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Alternative indicators: can socio-economic advancement be measured?

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The target of our study is to examine the possibilities as well as the limitations of the application alternative composite indicators. Our study focuses on what kind of relations the indicators are in; to what extent they can substitute the GDP and what kind of morals can be indicated for Hungary. The basic question of our research is how possible is to group countries clearly based on the values of alternative indicators. In this study three composite indicators (HDI, HPI, EPI) and the ecological footprint and GDP trends were examined. In the first phase of our research, we revealed that these indicators could be observed in pairs to linear relationship; the Pearson's correlation index values are shown in the correlation matrix. Based on our analysis, these two indicators are independent from each other and also independent from the GDP; these are the HPI and the EPI. The classification of countries was performed using cluster analysis. Based on the three-cluster model, a specific path of development was determined in Latin America, which proves a useful experience for Hungary.

1. INTRODUCTION

Recently, two analyses have been conducted in which the possibilities as well as the limits of the application of alternative composite indicators were examined. In our first study the connection between the alternative indicators, local trading systems and happiness was under investigation[4]. It has been found that there is a relation between stronger local cooperation and happiness. In the focus of our

second analysis[5] the relation between the sustainable indicators and the undertaking inclination was set and based on this, an alternative development way was defined for Hungary. In our present research, the specific Latin American development way of outlining based on the previous findings is being examined. The developmental differences between North and South American countries are attributed to the fact that such institutional as well as legal systems were established in the north to protect private ownership and favour market mechanisms[6]. However, the economic crisis queries the success of the model resting on conventional market operation as well as the private ownership and the values of those communal characteristics, which previously have not belonged to the features of successful countries, are rising. The influences of the economic crisis beginning in 2008 can be experienced even today[7]; the most significant crisis of the new Millennium has unusual effect on every participant of macroeconomics. The public budget was hard hit by the finance ability of the public debt and the economic crisis has meant significant events for both enterprises and the household, for instance the rise in the price of loan costs and the decline of consumption as well as investments, which can ultimately be recognised as the damaging factors of the welfare.[8] Due to the impact of the economic crisis, the professional interest toward the reform of macroeconomic indicators has increased and since the report of Stiglitz – Sen – Fitoussi[9] dealing with the limits of the GDP index, the accepted opinion is that the present clearing of accounts system is untenable, which appears not only in the theories and research findings of alternative economists but also in the decision making of economic policy.

[5] Farkas Sz. – Szigeti C. – Borzán A. (2012): *The state of Hungary based on some alternative indicators, the presentation was given in the Conference of Science Day of BGF.* 8th November. Budapest.

[6] Németh A. O. (2010): *Makrogazdaság-politika és növekedés Gondolatok közös javainkról. Válság az oktatásban? Oktatás a válságban!* Budapesti Corvinus Egyetem Közgazdaságtudományi Kar, Budapest. 98–115.

[7] Csiszárik-Kocsir Á. (2012): *A gazdasági válság hatására kialakult recesszió érzékelése egy kérdőíves kutatás eredményeinek tükrében.* Humánpolitikai Szemle. 2012. március. 52–60.

[8] Csiszárik-Kocsir Á. (2011a): *A gazdasági válság hatásainak vizsgálata életkor szerint egy primer kutatás eredményeinek tükrében* Erdei Ferenc VI. Tudományos Konferencia, Kecskemét, 2011. augusztus 25., Kecskeméti Főiskola, Kertészeti Főiskolai Kar. 203–207. and Csiszárik-Kocsir Á. (2011b): *A gazdasági válság hatásai az iskolai végzettség alapján képzett csoportokban egy kvantitatív kutatás eredményeinek tükrében.* Erdei Ferenc VI. Tudományos Konferencia, Kecskemét, 2011. augusztus 25., Kecskeméti Főiskola, Kertészeti Főiskolai Kar. 208–212.

[9] Stiglitz, J. E. – Sen, A. – Fitoussi, J.-P. (2009): *Report by the Commission on the Measurement of Economic Performance and Social Progress.* (Elérhető: http://www.stiglitz-senfitoussi.fr/documents/rapport_anglais.pdf. Letöltés ideje: 2013.11.04.)

