DELINKING OF ENERGY CONSUMPTION AND ECONOMIC GROWTH IN THE VISEGRAD GROUP

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ABSTRACT:

In this study two different decoupling indicators are applied to examine the delinking of the energy consumption from economic growth in the Visegrad Four countries (Poland, the Czech Republic, Slovakia and Hungary) during the period 1990-2015. In the light of these results conclusions are drawn with regard to the impact of decoupling as well (it means decoupling environmental impacts from economic growth) using the ecological footprint and biocapacity data. This paper pays special attention to the years when the economies are in recession. The resulting estimations of decoupling effects are optimistic, these economies achieved absolute or relative decoupling during a significant part of the period considered. However, the time interval 2009-2013 can be interpreted as a structural break, because in these years the decoupling of the examined variables was not detected and only weak negative, strong negative and expansive negative decoupling could be identified It can be stated that decoupling is not a permanent process and after even one and half decades (such as Poland – 1994-2009) the positive tendency can be reversed. The analysis of the ecological footprint shows that examining the energy consumption, not only the resource decoupling but the impact decoupling can be detected as well.

Key-words: *Absolute decoupling, Relative decoupling, Energy consumption, Economic growth, Ecological footprint.*

1. INTRODUCTION

The central question and main objective of the sustainability theory is the implementation of the economic activity with decreasing resource use and with lower rate of the environmental impact. The greatest challenge of the current century is to shift toward the green, low-carbon economy which uses the resources more effectively. According to UNEP (2011) if the currently (unsustainable) level of the consumption remains unchanged, the resource use is expected to triple by 2050. Considering this fact the pursuit of decoupling is even more urgent and it has a key role in sustainable development.

Decoupling as an environmental objective is listed in many strategies (such as OECD, 2002). In OECD (2002) the term decoupling refers to breaking the link between the environmental pressure and economic driving forces (economic growth, GDP). The environmental pressure can be linked not only to the pollution, but the energy sources and other environmental resources (mainly land and water) as well. As far as the term is concerned two kinds of decoupling can be distinguished: resource and impact decoupling (UNEP, 2011). A distinction can be made between relative (weak) and absolute (strong)

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decoupling (OECD, 2002). The previous one means that the growth rate of the environmental variable is lower than the growth rate of the economic indicator (usually this is the GDP). In the absolute case the resource use declines or stagnates. The absolute decoupling is really rare and by this eventually the growth rate of resource productivity has to be higher than the economic growth rate (Kerekes, 2007).

2. THEORETICAL BACKGROUND

The theory of resource productivity and efficiency is not a novel one appearing already in very early literature such as Jevons (1866). Furthermore, a groundbreaking Factor 4 study by Weizsäcker et al. (1997) suggested that supposing the current level of technology the resource productivity could be quadrupled. The topic of eco-efficiency is in tight connection with decoupling, which entails material and energy intensity, waste and pollution prevention and management, recycling, intensive use of the renewable energy sources, enhancing the product life cycle and dematerialization (Huppes & Ishikawa, 2009). This (specifically the extent of the eco efficiency) is examined by Szigeti et al. (2017) with the delinking of the ecological footprint and economic growth.

The studies describing the decoupling of environmental pressure from economic growth can be grouped in several ways. One part of the publications puts the emission into the center, another part focuses on the energy use. There are papers which examine only one country (such as Grand (2016), a country group (such as Wang et al., 2013), and some perform global analysis as well (such as Bithas & Kalimeris, 2013; Csereklyei & Stern, 2015). Not only the national-level analysis, but the sectoral papers (such as Andreoni & Galmarini, 2012) had been produced more frequently. The results show that decoupling can be proved in most cases (especially the relative decoupling) however, it is not a steady progress. For example Szabó (2006) finds that in case of municipal waste and transport pollution even the weak (or relative) decoupling cannot be proved.

