

# Adjusted Net Savings in the Countries of the European Union

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**Abstract:** Sustainable development (SD) is an overarching objective of the European Union (EU) enshrined in its primary law, governing all the EU's policies and activities. Adjusted Net Saving (ANS) as a macro level index of SD was used to evaluate SD in the EU countries and additional four developed countries for the purpose of comparisons. ANS was assessed according to the ANS ratio in % of GNI and the ANS per capita. Moreover, the ANS component indicators were investigated to complete the evaluation. Although the results differ between countries according to the applied ANS indicator, Norway has shown high levels of both ANS indicators. Although this country showed the highest sum of the negative ANS components after subtracting the positive component, it was evaluated as the best performing economy according to the combination of the monitored indicators. On the other hand, Greece is evaluated as the unsustainable country having shown negative ANS since 2008. Romania and Lithuania showed the significant improvements and moved from the unsustainable territory. The ANS of the monitored countries has significantly been affected by the economic crisis.

**Key words:** Adjusted Net Savings (ANS) · European Union (EU) · Sustainable Development (SD)

**JEL Classification:** Q51 · F56

## 1 Introduction

Sustainable development (SD) and achieving SD goals has gained great importance worldwide. Since the most quoted definition of the SD was adopted by the World Commission on Environment and Development (WCED) (WCED, 1987) a huge number of measurement methods and indicators of the SD has been developed. According to this definition, SD is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). SD is an overarching objective of the EU enshrined in its primary law, governing all the EU's policies and activities. The EU Sustainable Development Strategy (EU SDS) was launched in 2001 and renewed in 2006. This strategy provides an EU-wide policy framework to deliver SD (European Union, 2009). The Sustainable Development Indicators (SDIs), reflecting the key challenges of the EU SDS are used to monitor the EU SDS and presented in ten themes. However, there are other basic indicators that are useful to monitor SD aspects, such as the macro level index called Adjusted Net Saving (ANS). The aim of the Paper is to evaluate sustainability in the EU and its countries together with additional five developed countries. The evaluation is carried out by means of the ANS and its component indicators.

## 2 Methods

Advocates of weak sustainability argue that physical and natural capital are substitutes (Anderson, 2010). Thus, the basis for human welfare is not only natural capital but rather the aggregate level of capital. The concept aims to provide means for tracking that the total level of capital including natural, man-made, human and social capital of society is non-declining. Pearce and Atkinson (1993) put forward an index which is based on the Hicksian income concept. Particularly, they provided one of the earliest suggestions for an indicator for measurement of the (very) weak sustainability, according to which a country achieves very weak or weak SD path if the savings exceed the total depreciation of both material and natural capital. The human capital will not depreciate because it has public-good aspects and can be passed from one generation to another. The maintenance of the total capital stock depends on a national savings rate which is at least as great as the combined depreciation rate of natural and physical capital. The other forms of capital are difficult to measure. Following that an economy is sustainable if it saves more than the combined depreciation on the two forms of capital.  $Z$  is an Index of (Weak) Sustainability and the condition for sustainability is (Pearce and Atkinson, 1995):

$$Z = \frac{S}{Y} - \left[ \frac{\delta_M}{Y} + \frac{\delta_N}{Y} \right] \geq 0, \quad (1)$$

where  $S$  is savings,  $\delta_M$  is the value of depreciation on man-made capital, and  $\delta_N$  is the value of depreciation on natural capital. All variables are divided by income  $Y$ .

In order to consider the depletion of natural capital in national income accounting, the World Bank has developed a composite indicator known as Genuine Savings or Adjusted Net Saving (ANS) which is based on the above mentioned Index of Weak Sustainability (Pillarsetti, 2005). The ANS is a macro level index of SD building on the concepts of green national accounts. It extends the conventional net saving by adding human capital accumulation and deducting natural resources losses (Gnègnè, 2009). It means that ANS measures the true rate of savings in an economy after taking into account investments in human capital, depletion of natural resources and damage caused by pollution (World Bank, 2012). Thus, the theoretical background is the idea that sustainability requires the maintenance of a constant stock of extended wealth that is not limited to natural resources but it also includes physical, productive capital, as measured in traditional national accounts, and human capital. Net ANS should represent the change in this total wealth over a given time period (a year). Such a concept can be understood as the relevant economic counterpart of the notion of sustainability. Namely, it does not include only natural resources but also, in principle at least, those ingredients necessary to provide future generations opportunities which are at least as large as those available to current generations (Fitouss et al., 2011). The derivation of ANS from standard national accounting measures of Gross National Savings (GNS) by making four types of adjustments can be seen in Table 1. Firstly, estimates of capital consumption of produced assets are deducted to obtain Net National Saving (NNS). Secondly, current Education Expenditures (EDE) are added to NNS as an appropriate value of investments in human capital. In standard national accounting these expenditures are treated as consumption. Thirdly, estimates of the depletion of particular natural resources are deducted to reflect the decline in asset values associated with their extraction and harvest. Estimates of resource depletion are based on resource rents calculation whereas an economic rent represents the *excess* return to a given production factor. These rents are derived as the difference between world prices and the average unit extraction or harvest cost, including a *normal* return of capital. Finally, pollution damages are deducted. Many pollution damages are local in their effects, and therefore difficult to estimate without location-specific data. So, to calculate the ANS indicator, health damages due to urban air pollution are estimated. As regards global pollution damages, the estimates include damages from carbon dioxide emissions (Redclift and Springett, 2015). The construction of the ANS is described in Table 1 in detail. The formula for the ANS calculation is summarized in the last field of Table 1.