In recent years, several assessments and criticisms have been published on the research of Stiglitz, mainly as a result of social studies.[10]

Even from the beginning, the measuring experiments and their standpoints presented considerable variety; the basis of the measurements was the industrial achievement in England and mainly the agricultural performance in France. The contemporary measuring system based on the GDP started to be established in the 1930s and its difficulties emerged even in the first years: „In 1931 a group of governmental and private experts was called for congressional audition in order to provide answers to basic issues in connection with the economy. It came to light that they were not able to do this: the latest facts and figures had reference to 1929 and they were also incomplete. In 1932, in the last year of the Hoover administration, the senate called upon the Ministry of Commerce to conduct an overall estimation about the national income. Soon after, a young economist, Simon Kuznets was commissioned by the ministry to develop a unified system of the national clearing of accounts. This became the prototype of today's GDP. Simon Kuznets had serious reservations about the clearing of the accounts system of the national economy aided by him. In his first report of 1934 to the congress, he tried to draw the nation's attention to the limits of the new system. » Hardly can we conclude about the welfare of a nation from the measure of national income determined above«– drawing his conclusions. (...) Simon Kuznets rejected the most of the leading economic priori conceptual schema. When an economy starts to increase, as he claimed, the parts of that economy must increase as well. The economists ought to attempt to conduct the measure of more and varied items. In his book, *The New Republic*, 1962, Kuznets set down in writing that there is a need for a basic reconsideration of the national clearing of accounts. » We need to pay attention to the distinction between the quantity and the quality of increase, between the costs and the yields and the differences between the long and short-term considerations« according to Kuznets. » The targets of the 'larger' increase must be determined specifically, in other words, what should be increased and for what reason."[11] The situation remained unchanged for a long time: „After the GDP was welcomed completely in the United States, the calculation system of the national economy represented above was accepted globally. In the previous forty years this system was not being modified at all while mankind and the face of the Earth transformed to an extent, which had not been experienced before. Only some of the dynamic changes constitute the conquest as well as the exhaustion

[10] Tsai, M.-C. (2011): *If GDP is Not the Answer, What is the Question?* The Juncture of Capabilities, Institutions and Measurement in the Stiglitz-Sen-Fitoussi Report Social Indicators Research. 102. 363–372. and Michalos, A. C. (2011): *What Did Stiglitz, Sen and Fitoussi Get Right and What Did They Get Wrong?* Social Indicators Research. 102. 117–129.
[11] Cobb, C. – Halstead T. – Rowe J. (1997): *Ha a GDP felmegy, miért megy Amerika lefelé?* Kovász.1997/1. 30–47.

of the environment, the denial of the existence of the subsystem of the economy and the incorporation of other social factors (family, politics, public administration) by the economy, the huge population explosion and the incredible financial differentiation".[12] The development of national accounts was set in many ways due to the concerns related to environmental problems caused by the increasing economy from the 1970s.[13] Researchers have developed several indicators in the past decades as a result of the improvement of additional GDP or substituting alternative indicators[14]. One of the most completed overview of the findings of recent years can be found in the article of Bleys.[15] The author is not willing to determine the exact number of alternative indicators; however, Brent Bleys presents almost 200 indicators and its various clustering opportunities. The study by Vackár[16] is outstanding in its examinations aimed at exploring the connections among the indicators in which the correlation matrix of 27 alternative indicators was prepared. Detailed analysis about the relation between the GDP, the ecological footprint and happiness can be read in the article by Kocsis, in which the influences and consequences of the varied developmental ways are outlined for Hungary. Environmental sustainability would often require a decrease of the GDP per capita in the so-called developed countries among the possible and positive future prospects.[17] The various indicators are important at a global level, but we think that it could be also at a macro regional level too; for example the interpretation of the indicators could also be important in the cohesion policy of the EU. Also the local players (civil organisations, firms, etc.) can contribute to the success of the cohesion policy (Reisinger 2012)[18], so they can also contribute to the utilizations of the indicators in a wide range of the players.

[12] Dabóczi K. (1998): *A mérhető balgaság, avagy miért nincs olaj a közgazdaságtan lámpásában?* Kovász. II. évf. 2. sz. 32–57.

[13] Lawn, P. (2007): *A stock-take of green national accounting initiatives.* Social Indicators Research. 80. 427–460.

[14] Hák, T. – Moldan, B. – Dahl, A-L. (2007): *Sustainability Indicators.* A Scientific Assessment Island Press. 14–448.

[15] Bleys, B. (2012): *Beyond GDP.* Classifying Alternative Measures for Progress Social Indicators Research. 109. 355–376.

