

VIRTUAL WATER POTENTIAL OF SELECTED COMMODITIES IN CO-OPERATION OF THE SLOVAK REPUBLIC WITH COUNTRIES OF THE WESTERN BALKANS

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Abstract: Our paper rests on two fundamentals: firstly, the EU's initiative to deepen cooperation with and the prospect of its enlargement to the Western Balkans region; and, secondly, the urgency to address sustainable development issues in the international environment. As the virtual water perspective represents an innovative approach in the field of sustainable development, the aim of our paper is to analyse trade-related characteristics based on the water footprint concept (complementary to the alternative RCA/RTA indexes designed to calculate a country's comparative advantage or disadvantage). In our paper, we analyse and evaluate selected commodities traded by the Slovak Republic and the Western Balkans countries in terms of the absolute/comparative advantage related to the national water footprints.

Keywords: Sustainable Development Goals (SDGs); international trade; absolute/comparative advantage; revealed (RCA)/relative (RTA) advantage measurements; water footprint in exports/imports; virtual water; Slovak Republic; Western Balkans.

1 Introduction and Problem Formulation

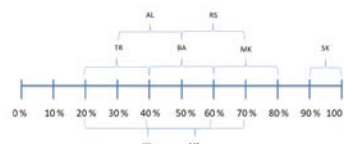
Before their accession to the European Union (EU), the Czech Republic and the Slovak Republic constituted a single contracting party of the „Declaration on Co-operation Between the Republic of Poland, the Czechoslovak Federal Republic and the Republic of Hungary on the Path for Advancing Towards European Integration“ (of 15 February 1991 – Visegrad Group); jointly they formed a customs union based on the „Agreement Establishing the Customs Union Between the Czech Republic and the Slovak Republic“ (of 29 October 1992); and they became individual parties of the „Central European Free Trade Agreement“ (of 21 December 1992 – CEFTA) with Central and East European Countries (CEECs). Čiderová and Kovačević (2015) indicate that as a matter of fact, the 1990s witnessing „centrifugal“ disintegration of a number of federal statehoods in Central and Eastern Europe marked parallel „centripetal“ attempts of now-independent successor states for (European) integration. Following the geopolitical commitment of the EU member states with regard to Central and Eastern Europe, the reality of „catching-up“ in socioeconomic terms fostered progressive participation of CEECs in the respective stages of economic integration framed by B. Balassa (in ascending order: free trade area; customs union; common market; economic union; total economic integration) in 1961.

Therefore, instead of the multilateral CEFTA free trade area and the bilateral customs union, the Czech Republic and the Slovak Republic have participated in the EU's joint customs union (with Andorra, Monaco, San Marino, and Turkey) and even the single European market as the EU customs union's upgrade, since their 2004 EU accession. After the 2007 and the 2013 EU enlargements to the East (Bulgaria, Romania) and West (Croatia) of the Balkan region, Turkey and the Western Balkans Six (Čiderová and Kovačević, 2015) now represent the so-called enlargement countries (Čiderová and Dionizi, 2015; Čiderová – Feješová – Kovačević, 2015; Čiderová and Kovačević, 2015; Zorkóciová and Petříková, 2018; Čiderová and Kovačević, 2019). Following the 2004, 2007 and 2013 EU enlargements, CEFTA did not cease to exist, but was transformed into CEFTA 2006 (of 19 December 2006) comprising (in alphabetical order): Albania; Bosnia and Herzegovina; Kosovo (UNSCR 1244/1999); Moldova; Montenegro; North Macedonia; Serbia. In this regard the 2021 Communication on EU Enlargement Policy (European Commission, 2021) states that in the area of trade policy „some progress was made in reducing Kosovo's

trade deficit, but Kosovo has not yet ratified the CEFTA additional protocols on trade facilitation and trade in services“. Overall, while in the Slovak Republic (SK) the share of exports (goods and services) as % GDP or the share of imports (goods and services) as % GDP lies in the interval between 90% of GDP and 100% of GDP, the same indicators of export performance and import intensity spread on a scale from 20% of GDP to 80% of GDP across the enlargement countries (in ascending order):