A unified and generally accepted methodology of decoupling has not been developed yet. Many alternative approaches currently coexist. Most often the formula (or decoupling factor) created by the OECD (2002) and the UNEP (2011) are applied (these formulas will be presented in the Methodology section). After the Millennium there are several studies which use econometric models (such as Csereklyei & Stern, 2015) to calculate the decoupling. Furthermore the index decomposition methods are popular as well (such as Zhang & Wang 2013, Mulder & Groot, 2004).

3. METHODOLOGY

The main objective of this study is to analyze the decoupling between the energy consumption and economic growth. In light of the results consequences are drawn based on ecological footprint and biocapacity-related data concerning the impact of decoupling. Hereinafter the changes of the mentioned variables are formulated:

$$e = \frac{EC_t - EC_0}{EC_0} = \frac{EC_t}{EC_0} - 1 \tag{1}$$

where *e* is the growth rate of the energy use, *EC* is the energy consumption, *t* is the current year, *0* is the basic year.

$$g = \frac{GDP_t - GDP_0}{GDP_0} = \frac{GDP_t}{GDP_0} - 1 \quad (2)$$

where *g* is the growth rate of the economic activity, the *GDP* is the economic activity, *t* is the current year, *0* is the basic year.

Analyzing the decoupling, it is essential to measure the changes of the energy intensity:

$$i = \frac{\left(\frac{EC_t}{GDP_t}\right) - \left(\frac{EC_0}{GDP_0}\right)}{\frac{EC_0}{GDP_0}} = \frac{EC_t}{GDP_t} \Big/ \frac{EC_0}{GDP_0} - 1 \quad (3)$$

To measure the decoupling two kinds of indicators are applied. The OECD (2002) can be considered as a pioneering work and here the decoupling factor is determined as follows (OECD, 2002: p.19):

$$decoupling\ ratio = \frac{EP_n/DF_n}{EP_0/DF_0} \quad (4)$$

where *EP* is the environmental pressure, *DF* is the driving force, *t* is the current year, *0* is the basic year. So the decoupling factor is the following:

$$decoupling\ factor = 1 - decoupling\ ratio = 1 - \frac{EP_t/DF_t}{EP_0/DF_0} \quad (5)$$

So:

$$decoupling\ factor = -i$$

Hereinafter we sign the decoupling factor as D_0:

$$D_0 = -i$$

If $D_0>0$, the trends of the examined indicators are separated (the energy intensity decreases) so the decoupling is fulfilled. The maximum value of D_0 is 1. If $D_0 \leq 0$ the decoupling does not occur (the energy intensity increases), this is the case of non-decoupling.

Because of its simplicity it is applied in many studies but here we draw attention to the limitations of this indicator. Decoupling is only associated with a reduction (or improvement) in energy intensity, but that can coexist with energy intensity that is not decreasing when the economy is in expansion or decreasing when economic activity is stagnating or falling (Grand, 2016: p.651).

The following indicator (D_ε) is worked out by the UNEP (2011) and it allows further interpretations, but it cannot solve the mentioned problem (the right side of the formula is deducted in detail in Grand, 2016: p.652).

$$D_\varepsilon = \frac{e}{g} = \frac{g + i + g * i}{g} \quad (6)$$

Table 1 enables us to interpret the possible results, which summarizes 13 different cases; hereinafter these are presented in more detail (Grand, 2016: pp.652-654). In the worst case the energy intensity increases (so i > 0) and it has three stages: expansive negative decoupling, weak negative decoupling and strong negative decoupling (case 1, 9 and 11). In the first case the rate of energy consumption fluctuation and the economic growth is positive and moreover the energy consumption is increasing more than the actual increase of the GDP. In the second case these indicators decrease (but the energy consumption to a lesser extent than the economy), by the third variation the energy consumption increases in spite of the recession. So the term of negative decoupling refers to its absence. In cases 2, 7 and 12 the growth rate of the energy consumption and the GDP is the same, but the direction of the change is different (the decoupling is performed in neither case). In reality due to the features of the respective statistical data and services these cases are really rare.