[16] Vackár D. (2012): *Ecological Footprint, environmental performance and biodiversity: A cross-national comparison.* Ecological Indicators. 16. 40–46

[17] Kocsis T. (2010): *„Hajózni muszáj" A GDP, az ökológiai lábnyom és a szubjektív jóllét stratégiai összefüggései.* Közgazdasági Szemle. LVII. évf. június. 536–554.

[18] Reisinger A. (2012): *Civil/nonprofit szervezetek a kohéziós politikában - elméleti alapok.* Tér és Társadalom. 1. 41–66.

2. MATERIAL AND METHODS

In our study we examined the indicators belonging to the group of alternative indicators of substituting the GDP. We took into consideration two factors when we selected the indicators. We were in search of such indexes, which can evaluate at least two pillars (environmental, economic and social) of sustainability and which are available in most countries. We present below the components of the examined alternative indicators:

Human Development Index (HDI)

The Human Development Index (HDI), an overall complex index including four indicators and three dimensions, evaluates the developmental level of certain countries with the combination of GNI per capita, life time expected by birth, combined gross school enrolment and the index of adult literacy. The HDI index is the member of a four-member index-family (HDI, IHDI, GII and MPI) of the United Nations Development Programme-UNDP. In 2010, an overall reform of indexes was accomplished which can be recognised in their renaming and content change. Although it is a characteristic of every indicator that they provide more a precise picture of the welfare of a country compared to the GDP, none of the indexes contain direct data about the state of the environment. The HDI index ensures a wide variety of comparison possibilities and detailed HDI data of 187 countries can be downloaded from the homepage of the UNDP. The values of indexes can be from 0 to 1. The higher the value of the indicator, the better the case is.

Environmental Performance Index (EPI)

Researchers at the Universities of Yale and Columbia together with scientists of the EU created the Environmental Performance Index, which is the successor of the Environmental Sustainability Index. The index of 2010 divides altogether 163 countries based on 25 performance indicators, which are listed into 10 categories including environment, public health and the health of the ecosystem. Among the indexes the DALY (Disability-Adjusted Life Year Index) index appears with 25%. These indicators show how close the governments are in order to set up a comprehensive environmental package of measures. In the database the data of 132 countries can be found. The values of indexes can be from 0 to 100. The higher the value of the indicator, the better the case is.

Happy Planet Index (HPI)

The HPI (Happy Planet Index) measured by the New Economic Foundation (NEF) includes 3 factors: expected life time, ecological footprint and satisfaction

with life; in other words, it complements the ecological footprint with objective and subjective factors determining people's quality of life. The database of the Happy Planet Index (HPI) contains the data of 151 countries. The values of indexes can be from 0 to 100. The higher the value of the indicator, the better the case is.

Ecological footprint (FP)

The Ecological Footprint means how much productive land is needed for a human society to maintain itself and to process its manufactured waste as well as given technological development. The measurement unit of the Ecological Footprint is the global hectare/person (gha). According to the European Commission, the ecological footprint and the carbon-dioxide footprint together make up those environmental indexes, which can fill the role of an overall environmental index; however, its circle of application is restricted. We can download the ecological footprint data of 142 countries from the homepage of the Global Footprint Network and estimations about further 9 countries can be found in the database including the calculation of the Happy Planet Index. The most common criticism against the Ecological Footprint Index is that it contains neither the social factors nor people's satisfaction. This index is not suitable for covering all the aspects of sustainability although it is often mentioned among the sustainability indicators. However, this criticism is irrelevant since the creators of the ecological footprint have never claimed that, for instance, it would be a composite indicator, such as the HDI or ESI, which include more pillars of sustainability. The Ecological Footprint gives information about the application of hypothetic area; it does not promise anything more or less.[19] The Ecological Footprint is applied on more levels from the beginning of measurement by its creators.[20] Besides global evaluation, they also use national, regional, settling and individual EF indicators in order to compare the spatial demands of the consumption with the disposable biological capacity. The general recognition of this index differs considerably in the different application areas and while the global EF is considered to be the best index of „sustainability"[21], its spatial application is criticised from more sides.[22] For this reason the national use of the Ecological Footprint must be treated with increased caution. The values of this indicator are more than 0, although it does not have a top limit. The smaller the value of the index, the more favourable the case is.

