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**Short-Term Effects of COVID-19 Pandemic
on Agri-Food Value Chains in Romania**

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Abstract

The value chains in the agri-food industry are affected by the new COVID-19 working standards, considering that, in such a complex and dynamic industry, activities may or may not require intense physical labour, depending on many factors, such as: the technologies used, the level of automation, the logistics performance, etc. However, taking into consideration the peculiarities of the agri-food value chains, it becomes clear that with the new pandemic regulations, the agri-food value chains are under additional pressure. On the one hand, the pressure comes from the new working standards and, on the other hand, the pressure comes from the demand-side of agri-food products. The main objective pursued in this research paper was to quantify the short-term impact caused by the COVID-19 pandemic on the agri-food value chains in Romania, from multiple perspectives. A statistical analysis was carried, highlighting the short term socio-economic implications of the COVID-19 pandemic in Romania at the level of one of the structures within the agri-food value chain, companies operating in the wholesale of agricultural raw materials and live animals, by analysing the evolution of the turnover value indices of these companies. Other relevant indicators were also included in the statistical analysis. The main findings of this study refer to the previously mentioned companies, which successfully met the request from the demand-side in March 2020, when Romania was under the state of emergency due to the COVID-19 pandemic. Not only did these companies efficiently adapt to the new working regulations, but they also managed to turn a difficult situation to their advantage, considering the turnover value index of 201 in March 2020, the greatest value of the index during January-April 2015-2020.

Keywords: value chains, agri-food industry, COVID-19, Romania.

JEL Classification: Q10, Q13

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1. Introduction

The novel coronavirus outbreak (COVID-19) was declared a pandemic by the World Health Organization on March 11th, 2020, considering that this disease was considered highly contagious, with flu-like symptoms and no vaccine was expected by July 2020. Regarding the new COVID-19 working standards, the agri-food value chains are sensitive, especially in Romania, due to many national factors, such as: the low-tech farming practices; the lack of automation in agriculture; the increased demand of agri-food products during the beginning of the COVID-19 outbreak in Romania (March 2020).

Considering this context, the aim of this research paper was to quantify the short-term impact caused by the COVID-19 pandemic on the Romanian agri-food value chains, especially from the perspective of companies operating in the field of wholesale of agricultural raw materials and live animals, by analysing the evolution of the turnover value indices of these companies. Moreover, in order to broaden the scope of this research, the industrial production price indices specific to the agri-food sectors were also analysed, as well as the dynamics of the average prices of agri-food products sold in Romania, before and during the pandemic.

2. Problem Statement

Since Porter's paradigm of value chains, academic and businessmen are more process oriented in order to reach greater added value. Therefore, the former focus on business function is no longer the most efficient approach (Stadler et al., 2015). The next step is to better integrate the risk management tools and procedures in the value chain management (Olson and Wu, 2017). Obviously, this is a very sensitive and skilled activity and it aims to a very precious competitive advantage of the business and product on the long run.

For that to happen, efforts and investments are necessary. But, at the same time, many stressors and risks may occur and the business and the management itself may be put at against the wall. Therefore, adapting the capacity of the production process and to the possible market shakes is another important business objective.

There is a strong academic interest in identifying the impact of several risks and stressors that could affect agri-food industry and agri-food market and several studies were run in order to quantify the impact of pandemics on this market.

Alders et al. (2014) proved that the H5N1 avian influenza impacted village poultry and their owners and changed even the travellers' consumer habits and Gstraunthaler and Day (2008) proved that the main drivers for change are knowledge and a very good awareness of the past.

In fact, beginning with mad cow crisis, the international paradigm has changed. To monitor the traceability is compulsory on this market and innovative technologies were developed in order to prevent food security risks and provide safer products (Jank et al., 2014). Therefore, countries look up for providing national security (Lupien, 2007) and meet population basic needs (Ion, 2020).