Case 3 is a decoupling situation, but its extent is really weak. Here both the energy consumption and the GDP increases as well, however the energy intensity improves (typically it is called relative decoupling). Case 5 shows absolute or strong decoupling, when the economy is in expansion but the reduction of the energy consumption can be observed (so the energy intensity improves). In Case 13 the economy is in recession and the energy consumption drops as well and it is the situation of recessive decoupling. In cases 4 and 10 the change of the rate of energy consumption is zero, in case 6 and 8 the economic growth rate is that so D_ε cannot be interpreted only D_0. Case 4 and 8 indicate a decoupling situation but case 6 and 10 do not.

Grand (2016) emphasizes that it is important to differentiate from the perspective of the economic situation. When the economy is in recession the interpretation is reversed. In such circumstances the relative decoupling is better than the absolute, because in both the energy intensity increases, but in the former (case 9) less than in the latter (case 11). If the economy is shrinking, the less negative situation is the recessive decoupling (case 13) because of the decreasing energy intensity.

Table 1.

Possible cases of decoupling indicators.

Case	e	g	i	D_0=-i	D_ε=e/g=(g+i+g*i)/g
1	>0	>0	>0	<0 non decoupling	>1 expansive negative decoupling
2	e=g>0	>0	=0	=0 non decoupling	=1 expansive coupling
3	>0	>0	<0	>0 decoupling	>0, i>-g/(1+g) <1 weak decoupling
4	=0	>0	<0	>0 decoupling	=0, i=-g/(1+g) not defined
5	<0	>0	<0	>0 decoupling	<0, i<-g/(1+g) strong decoupling
6	e=i>0	=0	>0	<0 non decoupling	→+∞ not defined
7	e=g=i=0	=0	=0	=0 non decoupling	indeterminate, not defined
8	e=i<0	=0	<0	>0 decoupling	→-∞ not defined
9	<0	<0	>0	<0 non decoupling	>0, i<-g/(1+g) <1 weak negative decoupling
10	=0	<0	>0	<0 non decoupling	=0, i=-g/(1+g) not defined
11	>0	<0	>0	<0 non decoupling	<0, i>-g/(1+g) strong negative decoupling
12	e=g<0	<0	=0	=0 non decoupling	=1 recessive coupling
13	<0	<0	<0	>0 decoupling	>1 recessive decoupling

Note: light grey color signs that cases when the economy stagnates; dark grey color signs when the economy is in recession.

Source: own compilation based on Grand, 2016: p.653).

We apply annual data (collected from the Eurostat and World Bank databases) to analyze the 1990-2015 time period and our study focuses on the Visegrad Four countries, so on the Czech Republic, Slovakia, Poland and Hungary (the following abbreviations are applied in the tables and charts: Czech Republic (CZ), Poland (PL), Slovakia (SK) and Hungary (HU)). The two main indicators are the final energy consumption and the economic growth. The former one expresses the sum of the energy supplied to the final consumer for all energy uses (data source is the Eurostat, 2016; unit: 1000 toe). In this study we prefer the GDP PPP (constant 2011 international USD) which contributes to the comparability of the data.

There is no reliable statistical data in the field of environmental pressure in our region so the ecological footprint is applied to calculate the impact of decoupling. The indicator is “the area of land and water it takes for a human population to generate the renewable resources it consumes and to absorb the corresponding waste it generates, using prevailing technology.” In other words, it measures the "quantity of nature" that we use and compares it with how much "nature’ we have” (Global Footprint Network, 2016). This latter component is defined by the biocapacity. (Data source is Global Footprint Network, 2016; unit: global hectare.)

Many researchers argue (so Sorrell, 2010) that the literature of decoupling mainly focuses on the economic growth, but it is unacceptable from the perspective of sustainability. In our view the basic idea of decoupling is how economic activity (which mainly resulted in energy consumption) at national level can be delinked from the additional energy use. Measuring the economic activity, the GDP is the most appropriate, it takes into account very precisely all of these activities (without regard if that activity has positive or negative effect on wealth or on quality of life) [Szendi (2016) argues similarly]. Many sustainability indicators (such as ISEW, GPI) are based on GDP and are calculated with correction of that (Szlávik, 2013). Furthermore, many cases during which the economy is in recession are examined in this paper, which can provide a solution to this indicated problem.