- in Turkey (TR) in the interval 20% - 40% GDP;
- in Kosovo (UNSCR 1244/1999 – XK) in the interval 20% - 60% GDP;
- in Albania (AL) in the interval 30% - 50% GDP;
- in Bosnia and Herzegovina (BA) in the interval 40% - 60% GDP;
- in Montenegro (ME) in the interval 40% - 70% GDP;
- in Serbia (RS) in the interval 50% - 70% GDP;
- in North Macedonia (MK) in the interval 60% - 80% GDP (Fig. 1).

Fig. 1: Intervals of export performance and import intensity of the Slovak Republic in comparison with the so-called enlargement countries



Source: European Commission (2020); European Commission (2021).

Fig. 1 implies the extent, to which disruptions in international trade may affect an economy. In the globalised world, participation in international trade goes hand in hand with participation in supply chains. International trade generates nearly 300 million jobs globally (corresponding to an estimate of USD 3,450 bil. in distributed wages annually) to produce goods in order to meet the demand in other countries – for illustration, 62 million jobs globally are generated to satisfy EU consumption (SDSN and IEEP, 2020).

On the one hand, according to the 2020 Europe Sustainable Development Report, most European countries contribute to considerable negative international spillovers in the form of CO₂ emissions, biodiversity loss and water scarcity through trade. On the other hand, all countries would lose from a shift away from interconnected economies to a localised regime of production, as OECD reports (OECD, 2020), and in the EU alone 54 million jobs are generated to produce goods that will satisfy foreign consumption.

In this context, progress in terms of the United Nations 2030 Agenda represented by 17 Sustainable Development Goals (SDGs) necessitates to address negative impacts (Schmidt-Traub et al., 2019), including those accompanying unsustainable supply chains (SDG 12 Responsible consumption and production). „Europe must ensure coherence between its domestic and its international policies,“ was an appeal made by the 2019 Europe Sustainable Development Report (SDSN and IEEP, 2019). In response, the EU acknowledges the role of trade policy and sustainable supply chains for the accomplishment of the SDGs and the European Green Deal. In the words of the President of the European Commission U. von der Leyen: „Trade is not an end in itself. It is a means to deliver prosperity at home and to export our values across the world. I will ensure that every new agreement concluded will have a dedicated sustainable-development chapter“ (von der Leyen, 2019). Furthermore, the EU's „Farm to Fork“ Strategy for a fair, healthy and environmentally friendly food system draws attention to the extent and significance of spillover effects in food supply chains.

Amidst the COVID-19 crisis, having a negative impact on the SDGs (especially SDG 1 No poverty; SDG 2 Zero hunger; SDG 3 Good health and well-being; SDG 8 Decent work and economic growth) in Europe and globally, in the Council conclusions of 19 October 2020 on the “Farm to Fork” Strategy the Council of the EU welcomed the European Commission's intention to develop a contingency plan designed to ensure food supply and food security in times of crisis (Council of the European Union, 2021). In his keynote speech at the 2021 EU Agricultural Outlook Conference J. Wojciechowski made an appeal: “Our emphasis is on sustainable agriculture, on agro-ecology, on practices that conserve soil, restrict CO₂ emissions, and improve water management” (Wojciechowski, 2021).

Although SDG 6 (Clean water and sanitation) is specifically oriented on the issue of water management, as a matter of fact water availability/scarcity concerns all 17 SDGs. According to Hoekstra – Chapagain – van Oel (2019) water footprint assessment represents the study of freshwater use, scarcity and pollution in relation to consumption, production as well as trade patterns, and as such it is an interdisciplinary field. “By nature, the field is integrative, bringing together different disciplines and perspectives, for instance, natural sciences, policy studies, and geographical and supply-chain perspectives. It links water issues to food, energy, and climate and addresses issues of sustainability, efficiency, and equitability of resource use,” they claim while emphasising that “indirect drivers of water problems, like incentives to produce water-intensive products in water-scarce regions for export” need to be taken into account, too.