**Table 1** The method of calculating the Adjusted Net Saving in successive steps

Item	Definition and/or Formula	Item	Definition and / or Formula
GNS	$GNS = GNI - \text{Private Consumption} - \text{Public Consumption} + \text{Net Current Transfers}$	Mineral Depletion (MD)	$MD = PV (\text{Rent}, 4\% \text{ Discount Rate}, \text{Exhaustion Time}) / \text{Exhaustion Time}$ $\text{Rent} = \text{Production Volume} \times \text{Unit Resource Rent}$ ; $\text{Unit rent} = \text{Unit Price} - \text{Unit Cost}$ ; $\text{Exhaustion Time} = \min (25 \text{ years}, \text{Reserves} / \text{Production})$
Depreciation (CFC)	Replacement value of capital used up in the process of production (data taken directly from source or estimated)	Net Forest Depletion (NFD)	$NFD = (\text{Roundwood Production} - \text{Increment}) \times \text{Average Price} \times \text{Rental Rate}$
NNS	$NNS = GNS - \text{Depreciation}$	CO <sub>2</sub> Damages (CO <sub>2</sub> D)	$CO_2D = \text{Emissions (tonnes)} \times \text{Marginal Global Damages per ton of Carbon emitted (\$20)}$
Education Expenditure (EDE)	Public current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment (data taken directly from source or estimated)	Particulate Emissions Damage (PED)	Damages are calculated as foregone labour income due to premature death.
Energy Depletion (ED)	$ED = PV (\text{rent}, 4\% \text{ Discount Rate}, \text{Exhaustion Time}) / \text{Exhaustion Time}$ $\text{Rent} = \text{Production Volume} \times \text{Unit Resource Rent}$ ; $\text{Unit Rent} = \text{Unit Price} - \text{Unit Cost}$ ; $\text{Exhaustion Time} = \min (25 \text{ years}, \text{Reserves} / \text{Production})$	Adjusted Net Savings (ANS)	<b><math>ANS = NNS + EDE - ED - MD - NFD - CO_2D - PMD</math></b>

Source: World Bank (2016), Bolt (2002); Own processing

Note: data used for individual variables are extracted from different sources, see more in World Bank (2016); Bolt et al. (2002)

The ANS is an indicator of sustainability and it serves as a policy indicator as well. It reinforces the need to boost domestic savings and hence the need for sound macroeconomic policies, as well as the need to improve the environment and resource management. In addition, it makes the growth-environment trade-off quite explicit, since those countries planning to grow in recent times and to protect the environment later will show lower levels of ANS. This is an important aspect of SD. Negative values of ANS imply that total wealth of the economy is in decline and therefore policies leading to persistently negative ANS can be regarded as policies for unsustainability (Gnègnè, 2009). He showed that positive and significant relationship exists between ANS and aggregate welfare but weak in magnitude.

However, there are some methodological aspects which needs to be taken into account. The negative ANS value clearly indicates unsustainability. However, the ANS values generally are to some extent affected by pricing method used to estimate economic values of natural resource and environmental damages and therefore some subjectivity is present. Beyond that, the current prices are used to calculate ANS. As the savings are derived from GNI including the social and environmental effects evaluated by the particular methods the resulting ANS indicator is calculated in current prices. Therefore, to deepen the analysis in this Paper two forms of ANS indicator are used, i.e, the ANS ratio (ANS in % of GNI) and the ANS per capita. Subsequently, they are combined with additional two indicators to detect the extent of sustainability in the EU and the sample of 33 countries. Data on the ANS are taken from the World Development Indicators (World Bank, 2016). Regarding the sample, the EU as a whole and its countries together with five additional developed countries are investigated according to the data availability. These countries are Canada, Iceland, Norway, Switzerland and the USA. The overall monitored period is 1990 – 2014, but for many EU countries data are available starting from 2002 and therefore in the analysis of the countries this period is used. For Malta, data on the ANS are not available but the component indicators are available except for NFD and thus all the required indicators were calculated using the available component indicators.

### 3 Research results

The results of the sustainability assessment are presented in this section. Firstly, the ANS ratio (ANS in % of GNI) and the ANS per capita are used for the evaluation of 33 sample countries. Next, the component indicators of the ANS are examined in this sample.

