, %, 2013	Statistical Office of V4 Countries
GVA per capita, PPS	Gross value added at basic prices by NUTS 3 regions [*nama_10r_3gva*], 2012, recalculated by PPS, and Population on 1 January by broad age group, sex and NUTS 3 region [*demo_r_pjanaggr3*], 2012	Eurostat

Other indicators		
Name	Denomination	Source
Population change	Number of population in 2011 per 2001, %	Statistical Office of V4 Countries
Employment in agriculture	Agriculture, forestry and fishing, %, 2013	Statistical Office of V4 Countries
Employment in industry	Industry and construction, %, 2013	Statistical Office of V4 Countries
Employment in services	Market and non-market services, %, 2013	Statistical Office of V4 Countries

Curriculum vitae

Prof. Dr. Imre Lengyel
(1954-)

Qualifications:
- mathematician (MSc), József Attila University, Szeged; 1979
- economist (MSc), Karl Marx University of Economic Sciences, Budapest; 1986

Current employer:
- University of Szeged, Faculty of Economics and Business Administration, Institute of Economics and Economic Development
- full professor, since 2004

Academic degree:
- Univ. Doctor (in operation research), József Attila University, Szeged (Hungary), 1983 (Dissertation title: Cutting problems and methods used to solve them)
- PhD (in economics), Hungarian Academy of Sciences, 1995 (Dissertation title: Regional characteristics of household savings and loans in Hungary)
- Doctor of Economic Sciences (in economics), Hungarian Academy of Sciences, 2005 (Dissertation title: Competitiveness and economic development of regions in Hungary)

Work experience:

1979-1983
production analyst, Brick and Tile Company, Békéscsaba

1984-1985
regional planner, Békés County Council, Békéscsaba

1986-1993
research fellow, Centre for Regional Studies, Hungarian Academy of Sciences, Békéscsaba

1994-1997
vice rector, associate professor, Kőrösi Csoma Sándor College, Békéscsaba

1997-2004
associate professor, founding head of Regional and Applied Economics Department, Faculty of Economics and Business Administration, University of Szeged

1999-2002
vice dean, Faculty of Economics and Business Administration

2004-2019
full professor, founding head of Economics and Economic Development Institute, Faculty of Economics and Business Administration
2007-2012
chair of Regional and Environmental Economic Studies MSc program
2013-2017
chair of Business Development MSc program
2012-2016
chair of Doctoral School in Economics, University of Szeged

Teaching experience:
Kőrösi Csoma Sándor College, Békéscsaba, 1994-1997
– Statistics
– Regional and urban economics
University of Szeged, Faculty of Economics and Business Administration, since 1997
– Introduction to regional and urban economics
– Regional and local economic development
– The Practice of Social Research
University of Szeged, Doctoral School of Economics, since 2009
– Advances in Social Research
– Regional and urban economics
– Regional economic development
– Publication practices
University of Pécs, Doctoral School of Regional Policy and Economics, since 2011
– Regional economic development
Széchenyi István University, Doctoral School of Regional Sciences and Business Administration, 2010-2016
– Regional economic development

Member of university and faculty bodies:
– Senate of the University of Szeged, 2000-2003 and 2013-2017
– Doctoral Council of the University of Szeged, 2005-2016
– Scientific Advisory Board of the University of Szeged, since 2006
– Council of Doctoral School in Economics, since 1999
– Scientific Committee on Habilitation of the Faculty, since 2013
– Council of the Faculty, 1999-2019
– Scientific Committee of the Faculty, since 1999, chair 1999-2011

Memberships:
– Committee on Regional Science of the Hungarian Academy of Sciences, elected member since 1995, deputy chair 1999-2008, chair 2008-2011

- Commission on Geography and Public Administration, International Geographical Union, 1992-96
- Hungarian Regional Science Association, since 2002, member of presidency 2002-2017, vice president 2015-2017
- Committee on Economics of the Regional Committee in Szeged, Hungarian Academy of Sciences, since 1993, chair 2008-2016
- European Regional Science Association, member since 1992
- founding series editor of 'modern regional science', Akadémiai Kiadó, since 2009
- Tér és Társadalom, member of editorial board, since 2006
- Területi Statisztika, member of editorial board, since 2014
- Tér-Gazdaság-Ember, member of editorial board, since 2012