[19] Csutora M. (2011a): Az ökológiai lábnyom számításának módszertani alapjai. In: Csutora (szerk): *Az ökológiai lábnyom ökonómiája*. Aula Kiadó. 12.
[20] Rees, W. – Wackernagel, M. (1996): *Urban ecological footprints: why cities cannot be sustainable and why they are a key to sustainability, Environ*. Impact Assess. Rev. 16. 223–248.
[21] Stiglitz, J. E. – Sen, A. – Fitoussi, J.-P. (2009): i. m.
[22] Bergh, Van den, J. C. M. J.– Verbruggen, H. (1999): *Spatial sustainability, trade and indicators: an evaluation of the ecological footprint*. Ecological Economics. 29. 61–72. and McDonald, G. W. – Patterson, M. G. (2004): *Ecological Footprints and interdependencies of New Zealand regions (analysis)*. Ecological Economics. 50. 49–67.

By selecting the methodology of our examination, we relied to a large extent upon the research of Mostafa[23]. We have investigated whether linear relation can be observed among the alternative indicators in pairs. We conducted our analyses with the help of the software package of IBM SPSS20 and based it upon the data analysis manual of Sajtos – Mitev[24] when selecting the methods and assessing the results. The basic query of our study is whether it is possible to group countries based on their ecological footprint structure. We accomplished the grouping of countries as well as regions with the help of cluster analysis. In the first phase of our study we revealed whether linear connection could be noticed among the alternative indicators in pairs.[25] We conducted the examination with the data of those 126 countries whose indicator values included in the calculation are available. We indicated the values of the correlation index of Pearson in a correlation matrix. Since the cluster analysis is sensitive to the presence of outliers, in the second phase of our research we checked the prominent data with average linkage method and excluded these values from our study. From the point of the assessment of the findings, it is significant that we did not exclude the prominent values of single data but rather those created by one member team during the examination, so after the elimination we continued the study with the data of 122 countries. We set two conditions, which mean that we take it as a relevant division: (1) the spreading within the cluster is smaller than the spreading of the whole mass as it refers to the fact that we managed to establish a homogeneous group according to the examined factor, (2) the findings of at least two examinations are similar.

3. THE RESULT OF OUR FIRST EXAMINATION

Based on the values of the correlation coefficient of Pearson (Table 1.), there is close connection between certain indicators (these are indicated by the highlighted cells). Two indicators, the HPI and the EPI can be considered independent from the GDP and all the other indexes. As a result of this, besides these two indicators, the GDP or any other indicators can be included in the cluster analysis without a deformation in the findings. The other essential aspect of the assessment of the findings is that the close connection between the Ecological Footprint and the GDP can question the suitability of the Ecological Footprint.

[23] Mostafa, M. M. (2010): *Clustering the ecological footprint of nations using Kohonen's self-organizing maps.* Expert Systems with Applications. 37. 2747–2755.
[24] Sajtos L. – Mitev A. (2007): *SPSS kutatási és adatelemzési kézikönyv.* Alinea Kiadó, Budapest.
[25] The availability of the above-mentioned database applied by the calculations can be found in the reference list by indicators.

Table 1: **The correlation coefficient of Pearson**

n=92	HDI	FP	HPI	EPI	GDP
HDI	1	0.744	0.145	0.535	0.758
FP		1.00	-0.336	0.377	0.909
HPI			1.00	0.174	-0.189
EPI				1.00	0.484
GDP					1.00

In the estimation of Vackár[26] the value of the correlation coefficient is 0,289 between the ecological footprint and the EPI, which confirms that only a weak-medium relation can be noticed between the two indicators. According to the study by Csutora, the correlation is 0,356 between the ESI (the predecessor of the EPI) and the ecological footprint.[27]

We can receive a more significant result from the analysis including the two indicators when comparing the values of HPI and FP. The Figure 1 is placed in the intersection point (2; 50) of axes. Since the value of the ecological footprint can be maintained under 2 gha / person and the value of the HPI is favourable above 50, (according to the usual naming) the countries belonging to the 2nd quarter (e.g. Jamaica, El Salvador and Columbia) are in the most favourable position based on the two indicators. A different strategy can be determined for those countries belonging to the other three horizontal quarters:
• 1st quarter (e.g. Costa Rica, Venezuela, Norway and Switzerland): decreasing the ecological footprint, holding the HPI on level.
• 3rd quarter (e.g. Angola, Kenya): holding the ecological footprint on level, increasing HPI.
• 4th quarter (all of the Members of the European Union): decreasing of both indicators.