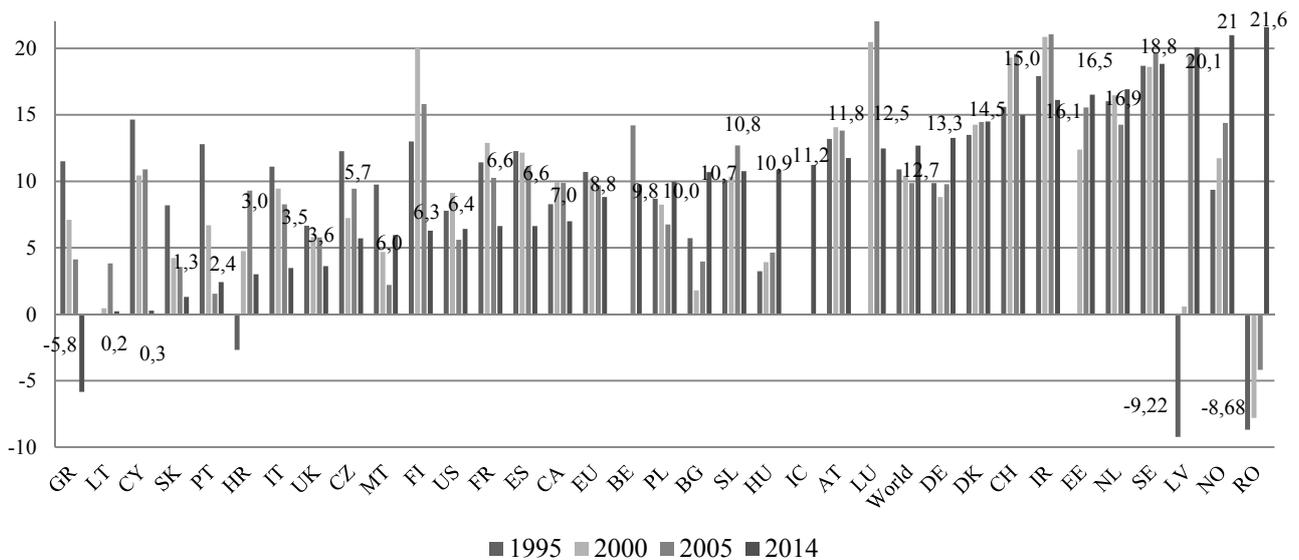
#### 3.1 Adjusted Net Savings in the EU and its countries

Starting with the first part of the analysis, the Figure 1 shows the ANS ratio in the EU and other five developed countries in 1995, 2000, 2005 and 2014. When data in the last year 2014 are not available, those of 2013 for Iceland and Greece and of 2011 for Malta were used in all the Figures included. In 1995 and 2000 data are also unavailable for several countries. However, these are not replaced by the data of other years. In 1995, Lithuania, Romania and Croatia showed the negative ANS values of -9.223%, -8.683% and -2.677% of GNI respectively. Sweden showed the highest ANS ratio in 1995 (18.692%) and it was followed by Ireland, Netherlands, Switzerland and Cyprus. In 2000, only Romania showed the negative ANS ratio (-7.802%) but Latvia and Lithuania showed the levels below 1% of GNI. Ireland achieved the highest ratio (20.871% of GNI). It was followed by Luxembourg, Finland, Switzerland, Sweden and Netherlands. It can be confirmed again that the Northern countries showed the relatively high ratios and the remaining Northern country, Norway, showed the ANS of 11.74% of GNI. In 2005 Romania as the only country showed the negative ANS ratio of -4.181%. However, in comparison to the previous monitored years, the improvement occurred. In this year, it was followed by Portugal (1.539%), Malta (2.207%) and three countries showing ANS in the range 3–4% of GNI, i.e. Slovakia, Latvia and Bulgaria. Some of the best performing countries are similar to those achieving the highest ratios in the previous years. BENELUX countries, Northern countries, two Baltic countries, Ireland and Switzerland showed the highest ANS ratios.<sup>2</sup> Luxembourg was the best performing country with the ANS ratio of 24.289% of GNI, exceeding even that of Ireland (21.058%). Sweden, Switzerland and Lithuania showed the ANS ratio higher than 19%. It can be seen that Lithuania has increased its ANS ratio significantly while Latvia remained as one of the worse performing country.

In the last monitored year 2014 the significant changes occurred as well, which is predominantly the result of the economic crisis. Greece became a worst performing country having shown the negative ANS since 2008. Although there are not available data in 2014, this country still showed the relatively high negative ratio of -5.845% in 2013. Latvia and Cyprus followed this country with the ratios lower than 1% while the latter country showed the significant ANS drops as compared to previous years, especially before 2007. Slovakia and Portugal are also one of the worst performing countries. Some of the best performing countries remained the same as in 2005, but some significant changes, including those in the order of countries, took place. Especially, Luxembourg and Finland worsened their position markedly as compared to 2005 (-11.814 p. b. and -9,528 p. b. respectively). These countries together with Cyprus and Greece deteriorated their ANS score most significantly. On the other hand, Romania significantly increased its ANS ratio. It has showed the positive rates since 2007 and ended up as the country with highest ANS ratio in 2014. It is followed by Norway which also increased its ratio markedly and in 2014 this country showed its highest score as compared to the period starting from 1990. Lithuania further increased its ANS score and ended up as the country with the third highest ratio in 2014. The ANS of Sweden slightly dropped as compared to 2005, achieving the fourth highest ratio in the sample.

<sup>2</sup> For Belgium data have been available since 2002, for Iceland data are available only in 2011 – 2013.