Distance and borders, but also trade barriers and controversies in trade policy, environmental issues (e.g. water footprint), historical context or cultural trends (vegetarian/vegan lifestyle) play an important role in trade. Based on the comparison of selected commodities by Nagyová and Číderová (2020) over the years 2012-2018 in the case of the Czech Republic and the Slovak Republic in the period before the outbreak of the COVID-19 pandemic, our option of countries covered corresponds with the planned enlargement of the EU to the Western Balkans region (Council of the European Union, 2021). As in the case of the Czech Republic and the Slovak Republic during the pre-accession period, we consider that CEFTA (now CEFTA 2006) continues to provide a framework assisting the Western Balkans region in the process of preparation for EU membership, too. Our focus on the Slovak Republic and five countries of the Western Balkans region is also facilitated by the Euro currency – by being the legal tender in the Slovak Republic and due to unilateral euroisation in Montenegro without the status of a legal tender (Číderová and Dionizi, 2015).

In terms of the focus of the VEGA research project No. 1/0420/19 the aim of our paper is to analyse trade-related characteristics based on the water footprint concept (complementary to the alternative RCA/RTA indexes designed to calculate a country's comparative advantage or disadvantage). In our paper we analyse and evaluate selected commodities traded by the Slovak Republic and the Western Balkans countries, so we will now proceed with application of the water footprint concept on the background of classical (political economy) concepts/theories of international trade and alternative revealed (RCA)/relative (RTA) advantage measurements in Part 2 Methodology and Part 3 Results. Then, Part 4 Conclusion will summarise our findings and outline their relevance.

2 Methodology

Zábojník – Číderová – Krajčák (2020) list the following classical (political economy) concepts and theories of international trade:

- The concept of the invisible hand of the market (A. Smith) – each country with a certain *absolute advantage* (lowest production costs) for the production of goods in international trade benefits from the specialisation in the production of such goods.

- The concept of foreign trade deregulation (D. Hume) – achieving the benefits of international trade does not require a significant degree of state intervention in order to achieve a satisfactory *balance* and territorial structure.
- The concept of comparative costs (R. Torrens, D. Ricardo) – involvement in international trade is effective and beneficial for the national economy, even if it has no absolute advantage. The prerequisite for the benefits of foreign trade are *comparative costs (advantages)*.

“Measuring comparative advantages is not easy at all in practice,” Zábojník – Číderová – Krajčák (2020) argue, pointing out that a method that measures the comparative advantage based on ex-post international trade data in the form of the most common and well-known index (the *Revealed Comparative Advantage* – RCA index) is used.

According to UNCTADSTAT, the “Revealed Comparative Advantage is based on *Ricardian trade theory*, which posits that patterns of trade among countries are governed by their relative differences in productivity”; however, it should be noted that applied national measures affecting competitiveness such as tariffs, non-tariff measures, subsidies and others are not considered in the RCA metric even though the RCA metric can provide a general indication of a country's competitive export strengths, UNCTADSTAT highlights.

A country with a revealed comparative advantage (RCA >1) for product *i* is interpreted as a competitive producer and exporter of that product relative to a country producing and exporting the same product at or below the world average.

That is,

(1)

$$RCA_{Ai} = \frac{X_{Ai}}{\sum_{j \in P} X_{Aj}} \geq \frac{X_{wi}}{\sum_{j \in P} X_{wj}}$$

Where

P is the set of all products (with *i* ∈ P),

X_{Ai} is the country A's exports of product *i*,

X_{wi} is the world's exports of product *i*,

∑_{j ∈ P} X_{Aj} is the country A's total exports (of all products *j* in P), and

∑_{j ∈ P} X_{wj} is the world's total exports (of all products *j* in P).