If we exclude the impact of the GDP with partial correlation calculation, the connection between the HDI and the ecological footprint practically disappears. It is interesting-professionally surprising-that there is no close connection between the values of HPI and the ecological footprint but nevertheless the ecological footprint is part of the HPI.

[26] Vackár D. (2012): i. m.
[27] Csutora M. (2011b): *From eco-efficiency to eco-effectiveness?* The policy – performance paradox in Society and Economy. 33. 1. 161–181.

Figure 1: **The relation between the ecological footprint and the HPI**
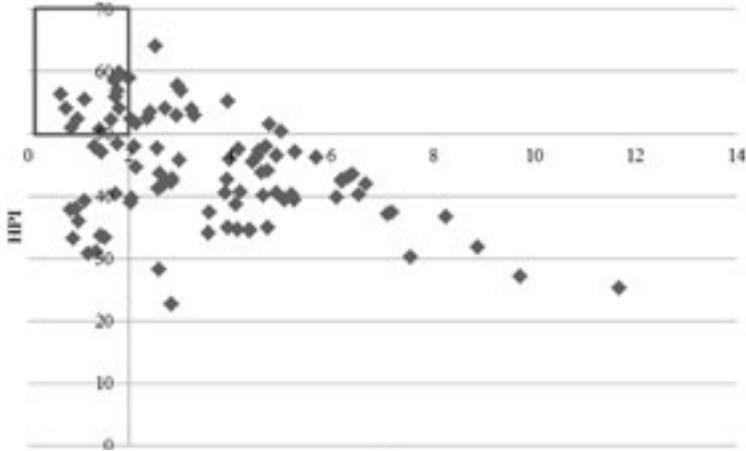
In our contemporary study we conducted the cluster analysis of countries based on the trio of EPI-HPI-HDI.

4. THE RESULT OF OUR SECOND EXAMINATION

The extreme outliers excluded by the simple chain method are Costa Rica, Botswana, Iraq and Switzerland. The value of the HPI index of Costa Rica is the highest in the world (64.0359) and the lowest value of the HPI index is Botswana's (22.5912). The highest value of the EPI index is in Switzerland and the lowest is in Iraq (25.32) (Table 2).

Table 2: **The most and the least favourable values of the examined alternative indexes and the data of Hungary**

Country	Index	Value	Source	Information
Qatar	Ecological footprint (gha/ person)	11.68	HPI database	The value of the index is better if it is smaller (The value of the sustainable ecological footprint is under 2 gha/person)
Afghanistan		0.54		
Hungary		3,59		
Botswana	HPI	22.59		The values of indexes can be from 0 to 100. The higher the value of the indicator is, the better the case is.
Costa Rica		64.03		
Hungary		37.4		
Democratic Republic of the Congo	GDP/ person	347		
Luxemburg		50700		
Hungary		20545		
Democratic Republic of the Congo		0.286	HDI database	The values of indexes can be from 0 to 1. The higher the value of the indicator, the better the case is.
Norway		0.943		
Hungary		0.816		
Iraq		25.32	EPI database	
Switzerland		76.92		
Hungary		57.06		

After the exclusion of countries consisting of the four prominent data, we accomplished a cluster analysis and we present the findings by the simple chain method (between-group linkage) in Table 3. In the grouping of the three clusters, it is true for all the three variables of the examination that their spreading is lower than the spreading of the whole mass and we received similar findings with the help of the ward method; for this reason the grouping is suitable for the original conditions. In Table 3 the values of the non-examined indicators

are indicated as well. We examined the deviation from the average of the values of certain indicators (expect for the ecological footprint the higher value is the more favourable). In the boxes highlighted in black the values of at least 15% more favourable than the average and in the boxes highlighted in grey the values of at least 15% more unfavourable can be found.

Table 3: **The findings of the cluster analysis**

	HDI	FP	HPI	GDP	EPI
means	**0.70**	**3.18**	**43.36**	**15800.99**	**53.07**
1. cluster	0.79	4.45	41.68	25954.03	61.12
2. cluster	0.71	2.14	55.03	9266.4	55.08
3. cluster	0.61	2.43	39.64	8856.92	44.26

1st cluster: the indicators of the GDP and EPI of the countries of the first cluster are more favourable than the average; in this sector the highest is the value of the HDI and Ecological Footprint indicators. Among others, the Members of the European Union, Japan and the USA belong to this cluster. These are the richest countries examined in this study. Among the Latin American countries Uruguay can be listed in this cluster.