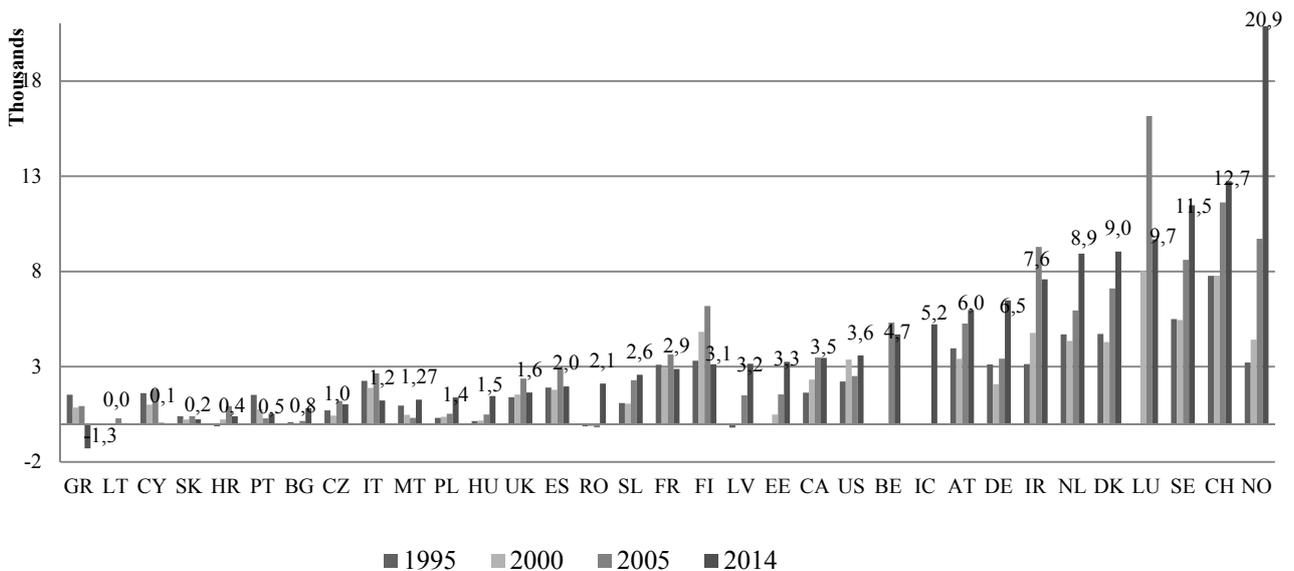
**Figure 1** Adjusted Net Savings, in % of GNI, selected years



Source: World Bank (2016); Own processing

Next, the ANS per capita was calculated for the countries in the sample. To obtain the ANS per capita the ANS in current US\$ was divided by total population of the country. The results are shown in Figure 2. There are some changes in the order of countries when the ANS per capita is used instead of ANS ratio. In 1995, Switzerland was the best performing country, followed by Sweden, Denmark and Netherlands. However, Ireland and Cyprus showed relatively worse position when this indicator is used and, on the other hand, Norway improved its position markedly. In 2000, Luxembourg achieved the highest ANS per capita and it was followed by Switzerland, Sweden and Finland. Ireland, which is the country with the highest ANS ratio in this year, ended up as the fifth best performing country and the following one, Norway, improved its position in comparison to the ANS ratio. In 2005, Luxembourg achieved the highest ANS per capita together with highest ANS ratio. It was followed by Switzerland, Norway, Ireland and Sweden, which means that Norway's ANS per capita exceeded those of other Northern economies as well as that of Ireland. In 2014, Norway showed the highest ANS per capita whereas Romania showing the highest ANS ratio showed the relatively lower score in ANS per capita. Norway was followed by Switzerland, Sweden, Luxembourg, Denmark and Netherlands (see Figure 2).

**Figure 2** Adjusted Net Savings, in Current US\$ per capita, selected years



Source: World Bank (2016), Own processing

The correlation coefficient between two ANS indicators in the sample in 2014 was equal to 0.689. It is obvious that while the ANS ratio is determined by the shares of the ANS components in GNI, the ANS per capita is determined by the overall ANS in monetary units including the influence of the price level and the population size. This can help understand why some less developed EU countries, such as Romania, Lithuania and Estonia are able to achieve high ANS ratio (see Figure 1) but not the ANS per capita (see Figure 2). Overall, the Northern countries (except for Finland) and BENELUX countries together with Switzerland, Ireland, Germany and Austria achieved relatively higher levels of both ANS indicators. In two Baltic economies the high ANS ratio was achieved, but not the ANS per capita while Latvia showed very low levels of the ANS indicators. Many new Member States and Southern economies showed relatively low ANS levels. As it results from the previous analysis, the development of the national savings, including the adjusted ones is significantly affected by the actual economic development. The last economic crisis led to substantial drops of the ANS indicator, including the deterioration of the positions of previously well performing countries. In 2009, the ANS ratio declined both in the EU and the overall world and in the majority of the countries in the sample except for Latvia, Switzerland, Bulgaria, Lithuania, Hungary and Portugal. On the other hand, the ANS per capita increased in four of them, i.e. except for Hungary and Lithuania. These kinds of shifts can indicate economic problems. Although the overall ANS can decrease due to the economic downturn and, probably, due to the drop of the price level, the variables reflecting the resource exhaustion and pollution would probably decline more significantly as a result of the economic recession and thus the RP is usually rising and the ANS ratio can increase as well. Generally, the ANS can decrease in economic recession due to the significantly lower resource use when production declines, which is also connected with lower level of pollution. Nevertheless, the environmental effects represent relative low ratios in the ANS. Thus, the important result could predominantly be the increase of GNS ratio (in % of GNI) by the simultaneous decrease of their absolute levels. In Lithuania this development is also connected with the increase of the EDE ratio (in % of GNI), but the declines in the environmental components also occurred. In the above mentioned countries, except for Portugal, GNS ratio increased. In Switzerland and Latvia, the CFC indicators dropped as well, while in the former only the ratio (in % of GNI) and in the latter it declined also in absolute terms. In the next subsection 3.2 the component indicators are studied more in detail and the changes related to the economic crisis are also discussed.