4. RESULTS

After the change of regime the energy consumption considerably decreased (the energy intensity significantly improved) in the Visegrad Four countries. It was caused mainly by the improvement of the sectoral energy efficiency (so called intensity effect which is consequence of the technological development and the growth of productivity). The structural effect [so the shift among the economic (sub)sectors)] mainly in the first years was significant, but analyzing the last two decades it can be stated that the magnitude of the structural effect is less than the intensity effect. (Sebestyén Szép, 2012)

The previously described processes are clearly presented in **Figure 1**. While the Czech Republic, Slovakia, and Hungary experienced a rapid economic development coupled with declining energy consumption and increasing energy intensity, the respective population did not considerably change (while in the Czech Republic and in Slovakia it slightly increased, in Hungary decreased). The last two examined years show an exception in Hungary. The corresponding increase in final energy consumption was partly motivated by the election period significantly affecting the economic policy and the central government budget along with the intensive absorption of the EU funds and the newly built capacities in the automotive industry. In Poland the final consumption recovered and returned to the transition level because of the increasing energy demand in the household, transport and service sectors. Furthermore, the population was reduced by 110 thousand people, while only the industry sector experienced a decrease.

The structure of energy use has significantly changed in the last two decades. In the examined time period – motivated by the shared objectives of the European Union – the share of the renewable energy sources significantly increased in the primary energy consumption at the expense of coal and crude oil. It is important to highlight that from the perspective of sustainability it is crucial whether the national energy use is based on renewables or not and furthermore in what kind of energy resources the decoupling occurs. This choice affects both the ecological footprint and the biocapacity as well (it will be described in more details in the next part of the study).

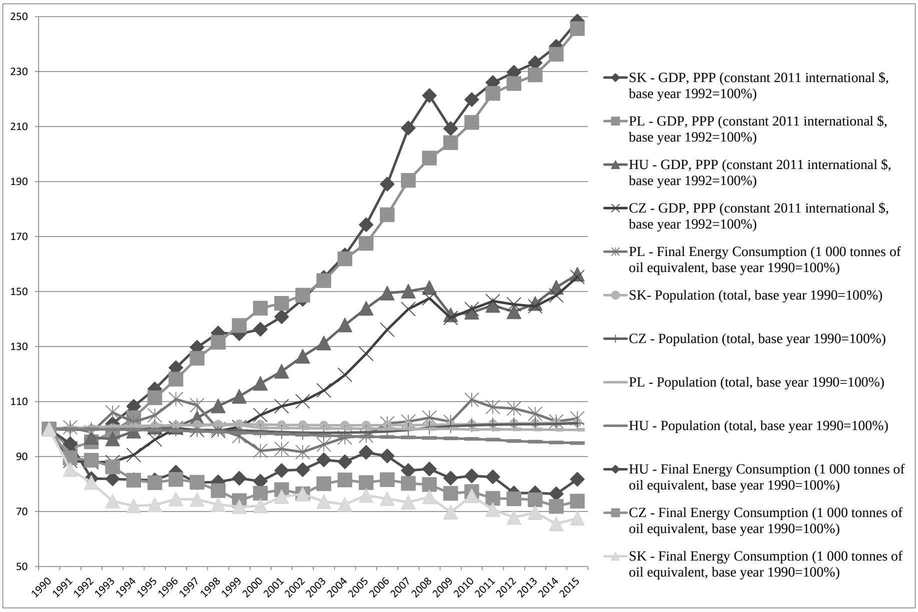

Fig. 1. The trends of the GDP, the final energy consumption and the population in East-Central Europe (1990=100%, 1990-2015)
(*Source: own construction based on Worldbank, 2016 database; Note:*: no data, basic year is 1991 and 1992*).

