The Resilience of Agricultural Comparative Advantage During the COVID-19 Pandemic

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Abstract

The agricultural sector is crucial for economies around the world, not only due to its role in ensuring food security, but also for capitalizing on the competitive advantages in a profitable and sustainable manner. The competitiveness of the agricultural sector has been highly debated in the literature. There are many well-developed methods for quantifying the different facets of agricultural competitiveness, most of which have a strong economic valence. One of the facets of competitiveness is resilience, the capacity to withstand the challenges that occur during periods of crisis while maintaining initial functions, if not improving them. Although the competitiveness of the agricultural sector has caught the attention of scholars, the literature is not abundant in studies dedicated to the analysis of the resilience of the agricultural sector's competitiveness. Thus, this study was aimed at bringing its contribution to the literature by tapping into the resilience of the agricultural comparative advantage in the context of the COVID-19 pandemic. The objective of this research was to assess Romania's agricultural comparative advantage and its associated resilience levels in the face of the negative effects of the SARS-CoV-2 pandemic on the global agri-food supply chains by resorting to the Balassa index. Data were extracted from the International Trade Center INTRACEN database and used to calculate the revealed comparative advantage for two different periods: before and during the COVID-19 pandemic. Findings showed that tobacco-based products were the most resilient and not only did those products maintain their level of competitiveness, but they also managed to become more competitive. On the other hand, although Romania is highly competitive in terms of exporting cereals, the resilience of this agri-food category proved to be poor during the COVID-19 pandemic. The same was observed in the case of oil seeds and oleaginous fruits. The drought from 2020 significantly contributed to these unfavorable results for Romania. This paper provides support and assists decision makers in the process of adopting measures aimed at increasing the resilience and competitiveness of the Romanian agricultural sector.

Keywords: revealed comparative advantage, Balassa index, resilience, food security, agricultural economics, trade flows, SARS-CoV-2 pandemic.

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Introduction

Identified in March 2020, the COVID-19 pandemic has had a prompt and noteworthy impact on peoples' lives and the global economy, materialized by restrictions in the movement of people, goods and services. This situation had repercussions in all the economic sectors as labor availability was affected, together with all the markets and logistical chains. In the context of the COVID-19 crisis, resilience in the agriculture sector is linked to the production and processing system, the economy, institutional activities, social interactions, and the environment. Resilience could be defined as the capacity to recover from long-term adversity, bringing into discussion endurance (Darnhofer, 2021). The resilience of the agriculture sector is often associated with using high technology in enterprises, having a prior experience of shocks, benefiting from subsidies offered by the government for people working in the agriculture sector and developing a well-organized logistical system (Muricho et al., 2019). On the other hand, competitiveness represents a country's advantage or disadvantage in commercializing its goods and services in the global markets (Popescu et al., 2017). In addition to this, Porter Diamond considers that competitive advantage at the microeconomic level is offered by the factor conditions, the demand, the supporting industries, the enterprise strategy, and competition. In regards to the macroeconomic level, Porter Diamond adds two more variables, respectively the public institutions and the unpredictability of markets (Herciu, 2013). There are numerous instruments for measuring competitiveness. The Revealed Comparative Advantage (RCA) or the Balassa index is used to calculate the relative advantage or disadvantage of a country for a certain class of goods or services by commercial flows. The Balassa index measures the degree of specialization of export products. Thus, if the Balassa index equals more than one, it indicates that the product involves specialization (Balassa, 1965). In the opposite case, if the index is less than one, there is no specialization for that product. Although agricultural activities continued during the quarantine of the COVID-19 pandemic, they have been affected by many variables such as: the depletion in the availability of inputs, the unavailability of the labor, the difficulties encountered in order to deliver the agricultural product from the farm to the processing or selling points, the decrease of the processing capability of the factories due to social distancing and nonetheless, the changes in the market demand.