### 3.2 Analysis of the components of the Adjusted Net Savings

To compare the performance of the countries in the ANS component indicators, which are related to the economic, social and environmental dimension of the SD, their ratios in % of GNI are used instead of recalculation of all the component indicators to obtain the corresponding per capita values. In Table 2 the countries with highest and lowest ANS ratios are shown in the most recent year 2014 and in the monitored period 2002 – 2014 where the average rates are used. When in the particular country data are not available in the overall period or in the most recent year, the longest possible period with available data is used to calculate the average rate and the most recent year where data are available. The particular cases are explained in Note 2 below Table 2. Some results are in compliance with the previous analysis (Drastichová, 2014).

**Table 2** The countries with the highest / lowest ANS component indicators ratios in % of GNI, 2002 – 2014, 2014

2002–2014	GNS	CFC	EDE	ED	MD	NFD	CO <sub>2</sub> D	PED
<b>LOWEST</b>	GR, IC, PT, MT	CY, PL, BG, UK	GR, RO, BG, SK	Zero – 7 countries	Zero – 11 countries	Zero – 18 countries	CH, SE, NO, FR	IC, NO, SE, FI
<b>HIGHEST</b>	NO, CH, LU, SE	LT, CZ, SK, CH	LV, DK, IC, SE	NO, CA RO, DK	BG, CA, PL, SE	LT, HR, SK, EE	BG, EE, PL, RO	HU, BG, RO, PL
2014	GNS	CFC	EDE	ED	MD	NFD	CO <sub>2</sub> D	PED
<b>LOWEST</b>	CY,GR, UK, MT	RO, PL, BG, UK	RO, GR, BG, SK	Zero – 7 countries	Zero – 11 countries	Zero – 20 countries	CH, SE, NO, DK	NO, IC, SE, FI
<b>HIGHEST</b>	NO, CH, EE, LU	LT, CZ, SK, CH	LV, DK, IC, MT	NO, CA, DK, RO	BG, CA, FI, PL	HR, LT, EE, SK	BG, EE, PL, CZ	HU, BG, HR, PL

Source: World Development Indicators (2016); Own processing

Note 1: The rates in the fields are ordered from the highest ones for the highest rates and from the lowest ones for the lowest rates.

Note 2: GNS – the last available data for Greece and Iceland are in 2013, for Malta in 2011; CFC, EDE, ED, MD, CO<sub>2</sub>D, PED – the same as by GNS, but the last available data for Malta are in 2013; NFD – for Greece data are not available in 2014, for Iceland data are available only in 2011– 2013, for Malta data are not available in the overall monitored period.

Note 3: The countries with zero rates of ED in 2002 – 2014 and in 2014: BE, CY, IC, LT, MT PT, SE. The countries with zero rates of MD in 2002 – 2014 and in 2014: BE, HR, CZ, EE, IC, LT, LV, MT, NL, SL, CH. The countries with non-zero values for the NFD in 2014: HR, LT, EE, SK, SL, LV, PL, CZ, CH, AT, DK, BE; moreover: IC and DE in 2002 – 2014;

GNS is the basis for the ANS and it is the crucial component of the ANS. The EU showed its share in GNI slightly above 21% both in the monitored period and in 2014. Norway showed the highest GNS, i.e. slightly higher than 37% both in the monitored period and in 2014. Switzerland also showed GNS above 30% of GNI. Luxembourg, Sweden, Netherlands and Ireland also showed relatively high saving ratios of GNI (higher than 26%, Luxembourg: 30.837%