Bojnec and Fertő (2012) cite Vollrath (1991) who outlined an alternative specification of the revealed comparative advantage titled as the *Relative Trade Advantage* (RTA) accounting for exports as well as imports and calculated as follows:

Relative Trade Advantage = Revealed Comparative Export Advantage – Relative Import Penetration Advantage, i.e.

$$RTA = RXA - RMA$$

When

$$RXA = (X_{ij} / X_{it}) / (X_{nj} / X_{nt}), \text{ i.e.}$$

in the Revealed Comparative Export Advantage indicator X represents exports, *i* is a country, *j* is a commodity, *t* is a set of commodities, and *n* is a set of countries;

$$RMA = (M_{ij} / M_{it}) / (M_{nj} / M_{nt})$$

in the Relative Import Penetration Advantage indicator M represents imports, *i* is a country, *j* is a commodity, *t* is a set of commodities, and *n* is a set of countries.

Then,

$$RTA = [(X_{ij} / X_{it}) / (X_{nj} / X_{nt})] - [(M_{ij} / M_{it}) / (M_{nj} / M_{nt})].$$

Bojnec and Fertó (2012) classify the RTA index in three categories: (2)

- RTA > 0 relates to product groups with a relative comparative trade advantage;
- RTA = 0 relates to product groups in a breakeven point without relative comparative trade advantage or relative comparative trade disadvantage;
- RTA < 0 relates to product groups with a relative comparative trade disadvantage.

Both A. Smith and D. Ricardo would appeal to policymakers “to look at the health of the domestic economy and not focus solely on the trade position. [...] Aiming for a trade surplus without examining what needs to be done in the domestic economy to make exports more desirable to the rest of the world would have struck Ricardo as the wrong way to go about it,” Yueh (2019) argues. In his paper titled “*Invisible Hand or Ecological Footprint? Comparing Social Versus Environmental Impacts of Recent Economic Growth*” Mikkelsen (2019) also suggests that public policy should shift toward enhancement of individual and social well-being in ways more direct and effective, and less ecologically damaging, than reliance on overall growth in gross domestic product (see also Zorkóciová and Palušková, 2019).

Mekonnen and Hoekstra (2011) point out that governments have traditionally adopted a purely national perspective when considering the match between national water supplies and national water demands. In line with such a consideration, a mismatch between national water supplies and national water demands might focus on maximising the first while minimising the latter. Still, the global dimension of water demand patterns tends to be abstracted from. “Since production processes in a global economy can shift from one place to another, water demands can be met outside the boundaries of a nation through the import of commodities,” Mekonnen and Hoekstra (2011) argue. In their words, “[a]ll countries trade water-intensive commodities, but few governments explicitly consider options to save water through import of water-intensive products or to make use of relative water abundance to produce water-intensive commodities for export”.

In terms of its scope, the *water footprint* concept “is integrative by nature by its applicability at different levels (local to global) and along supply chains (from investment and production to processing, sales, and consumption)” (Hoekstra – Chapagain - van Oel, 2019). Water footprint defined as the volume of water consumed in the production of goods or services represents the combination of the following blue, green and grey elements:

- *blue water footprint* relates to the consumption of the so-called blue water resources such as surface and ground water;
- *green water footprint* symbolises the consumption of rainwater as the so-called green water, which is significant especially in the case of crop production;
- *grey water footprint* is associated with the volume of freshwater needed to assimilate the load of pollutants in order to ensure compliance with the ambient water quality standards in place.

According to Hoekstra (2003), since the introduction of the water footprint concept at the dawn of the millennium, the endeavour to quantify and map the so-called *national water footprints* has represented an evolving field of study.

To calculate the *water footprint* of national consumption particularly for *agricultural commodities*, all agricultural products consumed by the population of the respective country are multiplied by the corresponding product water footprint as follows:

$$WF_{cons,indir}(agricultural\ commodities) = \sum_p (C[p] \times WF_{prod}^*[p])$$

Where

$C[p]$ is consumption of agricultural product p by consumers of the respective country (t/yr),

$WF_{prod}^*[p]$ is the water footprint of the product (m^3/t).