Considering the three possible cases of the economic development (economic growth, stagnation and recession) Poland appears to be unique because with the exception of 1991 the economic growth rate was uninterruptedly positive (even a temporary setback is not experienced). In 1991 the energy consumption – temporarily – increased in spite of the economic downturn (Case 11) eroding the energy intensity of the economy, which can be interpreted as strong negative decoupling. In the time period of the economic boost only two years can be found when the conditions of decoupling are not fulfilled (Case 1): in 1993 and in 2010 the energy use was increasing more than the expansion of the economy, the energy intensity deteriorated resulting in an expansive negative decoupling (so it is the worst case). In the remaining years the cases of the absolute and relative decoupling followed one an- other, but the former one is more common than the latter. These results (actually the realized decoupling) are confirmed by our former research (Sebestyén Szép, 2013) which analyzed the Granger causality directions between energy use and economic growth in Central-East Europe (refers to the period 1990-2009). It is found that the direct Granger causality relationship could not be proved in Poland between the two indicators.

The Czech economy depends greatly on the world economic cycle, because it was in recession in 1991, 1992, 1997, 1998, 2009, 2012 and 2013, and while the energy consumption decreased as well (except 2013) the situation is not rated as absolute or relative decoupling. In 1991 and 2009 (Case 9) the rate of economic decline exceeded the decreasing rate of the energy use, so it is the situation of the weak negative decoupling. In 2013 (Case 13) the energy intensity deteriorated in spite of the economic downturn, which resulted in strong negative decoupling. In 1992, 1997, 1998 and 2012 (Case 13) recessive decoupling is discernible because the energy use decreased more than the economic slowdown. In 2003 the decoupling is expansive negative (Case 1) as the energy intensity increased. Similarly to Poland in the remaining time period (17 years) the cases of the absolute and relative decoupling alternated, but the former one is more common than the latter.

In Hungary 14 cases from the 24 under examination show both the absolute (8) or the relative (6) decoupling. 8 years can be found when the energy intensity increases (during 3 years in spite of the economic recession): in 1996, 2001, 2003, 2010, 2013 and 2015 the situation is considered expansive, negative decoupling; in 1993 and in 2009 it was the weak negative decoupling. In 1992 and in 2012 the less negative Case 13 was fulfilled (recessive decoupling).

Regarding Slovakia 23 years were assessed and during 18 years the criteria of decoupling were fulfilled (11 absolute and 7 relative instances of decoupling). During 3 years (2001, 2010 and 2013) the decoupling is expansive and negative, in 1999 and in 2009 it is recessive (Case 13) which means that the economy is in recession and the energy consumption drops as well, but in greater extent so the energy intensity improves. **Table 2** shows the realized cases of decoupling and **Table 3** (Appendix) presents the exact numerical details.

Table 2.

The realized cases of decoupling in the examined countries (1990-2015).

	91	92	93	94	95	96	97	98	99	00	01	02	03	04
CZ	9	13	5	5	5	3	13	13	5	3	3	5	1	3
HU		13	9	5	5	1	5	3	3	5	1	3	1	5
PL	11	5	1	5	3	3	5	5	5	5	3	5	3	3
SK			5	5	3	3	5	5	13	3	1	3	5	5

	05	06	07	08	09	10	11	12	13	14	15
CZ	5	3	5	5	9	3	5	13	11	5	3
HU	3	5	5	3	9	1	5	13	1	3	1
PL	3	3	3	3	5	1	5	5	5	5	3
SK	3	5	5	3	13	1	5	5	1	5	3

Note: light grey indicates the less ideal cases of decoupling; dark grey indicates the cases of non decoupling. (Classification on Table 2).

Source: own compilation.

Previously the examination of the resource decoupling was performed in the context of the Visegrad Group (the Appendix contains the numerical results). In our view the consequences of resource decoupling should be reflected in the impact of decoupling as well and our analysis utilized the concept of the ecological footprint.