There are numerous countries with an abundance of factor endowments and agricultural potential that should be harnessed in an economic-efficient and sustainable manner. Romania is such a country. The Romanian agricultural sector plays an important role in the national economy and in ensuring high levels of food security – not only nationally, but internationally, considering Romania's intensity of international trade flows for agri-food products. Thus, exploring the changes in Romania's agricultural comparative advantage becomes important in the context of the COVID-19 crisis, considering both the economic and food security aspects at national and international levels.

Taking all these aspects into account, the objective of this research was to assess Romania's agricultural comparative advantage and the associated resilience levels in the face of the negative effects of the SARS-CoV-2 pandemic on the global agri-food supply chains. The objective of this study was met by resorting to the Balassa index (revealed comparative advantage), which was calculated and approached for two different periods: 2016-2019 (before the pandemic) and 2020 (during the SARS-CoV-2 pandemic). In order to assist decision makers in the process of adopting strategic decisions for the agricultural sector, it is necessary to perform constant monitoring and evaluation of the Balassa index, as well as to identify potential threats to food security through the Balassa index resilience analysis.

1. Review of the scientific literature

Since the COVID-19 pandemic started, the agriculture sector has encountered many difficulties, mainly caused by the movement restrictions of people, goods, and services. Even though agriculture is one of the most important sectors in the global economy, assuring food safety for the entire population, lack of inputs for agriculture, issues regarding labor mobility and logistics management have led to problems that expanded to the entire food chain (Moon, 2011). In this context, resilience and competitive advantage in agriculture could be built by using labor-saving technologies, training people in the rural areas, developing performant manufacturing sectors at the national level, improving enterprise flexibility, and focusing more on human welfare (Fielke et al., 2018). Resilience comes hand in hand with the competitive advantage. This is the reason why agricultural competitiveness, as an essential part of economic competitiveness, has to focus more on land use (Chivu et al., 2021). In this way, by acknowledging agricultural competitiveness, farmers could develop inland agriculture, by using crops that have the highest productivity (Popescu et al., 2017). When referring to resilience and competitive advantage during the COVID-19 pandemic, there are also brought into discussion robustness, exposure, and sensitivity of the agriculture sector. Thus, the robustness of the agriculture sector represents a balance between vulnerability and stability (Bečvářová, 2008). Moreover, robustness represents the capacity of a system to maintain its functionality despite any kind of perturbation. Related to robustness comes exposure which represents the extent of the perturbation that affects a system. Nonetheless, sensitivity, representing the intensity with which the system is affected by the perturbation, plays an important part in building up the resilience of agriculture (de Goede, Gremmen, and Blom-Zandstra, 2013). According to Herciu (2013), the main factors that influence the competitive advantage of a country's agriculture are the inadequate supply of agricultural inputs, tax regulation, inefficient government bureaucracy, access to financing, and corruption. As a solution for increasing the competitiveness of agriculture, exports could be sustained by a reduction in production costs and an increase in the quality of products together with encouraging exporting enterprises to access new markets. Another approach to increasing agricultural resilience during the pandemic refers to climate-smart agricultural practices which contribute to the mitigation of climate change and increase crop yields and incomes (Istudor et al., 2019). On top of that, resilience, as a dynamic concept, focuses more on long-term adaptation strategies rather than on short-term solutions for managing risks (Petrescu et al., 2022; Arslan, Belotti, and Lipper, 2017). According to other authors, by developing the agricultural trade balance, both the resilience and competitiveness will increase (Andrei et al., 2021). From another point of view, resilience could be understood as the capacity of agricultural systems to adapt to any kind of perturbation, in the present scenario of the COVID-19 pandemic, in order to transition to sustainable development (Beia et al., 2020). Moreover, resilience could represent the ability to rapidly recover from adversity, by absorbing the shocks caused by a perturbation and reorganizing in the same manner the system was organized before (Alexander, 2013).