Then,

(3)

the average water footprint of a product p consumed in the respective country is as follows:

$$WF_{prod}^*[p] = \frac{P[p] \times WF_{prod}[p] + \sum_{n_e} (T_i[n_e, p] \times WF_{prod}[n_e, p])}{P[p] + \sum_{n_e} T_i[n_e, p]}$$

Where

$P[p]$ is the production quantity of a product p in the respective country,

$T_i[n_e, p]$ is the imported quantity of product p from exporting country n_e ,

$WF_{prod}[p]$ is the water footprint of product p when produced in the country considered,

$WF_{prod}[n_e, p]$ is the water footprint of product p as in the exporting country n_e .

Subsequently, it is assumed that “the total consumption volume originates from domestic production and imports according to their relative volumes” (Mekonnen and Hoekstra, 2011).

As an indicator that is geographically explicit, the water footprint refers to the volume of water consumption just like the respective location; thus, we can consider the global average water footprint, or a national water footprint.

In their study oriented on the Czech Republic and the Slovak Republic, Nagyová and Čiderová (2020) focused on foreign trade of the two republics as well as their bilateral trade between 2012 and 2018 in the case of ten selected commodities: wheat; barley; maize; paddy rice; soyabeans; beef; pork; sheep (mutton+goat); sugar beet; sugar cane.

In this paper we will steer our attention in the framework of the VEGA research project No. 1/0420/19 to the Slovak Republic and five countries of the Western Balkans (in alphabetical order: Albania; Bosnia and Herzegovina; Montenegro; North Macedonia; Serbia). Furthermore, out of ten commodities examined by Nagyová and Čiderová (2020), we will streamline our focus on four commodities: wheat, maize, beef and pork. There is a reference to all of these commodities in the masterpiece “*An Inquiry into the Nature and Causes of the Wealth of Nations*” by A. Smith (1776) and the selection of these commodities was motivated by their substitutability (wheat and maize as substitutes; beef and pork as substitutes).

First and foremost, we will compare the global average water footprint with national water footprints of the respective countries that correspond with the selected commodities. Tab. 1 indicates the global average water footprint (l/kg) together with average water footprint (l/kg) in the Slovak Republic and in the countries of the Western Balkans considered (Serbia; Bosnia and Herzegovina; Montenegro; North Macedonia; Albania) for wheat, maize, beef and pork.

Tab. 1: Global average water footprint (l/kg) and national average water footprint (l/kg) in the Slovak Republic and five countries of the Western Balkans for selected commodities

Global average water footprint, l/kg	1,827	1,222	15,415	5,988
Commodities				
National average water footprint, l/kg	WHEAT	MAIZE	BEEF	PORK
SK	1,097	932	8,927	4,290
RS	1,486	985	14,180	4,789
BA	1,632	1,036	15,003	5,408
ME	1,486	985	14,180	4,789
MK	1,521	958	14,125	4,951
AL	1,556	1,199	14,693	4,841

Source: National water footprint accounts.

All countries covered in Tab. 1 demonstrate their level of average water footprint (l/kg) for the commodities of our choice below the respective global average water footprint values (l/kg). When taken from the country perspective, individual average water footprints range from 932 l/kg to 8,927 l/kg (SK); from 958 l/kg to 14,125 l/kg (MK); from 985 l/kg to 14,180 l/kg (RS & ME); from 1,036 l/kg to 15,003 l/kg (BA); from 1,199 l/kg to 14,693 l/kg (AL). Across commodities, the national average water footprints spread in an interval from 932 l/kg to 1,199 l/kg (maize); from 1,097 l/kg to 1,632 l/kg (wheat); from 4,290 l/kg to 5,408 l/kg (pork); from 8,927 l/kg to 15,003 l/kg (beef).