The challenge is no longer within the value chains, but also, within the supply chains and value chains connections. New entrepreneurial behaviours are approached where knowledge acquisition and collaborative performance are brought together (Dung, 2020). Moreover, there are opinions that put into discussions the green value chain innovation (Huiling, 2020), so that modern business models to be energy efficient and less polluting.

Yet, all these papers have studied pandemic impact on the raw materials for food industry. This paper aims at identifying another kind of pandemic, population disease upon agri-food market. Precursor ideas were published (Lopes de Sousa Jabbour, 2020; Zhang, 2020; Zhang, 2020) and proved or at least researched the overpowering impact of COVID-19 on the sustainable supply chains and even at macroeconomic level.

Considering all these, there is the obviously need to identify the short-term effects of the COVID-19 pandemic on the agri-food value chains in Romania.

3. Research Questions. Research Hypotheses

After carefully considering the carried out overview of the scholarly literature in the field of agri-food sectors and agri-food value chains, under the influence of the COVID-19 pandemic, this research paper starts from the prerequisite that the Romanian demand for agri-food products was marked by an increase as of March 2020, which was successfully met in the market. To be more specific, there were three hypotheses tested in this research paper, as follows:

- H₁: In March 2020, the turnover value index of wholesale companies was the greatest in the case of companies operating in the field of wholesale of agricultural raw materials and live animals, compared to other types of Romanian wholesale companies;
- H₂: In Romania, based on the NACE classification, the classes specific to the production of meat and poultry meat products (class 1013) and to the manufacture of farinaceous products (class 1073) were among the classes specific to the agri-food sectors which had the biggest industrial production price indices associated in March 2020 among all analysed agri-food classes;
- H₃: During the COVID-19 pandemic (based on available data, March and April 2020), the average price of agri-food products sold on the Romanian markets did not increase, on average, with more than 105%, compared to the average prices of the same products before the pandemic (January and February 2020).

However, supposing that the average price of agri-food products sold on the Romanian markets did not increase with more than 10% and that the increased demand for such products was successfully met during the first months of the COVID-19 pandemic, it can be accepted that the short-term effects on the agri-food value chains are beneficial to the wholesale companies, yet the long-term effects can negatively affect the consumers (due to a potential significant increase of the average prices for agri-food products) and even the producers (the demand might decrease due to many factors, such as: consumers adapting to living

with new COVID-19 regulations, the potential increase in the average prices of the agri-food products and other factors).

Considering the previously mentioned hypotheses, this research aims to provide answers to many questions, including the following: Did the COVID-19 pandemic bring short-term benefits to the companies operating in the field of wholesale of agricultural raw materials and live animals? Under the influence of the COVID-19 pandemic, how was the production of meat and poultry meat products affected by the raising demand in the Romanian market, considering the processing capabilities? Did the agri-food value chains already react to the effects of the COVID-19 pandemic in the form of the increase in the average price of agri-food products?

4. Research Methods

In order to be able to quantify the short-term impact caused by the COVID-19 pandemic on the Romanian agri-food value chains, statistical analyses were carried out. Used to provide necessary and sufficient points to validate or reject the hypotheses, the statistical analyses are based on indicators available on the TEMPO Online platform of the Romanian National Institute for Statistics. The indicators analysed in this research paper are the following:

Table 1. The list of indicators used in this research paper

Indicator Code	Short Indicator Description
COM103L	Turnover value indices in wholesale, working day adjusted series – base year 2015
PPI1033	Industrial production price indices (domestic and non-domestic market) – base year 2015
PPA101A	Monthly average price of products sold in agro-food markets

Source: own indicators selection from the TEMPO Online platform

The indicator codes are kept as extracted from TEMPO Online, on June 28th, 2020. According to The Romanian National Institute for Statistics, the turnover indices are Laspeyres-type indices. Wholesale implies activities specific to product resale in large quantities, without essential transformation of the products, which are resold to retailers, industrial, commercial users and others, but not to final consumers, no matter if sale is meant for domestic market or for export. The turnover is defined by the Romanian National Institute for Statistics as the total income registered by the company, from both the main activity and other activities, but it does not include the VAT, nor the income from the sale and transfer of fixed assets. The COM103L indices for the month of April 2020 are classified as temporary data, as of June 28th, 2020.