According to the Global Footprint Network (2016) the carbon-dioxide emission is the half of the complete ecological footprint in all of the examined countries which is in tight connection with the energy mix from the perspective of the global climate change. In primary energy production the changes of the share of the fossil and renewable energy sources have a major impact because the carbon footprint of the energy sources is really different. Calculating the carbon dioxide emission per kilowatt-hour – if the carbon footprint of a solar power plant is 1 unit – in this comparison the carbon footprint of the hydroelectric power plant is less than half and in case of wind farms it is less than one fifth. But the carbon footprint of the coal and oil power stations is tenfold and in case of gas operated power stations is sevenfold. But the carbon pressure of the nuclear power plants is positive as it is equal with carbon footprint of wind farms (However, it is noted that the complex environmental pressure of nuclear energy is probably greater than that of renewable energy sources. The nuclear power plants are sometimes called green electricity producers but it is correct only with regard to the low level of carbon dioxide emission).

It follows that the national ecological footprint is significantly affected by the energy mix and the dynamics of the structural changes and growth. It is important to highlight that the European carbon footprint (Global Footprint Network, 2016) decreased by 22% in the last two decades after 1990. Analyzing the potential causes, it can be stated that the carbon-dioxide emission related to the energy use declined by 20%, but it was offset by the increasing energy consumption of the transport sector (it increased by 20% in the examined time period). With the exception of the transport sector the carbon intensity significantly developed in all of the economy sectors.

Hereinafter we review the changes of the ecological footprint and the biocapacity in the Visegrad Group (**Fig. 2**). The ecological footprint of the 28 member states of the European Union was nearly 5 global hectare in 2010. In the Visegrad Group the eco pressure of the Czech Republic was the highest (6 global hectare per person), and Hungary had the lowest one (~ 3,5 gha). The ecological footprint is nearly the same in Poland and Slovakia (~ 5 gha). Let's examine these data in the context of energy production and decoupling! (It is noted that these data refer to the complex economic and social effects so the consequences on energy use are limited. More research is needed to get a clear picture).

Figure 2 shows the energy production by fuel in the Visegrad Group. In Poland the share of the solid fuels is still over 80% and (as previously described) the carbon footprint is great as well. Probably this phenomenon is one of the main causes of the big ecological footprint (which is higher than the development stage of the country would justify).

The ecological footprint of the Czech Republic is higher than the EU average and it can be explained with the high development stage (GDP per capita) and with the significant share of fossil fuels. But a positive trend can be observed as well because the substitution of fossil fuels with renewables and nuclear energy has started in the examined time period.

The Hungarian ecological footprint significantly improved as a consequence of the collapse of the heavy industry and the decreasing rate of coal use after the regime change. Both the increasing share of renewables and the significant nuclear capacity affect it positively as well. Next to the study of the ecological footprint (determined by the carbon footprint) a more complex analysis of the sustainable competitiveness is needed as well with special regard to the concept of sustainable regions. The renewed regional pyramid model of Lengyel (2016) shows that the sustainability analysis of the energy sector contains the elements of economic structure, regional access and infrastructure, employment etc. (Lengyel 2016: p.75). While a huge power plant (such as a nuclear power plant) strengthens the center, the developsgment of renewables and using the local resources can contribute to the decreasing of regional disparities.