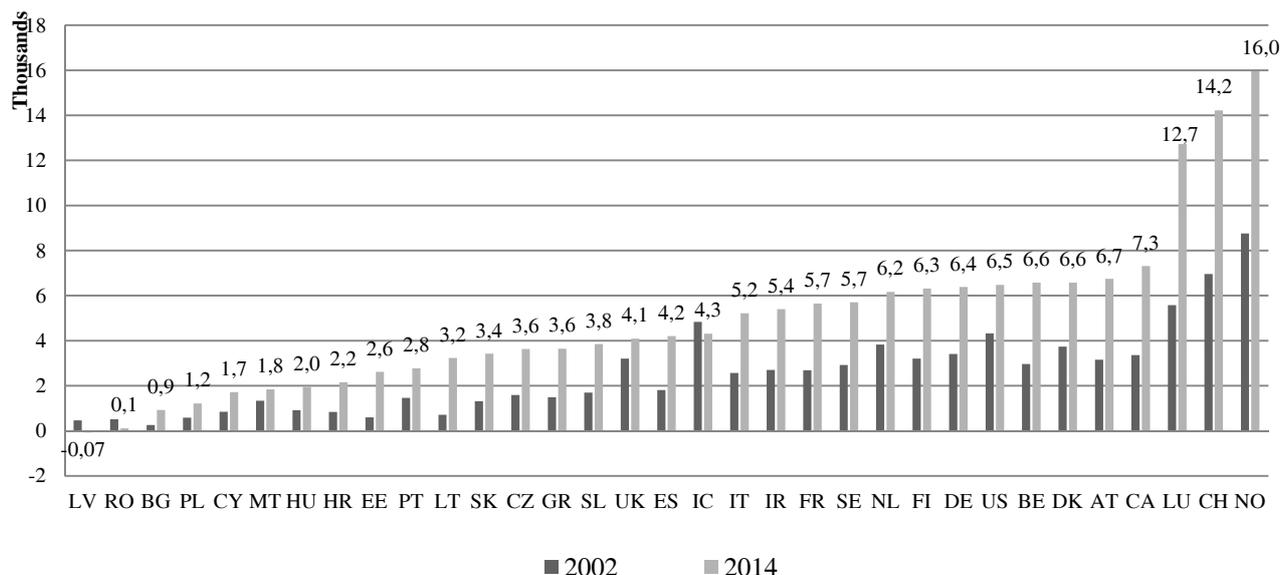
in period 2002 – 2014). Estonia has shown significant increases since 2011. On the other hand, the significant decrease in Ireland in 2008 and 2009 and persistence of the relatively lower ratios since then has been reversed since 2013. The economic crisis has had great impact on the countries, i.e. in the EU as a whole and the majority of the countries in the sample the GNS dropped in 2009. The exception were all three Baltic economies, Bulgaria and Romania, Switzerland, Iceland and Hungary. Nevertheless, some of them showed the significant drops in previous year (e.g. Bulgaria in 2007, Iceland and Switzerland in 2008) or following years (Latvia in 2010). Except for Spain, all three other Southern economies show low GNS ratios. This is also case of Cyprus, the UK, Malta, the USA, Poland and Lithuania while the latter showed the slight improvement in the recent period. In the EU the CFC is slightly above 16% of GNI both in the monitored period and in 2014. The low depreciation rate in Cyprus, Poland, Bulgaria, the United Kingdom (UK), Lithuania, Malta, the USA and Norway can partly help compensate the lower GNS in the majority of them, but in Norway it is the important factor even enhancing the highest GNS ratio. In Switzerland the high depreciation rate disadvantaged this country in relation to Norway having both high GNS and low CFC. The new Member States shown in Table 2 together with Slovenia showed relatively highest depreciation rate (around 20% of GNI and more).

EDE as a component representing social pillar of the SD showed the highest share in GNI when comparing to the environmental components (the average in 2002 – 2014: 4.754%, 2014: 5%). The lowest ratios are between 3 – 4% in the countries shown in Table 2 and also in Luxembourg. In Italy the 2014 ratio is also below 4%, so is the average ratio of the Czech Republic and Croatia. All the Northern economies show high shares of EDE but that of Lithuania is even significantly higher than in best performing Northern country which is Denmark (15.52% and 8.07% in 2014 respectively). In all three Baltic countries this kind of expenditure has predominantly been above 4% and below 6% since the middle of 1990s (according to data availability). However, in 2004 the significant annual increase by 12.543 p. b. occurred in Lithuania and the expenditure reached 17.62% of GNI. Since then it has been at the level above 15% (below 19%) and in 2009 it even showed 18.19 of GNI. The percentage ratios of the environmental variables are relatively low, some of them show zero values in more years and even the non-zero values are very low. This is especially the case of the NFD and to lower extent of MD indicator, because these indicators also significantly depend on the available amount of these resources and obviously on the way of their exploitation. Depletion of minerals shows the highest ratio in Bulgaria (0.821% of GNI in 2014 and 0.743% in 2002 - 2014) and it is followed by Canada (0.522% of GNI in 2014 and 0.461% in 2002–2014), Poland, Sweden and Finland while all three latter still show the ratio higher than 0.1%. The highest average share of NFD in period 2002 – 2014 was shown by Latvia (0.95% of GNI) and in 2014 by Croatia (1.068% of GNI). On average and in 2014 all three Baltic countries, Croatia, Slovakia, Slovenia and Poland showed the relatively higher NFD rates, all showing higher than world's average ratio.