When considering resilience – persistence, adaptability, and transformation capacity represent important factors of analysis. Persistence represents the capability of the agricultural system to absorb shocks caused by internal or external perturbations. At the same time, adaptability refers to the ability of the agricultural system to reorganize after suffering a shock. Nonetheless, transformation capacity approaches a system's ability to transform into a new system, if the existing one is unstable (Walker et al., 2004; Folke, Colding and Berkes, 2002). Regarding the dynamics of agricultural resilience, there has been identified a set of social variables that have a high impact on it: considering uncertainty as an opportunity to evolve, promoting innovation, and lifelong learning (Smutka and Burianová, 2013).

Adaptive and preventive measures represent an effective way to consolidate resilience and competitiveness in the agriculture sector. For this to happen, trust, transparency, and participation are required (Ion, Dobre, and Soproni, 2019). From other author's point of view, agricultural competitiveness was influenced by globalization and specialization. The reason why the agriculture sector is more resilient than other economic sectors is that it has a higher capacity to withstand a crisis because of the low elasticity of demand for agro-food products (Smutka and Burianová, 2013). In this context, it could be said that regardless of the crisis, food demand will continue to increase (Pawlak, 2018). According to another study, there is a link between productivity, efficiency, and competitiveness in agriculture. Thus, the agriculture sector could be economically inefficient but competitive, or it can be economically efficient but not competitive. Competitiveness in agriculture could also come from the sustainable management of water, as it is a scarce resource, with high demand in other economic sectors at the same time (Fuglie, 2018).

A different approach to increasing agricultural competitiveness refers to modifying the structure of production taking into account economic efficiency and crop performance (Hong et al., 2019). In Porter's view (1990), agricultural competitiveness is linked to productivity, as it is produced more output with the same resource input. In this regard, Porter's diamond model for the assessment of competitiveness has seen a viable and practical application in the agricultural sector (Constantin et al., 2022). Agricultural competitiveness could be measured by taking into consideration costs, prices, the quality of the commodities commercialized, as well as their suitability as input for other production processes in different, yet connected economic sectors (Cepoi, Bran and Dinu, 2020).

Moreover, an alternative factor that influences the competitiveness of the agriculture sector is land productivity, as it measures the output generated by a specific surface of the land. A further study comes in front with three approaches regarding competitiveness. The first approach links competitiveness to economic performance and competition throughout the market. The next approach refers to the quantity of inputs used during production and their price, as a potential way to increase productivity. Nevertheless, the last approach brings into discussion the conversion of competitive advantage into competitive performance (Bruce, Jackson and Lamprinopoulou, 2021).

Furthermore, the resilience and competitiveness of agriculture could be increased if it is taken into consideration the degree of predictability of what happens with the crops during the agricultural year: production/hectare, cost, price, and processing costs. In a different study, it is claimed that competitiveness represents the situation in which an economic sector competes with other economic sectors (Milanović, Nikitović, and Garabinović, 2020). Thus, competitiveness in the agriculture sector is influenced by technological advancements, production costs and selling prices, changes in the demand, and environmental issues. The distribution of the agro-food products also has a high impact on the competitiveness in agriculture.

2. Materials and methods

Data used in this conference paper were extracted in March 2022 from the International Trade Center (INTRACEN) database. In accordance with the research objectives, two different periods were analyzed: before the pandemic (timeframe: 2016 – 2019) and during the pandemic (the year 2020). Data regarding the year 2021 was not available at the moment of carrying out this study. Considering that this study was focused specifically on the agri-food sector, only the categories specific to this sector were included in the analysis, as described in Table no. 1.