3 Results

Data on foreign trade (with goods) of individual countries as well as bilateral trade were taken from the International Trade Centre TradeMap Database (2021), which covers data disaggregated both by partner countries and products. Our analysis documents data for the period 2012-2019, which on the one hand corresponds with the release of data on water footprints, and on the other hand it covers international trade and related international virtual water (Hoekstra, 2013) flows before the outbreak of the COVID-19 pandemic (having significant global impact on international trade) in Europe.

Tab. 2: Bilateral trade balance (in foreign trade with goods) of the Slovak Republic with five countries of the Western Balkans (2012–2019, in thousand Euro)

Balance (EX-IM)	SK-RS	SK-BA	SK-ME	SK-MK	SK-AL
2012	141,252	27,294	12,535	-22,040	20,801
2013	150,814	31,455	31,583	-19,564	37,969
2014	78,076	18,384	35,138	-11,737	33,399
2015	53,933	22,760	29,057	-11,498	35,631
2016	15,312	15,852	20,326	11,533	25,878
2017	6,356	27,168	15,674	30,253	28,402
2018	-11,097	23,608	18,341	6,069	17,379
2019	-57,654	41,560	24,108	12,793	22,331

Source: ITC TradeMap Database (2021)

In terms of bilateral trade balance (in foreign trade with goods) of the Slovak Republic with five countries of the Western Balkans between 2012–2019 (Tab. 2) the Slovak Republic recently (2018-2019) registered a shift from a positive trade balance to a negative trade balance in bilateral trade with Serbia. With Bosnia and Herzegovina, Montenegro and Albania the

trade balance of the Slovak Republic continues to be positive; in bilateral trade of Slovakia with North Macedonia an originally negative trade balance turned into a positive one. Data on foreign trade (with goods) of individual countries as well as bilateral trade taken from the International Trade Centre TradeMap Database (2021) show non-existence of bilateral trade (SK-RS; SK-BA; SK-ME; SK-MK; SK-AL) with the selected commodities despite their national average water footprints being below the global average water footprint demonstrated above. This is why figures on trade balance will now be followed by the water footprint balance for the Slovak Republic as well as for the respective Western Balkans countries covered in the case of selected commodities internationally traded between 2012-2019. As international virtual water flows result from multiplying the volume of traded commodity by the corresponding national average water footprint, we will next calculate the water footprint balance for wheat, maize, beef and pork in Tab. 3 – 8 for each country separately.

Tab. 3: Water footprint balance in the Slovak Republic for selected commodities internationally traded between 2012-2019 (in thousand m³/t)

WF (l/kg)	1,097	932	8,927	4,290
Water footprint balance				
SK	WHEAT	MAIZE	BEEF	PORK
2012	104,698	248,329	-35,190	-251,016
2013	287,656	216,640	-61,802	-390,948
2014	331,516	285,098	-28,897	-334,049
2015	488,008	332,471	-52,669	-363,217
2016	643,629	193,714	-66,417	-489,776
2017	516,684	400,205	-85,539	-503,633
2018	416,688	146,933	-83,048	-479,099
2019	459,278	266,759	-72,166	-441,128

Source: ITC TradeMap Database (2021)

Tab. 4: Water footprint balance in Serbia for selected commodities internationally traded between 2012-2019 (in thousand m³/t)

WF (l/kg)	1,486	985	14,180	4,789
Water footprint balance				
RS	WHEAT	MAIZE	BEEF	PORK
2012	95,254	2,086,373	21,242	-32,594
2013	153,259	764,855	18,590	-42,732
2014	58,682	2,335,527	15,655	4,559
2015	53,472	2,058,425	6,126	-34,098
2016	65,365	2,025,469	17,059	-34,969
2017	84,258	1,563,300	41,973	-63,914
2018	1,264,378	1,171,521	64,562	-110,310
2019	24,220	2,944,435	14,109	-88,774

Source: ITC TradeMap Database (2021)

Net export of wheat and maize in the case of Slovakia (Tab. 3) leads to water consumption, *ceteris paribus*. In contrast, net import of beef and pork to Slovakia results in water savings, *ceteris paribus*.