Norway showed the highest ED shares in GNI in the overall period as well as in 2014 (12.012% and 7.069% of GNI respectively). These ratios significantly exceeded those of Canada (2.675% and 1.54% of GNI respectively). The results confirm the great dependence of these countries on energy resources. Switzerland together with four Northern economies, i.e. Sweden, Norway, Denmark and Iceland as well as France showed the lowest CO<sub>2</sub>D ratios. On the other hand, i.e. countries showing relatively high CO<sub>2</sub>D ratio are especially the new Member States in the same order at the first three places in the overall period as well as in 2014. Romania and the Czech Republic interchanged the fourth and fifth position in the overall period and in 2014. Other new Member States together with Greece, the USA and Canada follow them showing relatively higher CO<sub>2</sub>D as well. The CO<sub>2</sub> levels are determined by the structures of the economies and the effort of countries to adopt appropriate structural reforms. Although the new Member States have made significant efforts, the level of emission is still high in some of them. As regards PED, all five Northern economies show low levels, with the highest ratio among them showed by Denmark. The highest levels are typical of new Member States. However, the exception is Cyprus with low PED ratio and Estonia, Slovenia and Malta also showed relatively lower ratios. To sum up, in the whole EU the EDE showed the average level of 4.754% of GNI, ED of 0.371%, CO<sub>2</sub>D of 0.216%, PED of 0.187%, MD of 0.02% and NFD indicator only 0.014%. On the other hand, the depreciation of the physical capital showed 16.275% of GNI. This reflects the importance of the economic, social and environmental ANS components in the EU's GNI.

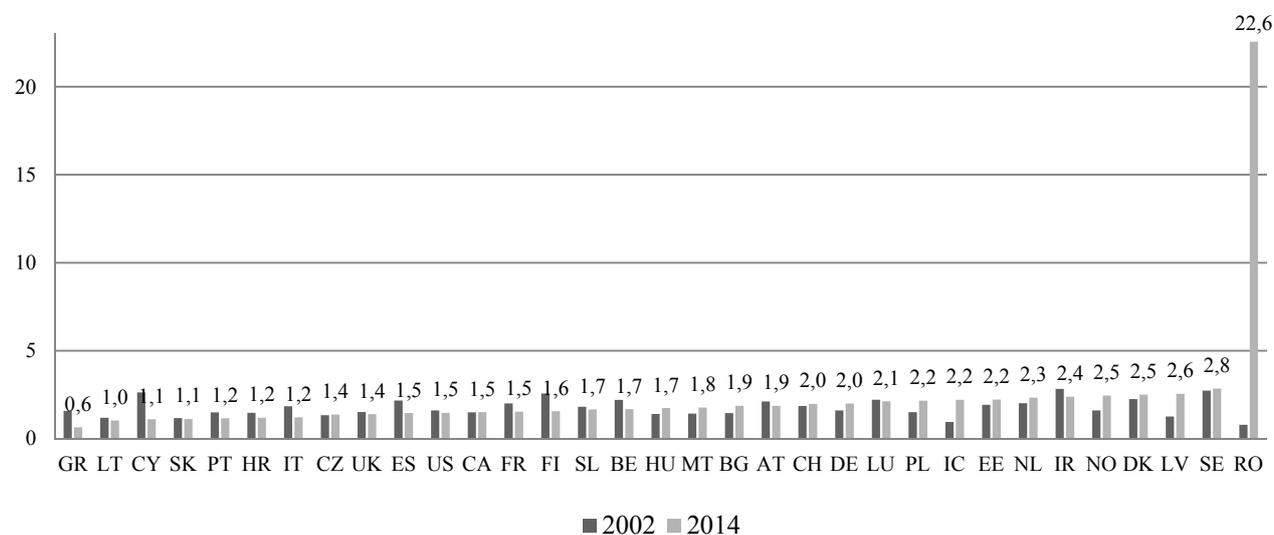
### 3.3 Relations of the Adjusted Net Savings to selected Environmental and Sustainable Development Indicators

To complete the analysis, the ANS component indicators were further elaborated to create two additional indicators for 33 sample countries. Both indicators are displayed in years 2002 and 2014. Firstly, the sum of the negative ANS components, from which the EDE is deducted, in current US\$ per capita is calculated. Particularly, depreciation of the physical capital (CFC), natural capital (ED, MD) and environmental damages (CO<sub>2</sub>, PED) are added up and the EDE is subtracted from this sum. The results are shown in Figure 3. Next, the ratio of GNS to these components (GNS ratio) is displayed in Figure 4. The former shows the absolute (net) level of the negative ANS components (costs) in current US\$ that will ultimately lead the economy to the unsustainable territory if the economy does not have enough money in the form of the GNS to compensate them.

**Figure 3** Sum of the negative ANS Component Indicators minus EDE, current US\$ per capita, 2012 and 2014

Source: World Development Indicators (2016); Own processing

It can be seen in Figure 3 that the best performing countries with the highest levels of the ANS also show highest absolute levels of the negative ANS components after the subtraction of the EDE indicator. In both monitored years Norway, Switzerland and Luxembourg show the highest values. On the contrary, Romania and Bulgaria together with Lithuania showed the lowest ones while the latter has shown negative values after subtraction of the EDE from the absolute value of these negative components since 2004. All the new Member States together with two Southern countries – Portugal and Greece, show relatively lower levels. The relatively higher levels in both years are also typical of Canada, the USA and Denmark. The three countries achieving highest levels also showed greatest increase between 2002 and 2014 with the highest one in Switzerland. Canada, Belgium and Austria also showed significant increases. Lithuania, Romania are the only countries showing the declines of these indicators between 2002 and 2014. The decrease occurred also in Iceland between 2011 and 2013 (data were available only in three years). Next the GNS is divided by the sum of the ANS to detect how many times (or if at all) the GNS of country can be used to pay for the negative ANS components. For Lithuania the calculation of the results had to be modified, i.e. the EDE were added up to GNS and then divided by the sum of the negative components. If the modification was not adopted the negative ratio would be obtained. In Figure 4, the ratios of GNS to the negative ANS components, after the subtraction of EDE are shown.