Awards, prizes
- Széchenyi professorship, 1997-2000
- Master Teacher Gold Medal, 2009
- 'Best book' Award of Akadémiai Kiadó (academic publisher), 2010
- Knight's Cross of the Order of Merit of Hungary, 2015
- Academic Award of the H
- Klebelsberg Kunó Award, University of Szeged, 2016

Number of scientific publications (Sept 2019): 195
- journal article: 67
- book as author: 6
- book as editor: 19
- book chapter: 69
- conference paper: 34

Independent citations: 4870
Hirsch-index: 26

Top 22 books and 22 articles

Top 22 books and book chapters

Lengyel, I. 1993: Development of local government finance in Hungary. In Bennett, R. J. (ed): *Local Government in the New Europe*. Belhaven Press, London, pp. 225–245.
Independent citations: 18

Lengyel, I. 1993: A lakossági megtakarítások területi egyenlőtlenségei a közgazdasági elméletek tükrében (Territorial inequalities in household savings based on economic theories). In Enyedi, Gy. (ed): *Társadalmi-területi egyenlőtlenségek Magyarországon*. Közgazdasági és Jogi Könyvkiadó, Budapest, pp. 333–358.
Independent citations: 3

Lengyel, I. 1995: From plan to market: The case of Hungarian banking system. In Tykkyläinen, M. (ed): *Local and Regional Development During the 1990s Transition in Eastern Europe*. Avebury, Aldershot, pp. 109–118.
Independent citations: 1

Barlow, M., Lengyel, I. & Welch, R. (eds) 1998: *Local Development and Public Administration in Transition*. JATEPress, Szeged (p. 226.).
Independent citations: 4

Lengyel, I. 1998: Features of Dwelling Construction in Hungary. In Barlow, M., Lengyel, I. & Welch, R. (eds): *Local Development and Public Administration in Transition*. JATEPress, Szeged, pp. 182–191.
Independent citations: 1

Lengyel, I. & Rechnitzer, J. 2000: A városok versenyképességéről (On competitiveness of cities). In Horváth, Gy. & Rechnitzer, J. (eds): *Magyarország területi szerkezete és folyamatai az ezredfordulón*. MTA RKK, Pécs, pp. 130–152.
Independent citations: 247

Lengyel, I. 2002: The Competitiveness of Hungarian Regions. In Varga, A. & Szerb, L. (eds): *Innovation, Entrepreneurship, Regions and Economic Development: International Experiences and Hungarian Challenges*. University of Pécs Press, Pécs, pp. 235–246.
Independent citations: 20

Lengyel, I. 2003: *Verseny és területi fejlődés: térségek versenyképessége Magyarországon* (Competition and territorial development: The competitiveness of regions in Hungary). JATEPress, Szeged (p. 454).
Independent citations: 633

Lengyel, I. (ed) 2003: *Knowledge Transfer, Small and Medium-Sized Enterprises, and Regional Development in Hungary*. JATEPress, Szeged (p. 210.).
Independent citations: 14

Lengyel, I. 2003: Globalizáció, területi verseny és versenyképesség (Globalization, territorial competition and competitiveness). In Süli-Zakar, I. (ed): *A terület- és településfejlesztés alapjai*. Dialóg Campus, Budapest-Pécs, pp. 161–177.
Independent citations: 37

Lengyel, I. & Rechnitzer, J. 2004: *Regionális gazdaságtan* (Regional economics). Dialóg Campus, Budapest-Pécs (p. 391).
Independent citations: 629

Lengyel, I. 2006: A területi verseny és versenyképesség elméleti alapjai (Theoretical basis of competition and competitiveness). In Horváth, Gy. (ed): *Régiók és települések versenyképessége*. MTA Regionális Kutatások Központja, Pécs, pp. 35–68.
Independent citations: 38

Kállay, L. & Lengyel, I. 2008: The Internationalization of Hungarian SMEs. In Dana, L-P., Welpe, I. M., Han, M. & Ratten, V. (eds): *Handbook of Research on European Business and Entrepreneurship. Towards a theory of internationalization*. Edward Elgar, Cheltenham- Northampton, pp. 277–295.
Independent citations: 19

Lengyel, I. 2009: Bottom-up Regional Economic Development: Competition, Competitiveness and Clusters. In Bajmócy, Z. & Lengyel, I. (eds): *Regional Competitiveness, Innovation and Environment*. JATEPress, Szeged, pp. 13–38.
Independent citations: 15