In the case of Serbia (Tab. 4) net export of wheat, maize and beef leads to water consumption, *ceteris paribus*. On the contrary, net import of pork to Serbia results in water savings, *ceteris paribus*.

Tab. 5: Water footprint balance in Bosnia and Herzegovina for selected commodities internationally traded between 2012-2019 (in thousand m³/t)

WF (l/kg)	1,632	1,036	15,003	5,408
Water footprint balance				
BA	WHEAT	MAIZE	BEEF	PORK
2012	-286	-134,651	-113,018	-26,418
2013	640	-228,911	-230,386	-45,535
2014	-165	-201,044	-356,096	-63,685
2015	-23,894	-216,063	-353,066	-75,701
2016	-29,115	-264,680	-384,497	-71,332
2017	-26,750	-214,887	-329,841	-72,851
2018	-26,070	-225,499	-384,182	-83,527
2019	-7,695	-184,716	-473,210	-79,362

Source: ITC TradeMap Database (2021)

Overall, Bosnia and Herzegovina (Tab. 5) is in the position of a net importer of wheat, maize, beef and pork, which might be interpreted as a tradeoff between conservation of water resources and export earnings, *ceteris paribus*.

Tab. 6: Water footprint balance in Montenegro for selected commodities internationally traded between 2012-2019 (in thousand m³/t)

WF (l/kg)	1,486	985	14,180	4,789
Water footprint balance				
ME	WHEAT	MAIZE	BEEF	PORK
2012	-46,825	-8,089	-34,401	-91,101
2013	-44,767	-6,389	-40,300	-96,450
2014	-59,284	-9,840	-49,786	-102,020
2015	-60,681	-13,144	-46,241	-99,262
2016	-41,728	-18,864	-57,500	-106,249
2017	-2,976	-21,673	-60,308	-99,961
2018	-1,639	-26,839	-63,952	-111,718
2019	-4,225	-30,585	-59,811	-98,898

Source: ITC TradeMap Database (2021)

Similarly, Montenegro's position (Tab. 6) of a net importer of wheat, maize, beef and pork might also be interpreted as a tradeoff between export earnings and conservation of water resources, *ceteris paribus*.

The case of North Macedonia (Tab. 7) as a net exporter of wheat implies water consumption, *ceteris paribus*. Conversely, net imports of maize, beef and pork registered in North Macedonia suggest water savings, *ceteris paribus*.

Tab. 7: Water footprint balance in North Macedonia for selected commodities internationally traded between 2012-2019 (in thousand m³/t)

WF (l/kg)	1,521	958	14,125	4,951
Water footprint balance				
MK	WHEAT	MAIZE	BEEF	PORK
2012	-415	-60,074	-108,042	-54,639
2013	0	-46,722	-99,242	-60,219
2014	1,036	-44,834	-100,810	-52,956
2015	1,831	-52,314	-102,406	-53,624
2016	3,393	-48,282	-102,053	-58,580
2017	17,893	-54,111	-99,920	-58,843
2018	16,296	-32,022	-103,974	-67,200
2019	3,206	-12,038	-113,283	-59,318

Source: ITC TradeMap Database (2021)

Tab. 8: Water footprint balance in Albania for selected commodities internationally traded between 2012-2019 (in thousand m³/t)

WF (l/kg)	1,556	1,199	14,693	4,841
Water footprint balance				
AL	WHEAT	MAIZE	BEEF	PORK
2012	-14,292	-55,859	-103	-52,772
2013	-65,166	-76,385	-29	-51,876
2014	-4,242	-61,187	0	-24,302
2015	-2,497	-76,312	-44	-28,305
2016	-4,136	-86,782	-44	-27,986
2017	-2,191	-78,148	0	0
2018	-3,307	-101,046	0	-21,407
2019	-601	-106,873	-59	0

Source: ITC TradeMap Database (2021)

All in all, the case of Albania (Tab. 8) being in the position of a net importer of wheat, maize, beef and pork might be interpreted as the case of tradeoff between conservation of water resources and export earnings, *ceteris paribus*, too.