The industrial production price index is also a Laspeyres-type index. PPI1033 quantifies the evolution of prices for products delivered during the first marketing

stage by domestic producers during a particular period as compared to a previous period (in this case, the base year is 2015), VAT excluded.

PPA101A refers to the products sold by private agricultural producers and/or their associations in markets within the urban area and in fairs.

5. Findings

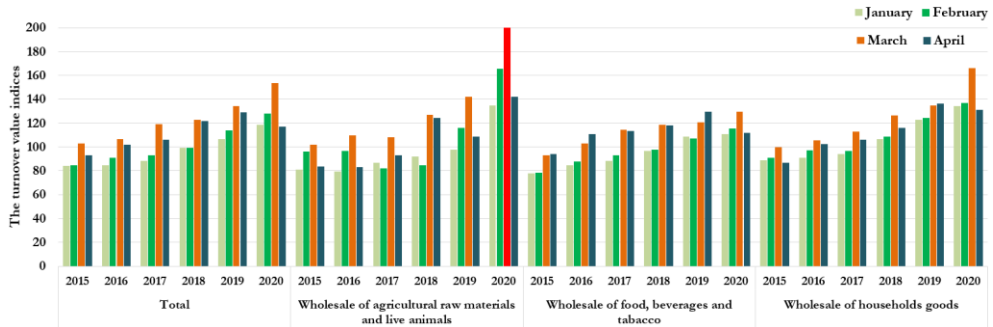


Figure 1. The turnover value index of Romanian wholesale companies during January-April 2015-2020

Source: own conceptualization based on data extracted from TEMPO Online

Nationwide, the turnover value index of Romanian wholesale companies during January-April 2015-2020 increased yearly. The national average growth rate for the previous mentioned timeframe was: 7.25% for the month of January, 8.73% for the month of February, 8.42% for the month of March and 5.07% for the month of April. In the case of companies operating in the field of wholesale of agricultural raw materials and live animals, the average growth rate was marked by even greater values: 11.45% for the month of January, 13.72% for the month of February, 15.36% for the month of March and 13.31% for the month of April. Similarly, the companies operating in the field of wholesale of food, beverages and tobacco registered the greatest turnover value index in March 2020, of almost 130, which is greater with 7.37% than the value registered in March 2019. However, among all the analysed sectors during the January-April 2015-2020 timeframe, the greatest value of the turnover value index was reached by the companies operating in the field of wholesale of agricultural raw materials and live animals, during March 2020, with an index of 201. This was the peak, considering that the second greatest value of the index was registered by the same sector in February 2020: 165.5. Taking this early signal into account, from February, one month before the global pandemic with COVID-19 was officially declared by the World Health Organization, one can notice that the Romanian agricultural sectors were extremely sensitive to an increase in the market demand. As a result, the companies operating in the field of wholesale of agricultural raw materials and live animals recorded an increase in the turnover value index with 41.55% in March 2020 compared to March 2019. Under the influence of a threat to the food safety due to the emerging pandemic in Romania, where the first patient infected with COVID-19 was

confirmed on February 26th, the companies operating in the field of wholesale of agricultural raw materials and live animals managed to respond quickly to the raising demand for such products. As a consequence and immediate result, the turnover value index of the previously mentioned companies recorded the greatest increase during the analysed timeframe, which corresponds to the first impulses of the human kind — to ensure food safety during an uncertain future.