Lengyel, I. 2009: Knowledge-based local economic development for enhancing competitiveness in lagging areas of Europe: The case of the University of Szeged. In Varga, A. (ed): *Universities, Knowledge Transfer and Regional Development: Geography, Entrepreneurship and Policy*. Edward Elgar, Cheltenham-Northampton, pp. 322–349.
Independent citations: 34

Lengyel, I. & Rechnitzer, J. (eds) 2009: *A regionális tudomány két évtizede Magyarországon* (Two decades of regional science in Hungary). Akadémiai Kiadó, Budapest (p. 468).
Independent citations: 39

Lengyel, I. 2010: *Regionális gazdaságfejlesztés. Versenyképesség, klaszterek és alulról szerveződő stratégiák* (Regional economic development: Competitiveness, clusters, and bottom-up development strategies). Akadémiai Kiadó, Budapest (p. 385).
Independent citations: 338

Lengyel, I. 2012: Competitiveness of Regions of Central and Eastern European Countries. In Rechnitzer, J. & Smahó, M. (eds): *Vehicle Industry and Competitiveness of Regions in Central and Eastern Europe*. Széchenyi István University, Győr, pp. 129–164.
Independent citations: 1

Lengyel, I. 2012: Regionális növekedés, fejlődés, területi tőke és versenyképesség (Regional growth, development, territorial capital and competitiveness). In Bajmócy, Z., Lengyel I. & Málovics, Gy. (szerk.): *Regionális innovációs képesség, versenyképesség és fenntarthatóság*. JATEPress, Szeged, pp. 151–174
Independent citations: 70

Lengyel, I. 2017: Competitive and uncompetitive regions in transition economies: the case of the Visegrad post-socialist countries. In Huggins, R. & Thompson, P. (eds): *Handbook of Regions and Competitiveness*. *Contemporary Theories and Perspectives on Economic Development.* Edward Elgar, Cheltenham, pp. 398–415.
Independent citations: 4

Top 22 journal articles

Lengyel, I. 1994: The Hungarian Banking System in Transition. *GeoJournal*, vol 32., no. 4, pp. 381–392.
Independent citations: 7

Lengyel, I. 2000: A regionális versenyképességről (On regional competitiveness). *Közgazdasági Szemle*, vol 47., no 12, pp. 962–987.
Independent citations: 497

Lengyel, I. 2001: Iparági és regionális klaszterek: tipizálásuk, térbeliségük és fejlesztésük főbb kérdései (Industrial and regional clusters: Typing, spatiality and major issues of development). *Vezetéstudomány*, vol 32., no 10, pp. 19–43.
Independent citations: 110

Lengyel, I. 2004: The Pyramid Model: Enhancing Regional Competitiveness in Hungary. *Acta Oeconomica,* vol. 54., no 3., pp. 323–342.
Independent citations: 143

Lengyel, I. 2007: Fejlesztési pólusok, mint a tudásalapú gazdaság kapuvárosai (Development poles as gatekeepers for the knowledge economy). *Magyar Tudomány,* vol 168., no 6. pp. 749–758.
Independent citations: 66

Lengyel, I. 2010: A regionális tudomány „térnyerése": reális esélyek avagy csalfa délibábok? ('Gaining space' of regional science: Real chance or false illusion?). *Tér és Társadalom*, vol 24., no 3. pp. 11–40.
Independent citations: 45

Lengyel, I., Fenyővári, Zs. & Nagy, B. 2012: A közelség szerepének újraértelmezése az innovatív üzleti kapcsolatokban (Rethinking the role of the proximity in the innovative business relationships). *Vezetéstudomány*, vol 43., no 3. pp. 19–29.
Independent citations: 21

Lengyel, I., & Szakálné Kanó, I. 2012: Competitiveness of Hungarian Urban Microregions: Localization Agglomeration Economies and Regional Competitiveness Function. *Regional Statistics*, vol. 52., special issue 2., pp. 27–44.
Independent citations: 26

Lengyel, I. & Rechnitzer, J. 2013: Drivers of Regional Competitiveness in the Central European Countries. *Transition Studies Review*, vol. 20., no 3., pp. 421–435.
Independent citations: 21