2nd cluster: the values of the ecological footprint and the HPI indicators of the countries of this cluster are more favourable than the average while the GDP is lower than the average; typically Latin American countries belong to this cluster. The happiest countries belong to this cluster.

3rd cluster: the values of the ecological footprint of these countries are the most favourable while their GDP and EPI are lower than the average. The happiest countries belong to this cluster. Among the Latin American countries Haiti is part of this cluster.

5. CONCLUSION

As the result of the criticism of the GDP and the increasing changing demand, the different scientist teams have established several alternative indicators and some of these (e.g. HDI or the ecological footprint) strongly correlate with the GDP despite the differing calculation methods. The significant surplus information in the indicators can be a useful addition in relation to the judgement of sustainability of certain countries. However, this fact can question the applicability instead of the GDP. The independence from the GDP provides a possibility for two complex indicators, namely for the EPI and for the HPI to conduct analysis based on other points. In our study, besides these two independent indicators, the values of the HDI index were placed in our examination. On the basis of the three indicators, the countries can be clearly grouped.

The countries of the 2nd cluster represent a specific and significantly different development route from the European one. They can live more happily with a lower than average GDP and with smaller environmental problems. (The Latin-American country, Costa Rica, the extreme outlier excluding from the study, is the happiest state in the world.) It is interesting that The HPI index (50.34) of the happiest European state, Switzerland lags behind the HPI index (50.65) of the least happy Latin American country, namely the Dominican Republic. In the 21st century, a paradigm shift happened in the economical policy thinking of the Latin American countries. It is a common belief among Latin-American politicians and economists that it is not appropriate to view the neoliberal economic policy as one without an alternative and it is not obvious that the steps initiated by the IMF mean the long-term solutions for the region.

It would be worth considering for Hungary as well as for the European countries that, besides the economic development presented in GDP, they should favour improvement based on community building and local cooperation, which is a characteristic in the high number of the local trading systems (LES) in Venezuela.[28] On the website of the Complementary Currency Resource Center, we can find some detailed information of 163 Local Exchange Systems of only 27 countries. The number of the members of the LES is altogether more than 792 000. 47 different types of LES system can be distinguished; however the most common (including 43 organisations) is the Local Exchange Trading System – LETS. The datum of 3 Hungarian organisations can be found in the database: Bakonyi Cserekör, Charity Exchange Shop (Szolnok) and Soproni Kékfrank. In those countries where the LES system is more widespread, people are more satisfied with their life. There is no absolute relation of cause and effect between the two factors, so it is likely that the many-coloured local relationships can promote the establishment of LES, which can contribute to the satisfaction of demands on higher levels as well as to the contentment with life even at a lower income level.

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[28] http://complementarycurrency.org/

- Csiszárik-Kocsir Á. (2011b): *A gazdasági válság hatásai az iskolai végzettség alapján képzett csoportokban egy kvantitatív kutatás eredményeinek tükrében*. Erdei Ferenc VI. Tudományos Konferencia, Kecskemét, 2011. augusztus 25. Kecskeméti Főiskola, Kertészeti Főiskolai Kar. 208–212.
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HUNGARIAN SUMMARY

Kutatásunk alapkérdése, hogy lehetséges-e az országokat egyértelműen csopor-tosítani az alternatív indikátorok értékei alapján. Jelenlegi tanulmányunkban három kompozit indikátor (HDI, HPI, EPI) és az ökológiai lábnyom, valamint a GDP alakulását vizsgáltuk. Az alternatív indikátorok kiválasztásánál két tényezőt vettünk figyelembe: olyan mutatókat kerestünk, amelyek a fenntarthatóság legalább két pillérét (környezeti, gazdasági, társadalmi) mérik és a lehető legtöbb országra rendelkezésre állnak. Kutatásunk első szakaszában feltártuk, hogy a mutatók között páronként megfigyelhető-e lineáris kapcsolat, a Pearson-féle korrelációs index értékeit korrelációs mátrixban tüntettük fel. Elemzésünk alap-ján két olyan mutató van, amely egymástól és a GDP-től is független, a HPI és az EPI. Az országok csoportba sorolását klaszter analízis segítségével végeztük. A létrehozott háromklaszteres modell elemzése alapján meghatároztunk egy sajá-tos latin-amerikai fejlődési utat és ennek hasznosítható tapasztalatait Magyar-ország számára.