Table no. 1. Major Agri-food Product Categories Analyzed

Category Code	Full Name of the Agri-food Product Category Codes	Category Code	Full Name of the Agri-food Product Category Codes
1	Live animals	13	Lac; gums, resins and other vegetable saps and extracts
2	Meat and edible meat offal	14	Vegetable plaiting materials; vegetable products not elsewhere specified or included
3	Fish and crustaceans, molluscs and other aquatic invertebrates	15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin	16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates
5	Products of animal origin, not elsewhere specified or included	17	Sugars and sugar confectionery
6	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	18	Cocoa and cocoa preparations
7	Edible vegetables and certain roots and tubers	19	Preparations of cereals, flour, starch or milk; pastrycooks' products
8	Edible fruit and nuts; peel of citrus fruit or melons	20	Preparations of vegetables, fruit, nuts or other parts of plants
9	Coffee, tea, maté and spices	21	Miscellaneous edible preparations
10	Cereals	22	Beverages, spirits and vinegar
11	Products of the milling industry; malt; starches; inulin; wheat gluten	23	Residues and waste from the food industries; prepared animal fodder
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit	24	Tobacco and manufactured tobacco substitutes

Source: International Trade Center INTRACEN, 2022

Taking into account the objective of this research, the Balassa index (revealed comparative advantage) was calculated for two different periods: 2016-2019 (before the pandemic) and 2020 (during the SARS-CoV-2 pandemic). Equation 1 described how the Balassa index was calculated in the case of each agri-food product category. Afterward, the absolute change of the Balassa index was calculated. The absolute values were determined by resorting to the difference between the Balassa index per product category scored in the year 2020 and the average value of the Balassa index specific to a period before the SARS-CoV-2 pandemic (2016-2019), thus aiming at observing the degree of resilience during times of crisis. Based on the results, the agri-food product categories were classified as: (a) resilient – those with positive absolute change, and (b) poorly resilient categories – those that scored negative absolute changes of the Balassa index. Finally, the share of the absolute change was calculated per type of agri-food product categories: resilient and poorly-resilient.

$$RCA_{ij} = \frac{X_{ij}}{X_{ik}} \Big/ \frac{X_{nj}}{X_{nk}} \qquad (1)$$

Where: *X* represents the export value, *i* represents Romania, *n* represents the world, *j* represents the analyzed group of agri-products (from 1 to 24), *k* represents all the agri-food traded goods. Balassa index values below one justify no comparative advantage. If the value is between one and two, then the advantage is considered weak. If the value is situated between two and four, then the one can consider this advantage medium and if the value exceeds four, then this signals a strong comparative advantage.

3. Results and discussions

The Balassa index was calculated as explained in the methodology section: for a period of time before (2016-2019 and an average was calculated, *n*=four years) and during (2020) the COVID-19 pandemic. Results were graphically represented in Figure no. 1. Moreover, the resilience of the agricultural comparative advantage based on the Balassa index was calculated in Table no. 2.