Vas, Zs., Lengyel, I. & Szakálné Kanó, I. 2015: Regionális klaszterek és agglomerációs előnyök: feldolgozóipar a magyar városrégiókban (Regional clusters and agglomeration advantages: manufacturing in Hungarian urban areas). *Tér és Társadalom*, vol 29., no 3. 49–72. o.
Independent citations: 22

Lengyel, I., Lukovics, M. & Imreh, Sz. 2016: Challenges of Entrepreneurship in a Less Developed Region of Hungary: the ELI-ALPS Laser Research Centre in Szeged. *Journal Transition Studies Review*, no. 1, pp. 79–96.
Independent citations: 2

Lengyel, I. 2016: Competitiveness of Metropolitan Regions in Visegrad Countries. *Procedia - Social and Behavioral Sciences*, vol. 223, pp. 357–362.
Independent citations: 11

Nagy, B. & Lengyel, I. 2016: The structural change of manufacturing in Hungary, 2008–2014. *Studies in International Economics*, vol. 2, no. 2. pp. 3–22.
Independent citations: 2

Szakálné Kanó, I., Sánta, É. & Lengyel, I. 2017: Territorial distribution of highly educated individuals in Hungary after 1990. *Regional Statistics*, Vol. 7. No. 2., pp. 171–189.
Independent citations: 5

Lengyel, I., Vas, Zs., Szakálné Kanó, I. & Lengyel, B. 2017: Spatial differences of reindustrialization in a postsocialist economy: manufacturing in the Hungarian counties. *European Planning Studies*, vol. 25., no. 8., pp. 1416–1434.
Independent citations: 11

Lengyel, I. & Varga, A. 2018: A magyar gazdasági növekedés térbeli korlátai – helyzetkép és alapvető dilemmák (The spatial limits of economic growth in Hungary: An overview and some dilemmas). *Közgazdasági Szemle*, vol 65., no 5., pp. 499–524.
Independent citations: 15

Lengyel, I. & Kotosz, B. 2018: The catching up processes of the regions of the Visegrad Group countries. *Comparative Economic Research*, vol. 21, no 4., pp. 5–24. (ISSN: 2082–6737)

Kotosz, B. & Lengyel, I. 2018: Térségek konvergenciájának vizsgálata a V4 országokban (Examining the convergence of regions in the V4 countries). *Statisztikai Szemle*, vol 96., no 11–12., pp. 1069–1090.

Nagy, B., Udvari, B. & Lengyel, I. 2019: Újraiparosodás Kelet-Közép-Európában - újraéledő centrum-periféria munkamegosztás? (Re-industrialization in Central and Eastern Europe: Revitalizing center-periphery of division of labour?). *Közgazdasági Szemle,* vol 66., no 2., pp. 163–184.

Szakálné Kanó, I., Lengyel, B., Elekes, Z. & Lengyel, I. 2019: Agglomeration, foreign firms and firm exit in regions under transition: the increasing importance of related variety in Hungary. *European Planning Studies,* vol 27., no 11., pp. 2099–2122.

A régiók dinamikus növekedésének és fejlődésének záloga versenyképességük javítása. A versenyben való helytállás képességének megértése és fejlesztése ugyanakkor kihívásokkal teli. E kihívásokra ad választ a regionális versenyképesség piramismodellje, amely a nemzetközi szakirodalomra és gyakorlati tapasztalatokra építve szintetizálja a versenyképesség javítása által elérhető célokat és eredményeket, valamint a folyamatot rövid és hosszútávú befolyásoló fejlesztési és sikerességi tényezőket. A két évtizede megszületett és az évek alatt továbbfejlesztett, 22 nyelvre lefordított modell hiánypótló itthon és külföldön. Intézetünk ezzel a kötettel köszönti az intézet alapítóját, aki 22 éven át vezette közösségünket.

Vas Zsófia mb. intézetvezető
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Improving regional competitiveness is the key to dynamic growth and development of regions. However, understanding and improving the ability for being competitive is challenging. The answers for the challenges are given by the pyramid model of regional competitiveness, which synthesise the targets and outputs as well as the short and long-term development and success factors of competitiveness based on the international literature and practical experience. The model which was born two decades ago, have been further developed over the years and translated for 22 languages is a niche at home and abroad. Our Institute greets the Founder of the Institute with this volume, who has led our community for 22 years.

Zsófia Vas, assigned head of the Insitute
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