**Figure 4** Ratio of GNS and negative Component Indicators after subtraction of EDE, 2012 and 2014

Source: World Development Indicators (2016); Own processing;

In 2014, Romania shows the highest GNS ratio, i.e. significantly higher ratio than any other country in the sample. It is followed by Sweden and Lithuania. Greece showed the worst results, it is clearly unsustainable economy because it showed the ratio lower than 1 (0.646). There are also other countries showing the ratios slightly higher than 1, such as Latvia, Cyprus, Slovakia, Portugal and Croatia. These countries should be cautious and make efforts to increase this ratio. Significant changes also occurred between 2002 and 2014. The ratio significantly increased in Romania, Lithuania, Iceland (2011 – 2013) and Norway and dropped most significantly in Cyprus, Finland and Greece. As it was already indicated in subsection 3.1. Romania showed the negative rates until 2006. The ratio was 0.798% in 2002 which indicates unsustainability and thus significant improvement in this country occurred. Iceland also improved its position, it showed the negative ANS in 2011 and turned it to positive ones and to one of the highest GNS ratios in 2013. The great improvement was also shown by Norway. For Lithuania the calculation had to be modified due to the high extent of EDE exceeding the sum of the negative components. This indicates great improvement because this country also showed negative ANS in several years in 1990s (see subsection 3.1). On the other hand, Greece showed the positive ANS in 2002, the GNS ratio was 1.585 and subsequently moved to the unsustainable territory. Cyprus and Finland even showed one of the highest GNS ratios in the sample in 2002, but Cyprus recently shows one of its lowest levels and Finland's GNS ratio also dropped significantly. Ireland showed highest GNS ratio in 2002 but it also dropped between monitored years. Sweden's ratio was the second highest in both monitored years.

#### 4 Conclusions

The aim of the Paper was to evaluate sustainability in the EU and its countries together with additional five developed countries by means of the ANS and its component indicators. This evaluation was carried out by means of the ANS and its component indicators. The results of the 33 countries in the sample differ according to the applied ANS indicator, i.e. ANS in % of GNI or ANS per capita. Overall, the Northern countries (except for Finland), Luxembourg, Netherlands, together with Switzerland, Ireland, Germany and Austria achieved relatively higher levels of both ANS indicators. For two Baltic economies the high ANS ratio is typical, but not the ANS per capita, while the remaining one – Latvia showed very low levels of both ANS indicators. Many new Member States and Southern economies showed relatively low ANS levels. While the ANS ratio is determined by the shares of the ANS components in GNI, the ANS per capita is determined by the overall ANS in monetary units including the price level and the population size. This explains why some less developed EU countries, such as Romania, Lithuania and Estonia are able to achieve one of the highest ANS ratios, but not the ANS per capita. The ANS results also significantly depend on the ANS components. GNS is the crucial component of the ANS. In the EU it showed the share in GNI slightly higher than 21% both in 2002 – 2014 and in 2014. The average ratio of the depreciation of physical capital in 2002 – 2014 showed 16.275% of GNI. In period 2002 – 2014, the EDE indicator representing the social pillar of SD showed in the EU the average level of 4.754% of GNI. On the other hand, the shares of the environmental effects in GNI are significantly lower. ED showed the average ratio of 0.371%, CO<sub>2</sub>D of 0.216%, PED of 0.187%, MD of 0.02% and NFD indicator only 0.014%. Although these components differ between countries according to the structures of their economies, their overall effects on the ANS are often lower than those of the previous three components.

The low depreciation rate of physical capital in Cyprus, Poland, Bulgaria, the UK, Lithuania, Malta, the USA and Norway can partly help compensate the lower GNS in the majority of them, but in Norway it is the important factor even enhancing the highest GNS ratio. Switzerland showed lower ANS than Norway due to the higher depreciation rate. Lithuania has significantly increased its EDE since 2004 which has led to the great increases of the ANS, especially the ANS ratio, since then. This indicates significant improvement because the ANS was negative in several years of 1990s or very low until 2003. Other significant improvement occurred in Romania that moved from the unsustainable territory in 2007, recently showing the highest ANS ratio in the sample. On the other hand, Greece moved to the unsustainable territory in 2008 which was also related to the economic problems resulting from the effects of the economic crisis. Recently Greece is the only unsustainable economy showing negative ANS. Analysis of the component indicators also showed that Romania achieved the lowest sum of the negative components after subtraction of EDE (net costs) and Lithuania achieved even negative value. Romania is able to cover these net cost from its GNS at highest rate as compared to other sample countries, but Lithuania is even able to cover these costs by its education expenditure. The countries showing highest ANS levels, particularly Norway, Switzerland and Luxembourg, also show highest net costs, but are able to cover them by the GNS at higher rate. The economic problems and recession caused the drop of GNS, but, on the other hand, the drop of natural resource exhaustion and pollution in the majority of countries as well. Thus, in some countries the ANS also increased as a results of the changes in the ratios of the ANS components. To conclude, every country should address the particular aspects of sustainability by the appropriate structural reforms.

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