4 Conclusion

In this paper we focused our attention in the framework of the VEGA research project No. 1/0420/19 on the Slovak Republic and five countries of the Western Balkans (in alphabetical order: Albania; Bosnia and Herzegovina; Montenegro; North Macedonia; Serbia) with the aim analyse trade-related characteristics based on the water footprint concept, i.e. we analyse and evaluate selected commodities traded by the Slovak Republic and the Western Balkans countries in terms of the absolute/comparative advantage related to the national water footprints.

Our option of countries covered corresponds with the planned enlargement of the EU to the Western Balkans region – and just like in the case of the Slovak Republic during the pre-accession period, CEFTA (now CEFTA 2006) was meant to help the candidate countries and potential candidates to prepare for EU membership.

Data on foreign trade (with goods) of individual countries as well as bilateral trade were taken from the International Trade Centre TradeMap Database (2021) covering data disaggregated both by partner countries and products. Our analysis documented data for the period 2012-2019, which on the one hand corresponds with the release of data on water footprints, and on the other hand it covers international trade and related international virtual water flows before the outbreak of the COVID-19 pandemic in Europe. Out of ten commodities examined by Nagyová and Čiderová (2020), we streamlined our focus on four commodities: wheat, maize, beef and pork. The selection of these commodities was motivated by their substitutability (wheat and maize as substitutes; beef and pork as substitutes).

On the one hand, the Slovak Republic has had an overall negative trade balance with Serbia in recent years; on the other hand, the Slovak Republic overall registers an individual positive trade balance with Albania, Bosnia and Herzegovina, and Montenegro (in recent years also with North Macedonia). International virtual water flows resulting from trade with wheat, maize, beef and pork document total positive water footprint balance (i.e. export earnings and water consumption) in these cases:

- net export of wheat, maize and beef in the case of Serbia;
- net export of wheat and maize in the case of Slovakia;
- net export of wheat in the case of North Macedonia;

and total negative water footprint balance (i.e. water savings and no export earnings) in these cases:

- net import of wheat, maize, beef and pork in the case of Albania, Bosnia and Herzegovina, and Montenegro;
- net import of maize, beef and pork in the case of North Macedonia;
- net import of beef and pork in the case of Slovakia;
- net import of pork in the case of Serbia.

Ceteris paribus, in Serbia as one of the largest markets in the Western Balkans region (Zorkóciová and Petriková, 2018), there is further potential in individual bilateral trade (RS-BA; RS-ME; RS-AL) with maize. Even though Serbia could intensify its exports of maize to North Macedonia as well, adherence to the water footprint concept would rather suggest exports of maize from the Slovak Republic (based on the national water footprint of 932 l/kg) to North Macedonia (based on the national water footprint of 958 l/kg).

Additionally, as the 2012-2019 data documented non-existence of bilateral trade (SK-BA; SK-ME; SK-MK; SK-AL) of the Slovak Republic with the selected commodities despite their national average water footprints being below the global average water footprint, in terms of the absolute/comparative advantage concept there is, ceteris paribus, potential for trade creation in bilateral trade of the Slovak Republic:

- i.e. in SK-BA bilateral trade with wheat on the basis of the respective national water footprints for the Slovak Republic (1,097 l/kg) and for Bosnia and Herzegovina (1,632 l/kg);
- i.e. in SK-AL bilateral trade with wheat on the basis of the respective national water footprints for the Slovak Republic (1,097 l/kg) and for Albania (1,556 l/kg);
- i.e. in SK-ME bilateral trade with wheat on the basis of the respective national water footprints for the Slovak Republic (1,097 l/kg) and for Montenegro (1,486 l/kg).

Subject to data availability, future research might incorporate Kosovo (UNSCR 1244/1999) as another enlargement country in the Western Balkans region (Čiderová and Dionizi, 2015; European Commission, 2021), too.

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