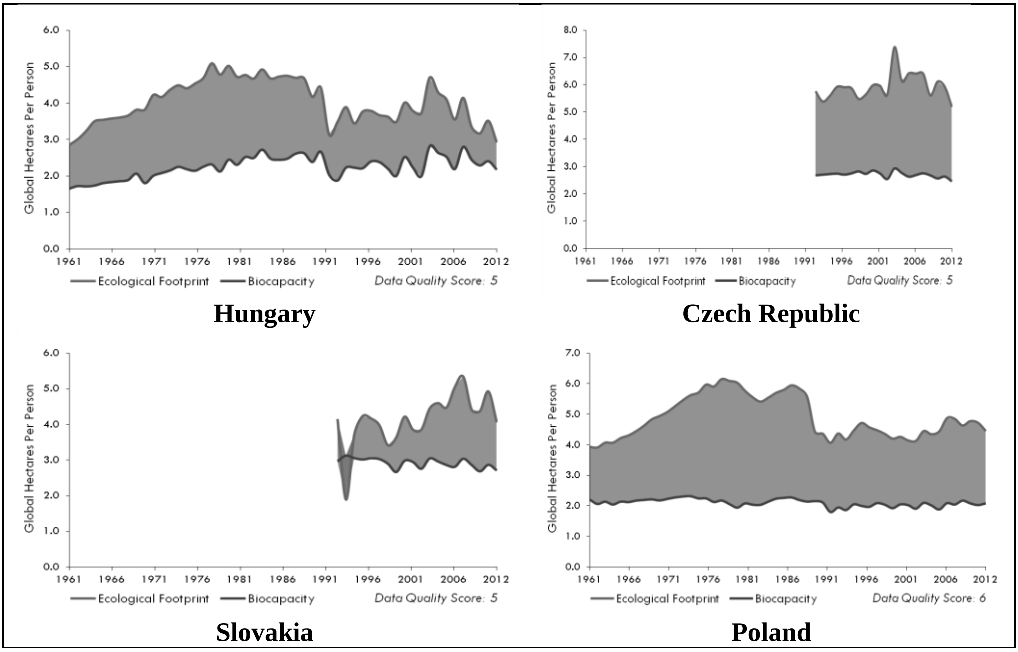

Fig. 2. The ecological footprint and biocapacity in East-Central Europe (1960-2012, global hectare) (*Source: Global Footprint Network, 2016*).

Slovakia has a relatively high ecological footprint but it cannot be explained with the energy structure, because the low level of fossil fuel use, high nuclear and renewable energy consumption might suggest low ecological footprint. The reasons of this discrepancy need more analysis.

Our study about the ecological footprint shows that not only a resource examination but an impact analysis should be performed as well because the issues on sustainability can be solved only in this way.

5. CONCLUSION

After the regime change the energy intensity of the Visegrad Four countries decreased significantly which can give rise to optimism. In the long run it makes economic development with decreasing energy growth rate possible thereby contributing to economic and social sustainability. The technological development and the changes of the economic structure facilitate meeting the needs of the population in less energy intensive ways.

Our study leads to the following conclusions:

1. Two and half decades after the regime change, the economies in East-Central Europe performed the absolute or relative decoupling during a significant part of the period considered.
2. However, the time intervals of 1990-1993 and 2009-2013 (as a result of the 2008-2009 global crisis) can be interpreted as a structural break, because in these years

the decoupling of the examined variables was not detected and only weak negative, strong negative and expansive negative decoupling can be found.

3. It can be stated that the decoupling is not a permanent process after even one and half decades (such as Poland – 1994-2009) the positive tendency can be reversed.
4. The analysis of the ecological footprint shows that the examination of the energy consumption not only reveals resource decoupling, but impact decoupling as well.

The process of decoupling is an important sign for the decision makers of a country to assess the effectiveness of the environmental policy. There are many devices available for delinking the energy consumption from economic growth including the restructuring of the industrial production and supporting energy efficiency and energy saving policies.

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Appendix

Table 3.

The trends of the decoupling indicators in the examined countries (1990-2015).