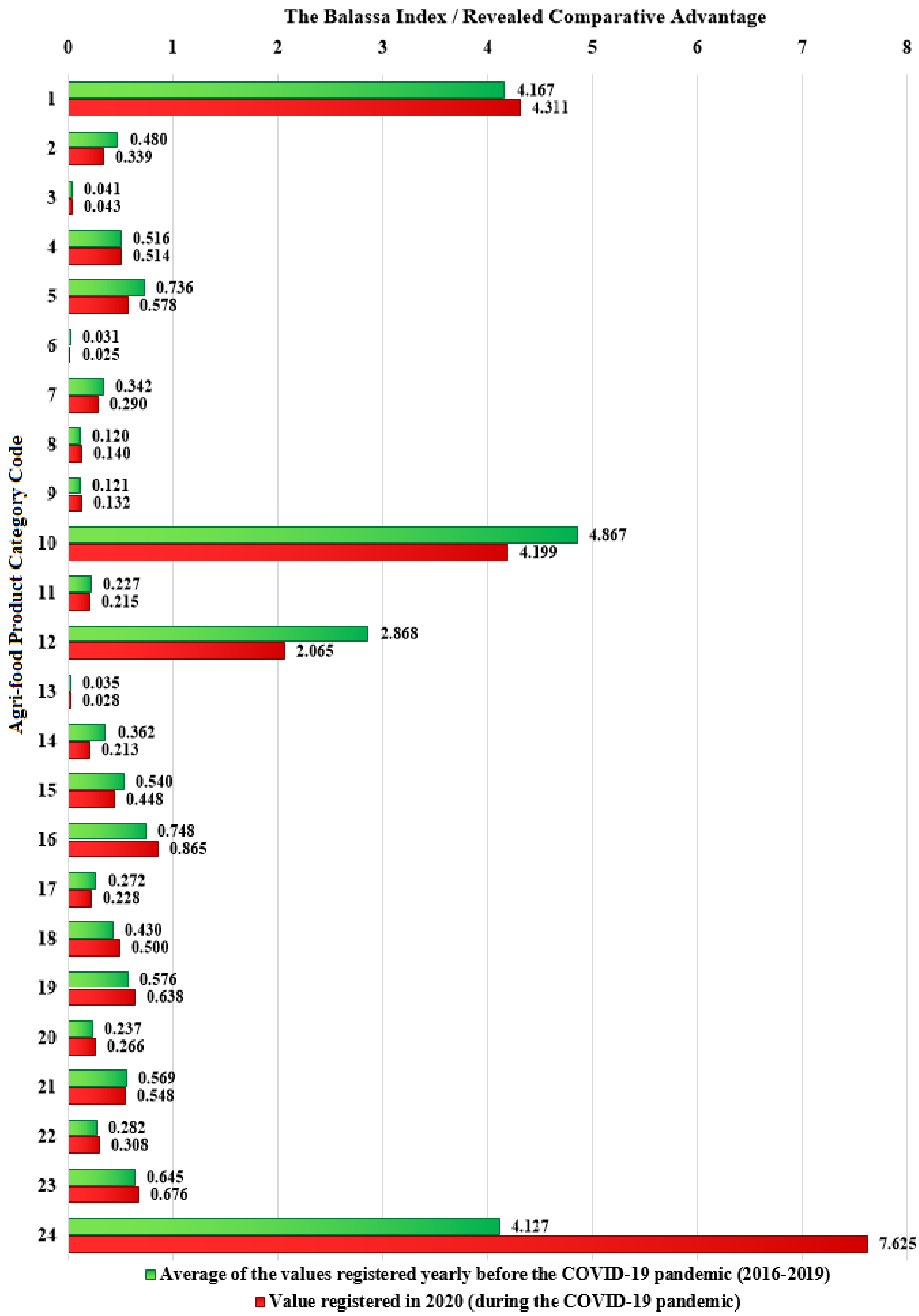

Figure no. 1. The Balassa index before and during the COVID-19 pandemic, per category
Source: Authors' own calculations based on International Trade Center (INTRACEN) database (2022)

Findings show that the most resilience agricultural comparative advantage was noticed in the case of agri-food category 24: tobacco and manufactured tobacco substitutes. The Balassa index scored a value almost double in 2020 (7.625) than the one registered on average during 2016-2019 (4.127), thus making this category one of the most competitive Romanian at export. Romania's trade balance registered a surplus of one billion EUR in 2020 in the case of tobacco and manufactured tobacco substitutes, making it the second category in the ranking of the agri-food product categories with the highest trade balance surplus.

Table no. 2. The resilience of agricultural comparative advantage based on the Balassa index

Agri-food Product Category Code	Absolute Change of the Balassa index (scored in the year 2020 vs the 2016-2019 average)	Share of the Absolute Change (%)	
		High Resilience based on Positive Change Results	Poor Resilience based on Negative Change Results
1	0.144	3.586%	—
2	−0.141	—	6.537%
3	0.003	0.072%	—
4	−0.001	—	0.065%
5	−0.157	—	7.289%
6	−0.006	—	0.300%
7	−0.053	—	2.439%
8	0.020	0.509%	—
9	0.012	0.298%	—
10	−0.668	—	30.976%
11	−0.012	—	0.550%
12	−0.804	—	37.250%
13	−0.008	—	0.353%
14	−0.149	—	6.926%
15	−0.093	—	4.289%
16	0.116	2.902%	—
17	−0.044	—	2.053%
18	0.070	1.745%	—
19	0.061	1.528%	—
20	0.029	0.725%	—
21	−0.021	—	0.973%
22	0.026	0.659%	—
23	0.031	0.773%	—
24	3.498	87.203%	—
TOTAL		**100.000%**	**100.000%**

Source: Authors' own calculations based on International Trade Center (INTRACEN) database (2022)

Regarding the ranking of the agri-food product categories with the highest trade balance surplus, the first place is held by class 10 – cereals, with 1.7 billion EUR on average during 2016-2020. On top of that, the Balassa index is above the threshold of four in the case of cereals, making Romania a net exporting country of raw materials, highly competitive in this regard. However, regarding class 19 – preparations of cereals, flour, according to the registered Balassa index values (0.576 on average and 0.638 in 2020), Romania is not competitive at all. Consequently, findings justify that: (a) Romania is 'highly competitive' through exporting raw materials with little added value, (b) Romania is not able to capitalize on its raw materials in order to increase its profitability through exporting processed foods (class 19 – preparations of cereals) with higher degrees of added value and improving its competitiveness in this regard. Thus, one can question the nature of competitiveness when approaching the high levels of exporting raw materials.

Regarding the resilience of the comparative advantage of cereals, the decrease of the Balassa index was 0.668, but the value scored in 2020 was still high (4.867). This decrease could have been caused by multiple factors: (a) the major drought that occurred in Romania in 2020, (b) an inefficient irrigation infrastructure, (c) the resulted low level of production, which also led the generation of the smallest surplus of trade balance with cereals (1.4 billion EUR) during the 2016-2020 period. Agri-food product category 10 – cereals registered the second most major decrease of the Balassa index, immediately after the category 12 – oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, which held the first place in the ranking of the most non-resilience agri-food products. With a decrease of the Balassa index of 0.804, the degree of competitiveness was still high in 2020: 2.065 and the trade balance scored a surplus of half billion EUR. Overall, the SARS-CoV-2 pandemic has caused the diminishment of the comparative advantage of the raw materials produced by Romania. More investments in the processing of raw materials are needed in order to Romania to become competitive in the case of the processed agri-food product categories and thus making Romania more profitable through efficient agricultural trading.

Conclusions

The COVID-19 pandemic has led to many changes in international trade flows for agri-food products. As a result of the divergent and dynamic actions in the global agri-food chains, agricultural comparative advantage has also been the subject of various changes with economic and food security implications. This research was aimed at exploring the resilience of the Romanian agricultural comparative advantages in the context of the COVID-19 pandemic by resorting to the changes of the Balassa index values.

In the case of Romania, results showed that the most resilient agricultural comparative advantage was that of the tobacco and manufactured tobacco substitutes. In this direction, Romania's competitiveness has almost doubled based on the Balassa index result and the trade balance surplus that registered a peak during the COVID-19 pandemic in 2020. On the other hand, the resilience of the comparative advantage regarding cereals, oil seeds, oleaginous fruits; miscellaneous grains and seeds was the weakest during the COVID-19 pandemic, despite Romania's tradition and competitiveness in this regard, which did not only cause food security vulnerabilities at the national level, but also at the level of the European Union.

This research has its limitations: the resilience of the agricultural comparative advantage was only approached through the lens of the change of the Balassa index values and did not focus on the specific causes that determined the outcome. Thus, future research avenues can be dedicated to exploring the exact causes that caused the decrease in competitiveness during times of crisis. Moreover, the research can be expanded at the level of other countries and the linkage analysis between resilience and agricultural comparative advantage can be further improved by including more indicators into the equation.

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