	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
e - CZ	-0,105	-0,009	-0,027	-0,056	-0,011	0,015	-0,013	-0,038	-0,047	0,036	0,017	-0,020
g - CZ	-0,116	-0,005	0,001	0,029	0,062	0,043	-0,007	-0,003	0,014	0,043	0,031	0,016
D_0 - CZ	-0,012	0,004	0,028	0,083	0,069	0,027	0,006	0,035	0,060	0,006	0,013	0,035
D_ε - CZ	0,906	1,832	-44,25	-1,924	-0,182	0,354	1,907	12,009	-3,246	0,848	0,551	-1,188
e - HU	-0,054	-0,133	-0,002	-0,004	-0,001	0,035	-0,045	0,004	0,016	-0,013	0,049	0,004
g - HU		-0,031	-0,006	0,029	0,015	0,000	0,033	0,042	0,032	0,042	0,038	0,045
D_0 - HU		0,106	-0,004	0,032	0,016	-0,035	0,076	0,037	0,015	0,053	-0,010	0,040
D_ε - HU		4,352	0,300	-0,128	-0,077	625,110	-1,363	0,085	0,504	-0,316	1,285	0,078
e - PL	0,006	-0,018	0,074	-0,033	0,023	0,056	-0,020	-0,079	-0,026	-0,054	0,007	-0,012
g - PL	-0,070	0,025	0,037	0,053	0,070	0,061	0,065	0,046	0,046	0,046	0,012	0,020
D_0 - PL	-0,082	0,042	-0,035	0,081	0,043	0,004	0,080	0,120	0,070	0,096	0,005	0,032
D_ε - PL	-0,088	-0,727	1,968	-0,616	0,336	0,922	-0,311	-1,716	-0,570	-1,190	0,571	-0,598
e - SK	-0,147	-0,055	-0,084	-0,023	0,005	0,029	-0,002	-0,025	-0,010	0,004	0,046	0,013
g -SK			0,019	0,062	0,058	0,068	0,061	0,040	-0,002	0,012	0,033	0,045
D_0 - SK			0,101	0,080	0,051	0,036	0,059	0,063	0,008	0,008	-0,013	0,031
D_ε - SK			-4,430	-0,375	0,079	0,435	-0,030	-0,625	5,117	0,325	1,390	0,290

	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15
e - CZ	0,048	0,017	-0,012	0,013	-0,016	-0,005	-0,041	0,009	-0,032	-0,002	-0,005	-0,03	0,027
g - CZ	0,036	0,049	0,064	0,069	0,055	0,027	-0,048	0,023	0,020	-0,008	-0,005	0,027	0,045
D_0 - CZ	-0,012	0,031	0,072	0,052	0,068	0,032	-0,008	0,014	0,052	-0,006	0,000	0,058	0,018
D_ε - CZ	1,339	0,352	-0,189	0,192	-0,294	-0,200	0,837	0,396	-1,621	0,217	0,991	-1,21	0,595
e - HU	0,042	-0,008	0,039	-0,014	-0,059	0,007	-0,039	0,010	-0,004	-0,071	0,001	-0,01	0,069
g - HU	0,038	0,050	0,044	0,039	0,004	0,009	-0,066	0,007	0,017	-0,016	0,021	0,040	0,031
D_0 - HU	-0,003	0,055	0,005	0,051	0,063	0,002	-0,028	-0,003	0,021	0,056	0,020	0,043	-0,04
D_ε - HU	1,087	-0,154	0,879	-0,367	-13,07	0,755	0,598	1,479	-0,249	4,437	0,045	-0,11	2,206
e - PL	0,030	0,027	0,006	0,046	0,006	0,014	-0,014	0,078	-0,024	-0,005	-0,018	-0,03	0,011
g - PL	0,036	0,051	0,035	0,062	0,070	0,042	0,028	0,036	0,050	0,016	0,014	0,033	0,039
D_0 - PL	0,006	0,023	0,028	0,015	0,060	0,027	0,041	-0,040	0,071	0,021	0,031	0,057	0,028
D_ε - PL	0,831	0,532	0,184	0,749	0,092	0,331	-0,509	2,155	-0,481	-0,297	-1,292	-0,8	0,268
e - SK	-0,036	-0,014	0,044	-0,016	-0,017	0,027	-0,074	0,086	-0,067	-0,039	0,025	-0,06	0,032
g -SK	0,054	0,053	0,068	0,085	0,108	0,056	-0,054	0,050	0,028	0,017	0,015	0,026	0,038
D_0 - SK	0,085	0,063	0,022	0,093	0,113	0,028	0,021	-0,034	0,093	0,055	-0,010	0,082	0,006
D_ε - SK	-0,660	-0,259	0,659	-0,187	-0,160	0,481	1,369	1,706	-2,379	-2,381	1,694	-2,29	0,831

(Source: own compilation)