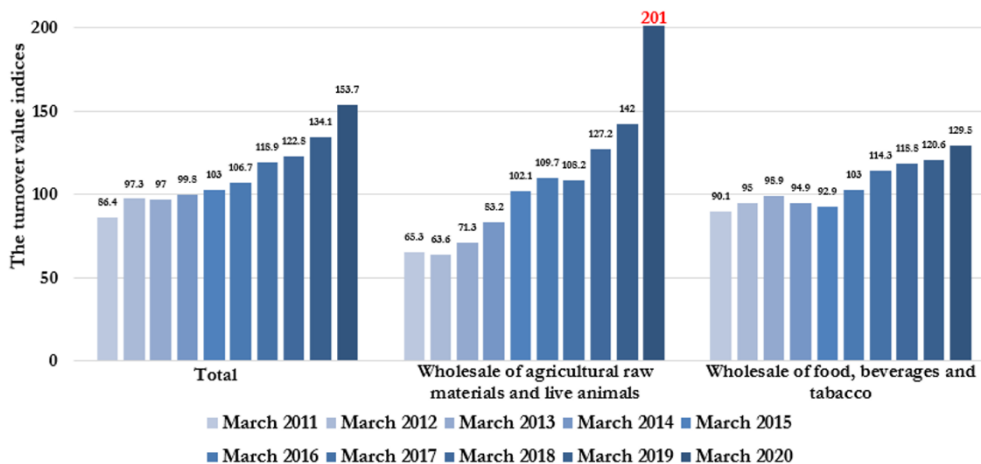


Figure 2. The evolution of turnover value index of the Romanian wholesale companies during March 2011-2020

Source: own conceptualization based on data extracted from TEMPO Online

Therefore, the first hypothesis is validated: in Romania, in March 2020, the turnover value index of wholesale companies was the greatest in the case of companies operating in the field of wholesale of agricultural raw materials and live animals, compared to other types of Romanian wholesale companies.

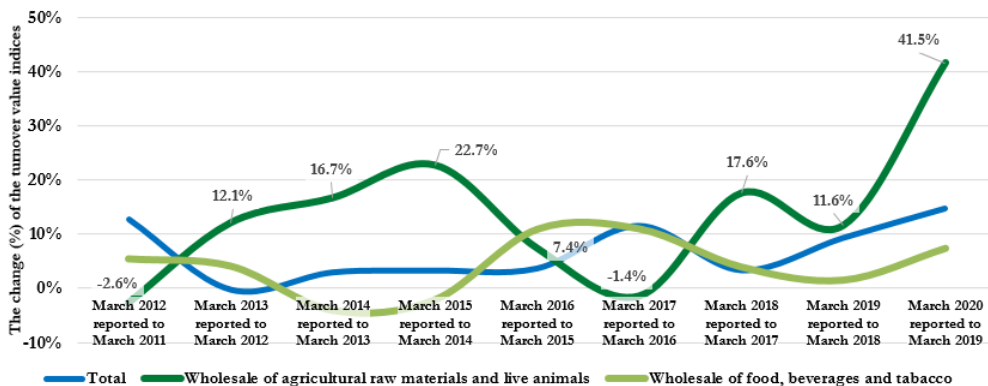


Figure 3. The dynamics of the turnover value index

Source: own conceptualization based on data extracted from TEMPO Online

Data included in Figure 2 strengthens the finding that companies active in the field of agriculture are the first to economically benefit due to human kind perceiving food safety as a major priority when the future is no longer predictable. In Romania, the state of national emergency was declared by the President, on March 16th, 2020. In order to mitigate the spread of COVID-19 in Romania, the exercise of certain rights, including the freedom of movement and economic freedom, was restricted proportionally based on the gradual degrees mentioned in the Decree no. 195 / March 16th, 2020 published in the Official Journal of Romania no. 212 / March 16th, 2020. Considering the restricted exercise of such rights, food safety became a major concern for the individual, while the companies operating in the field of wholesale of agricultural raw materials and live animals managed to turn this situation of national and global crisis into an opportunity to increase the sales of the products that underpin food safety.

Another relevant metric for this study is the industrial production index with regard to the agri-food NACE classes, because it indicates which agri-food chain was the most responsive to the new COVID-19 influenced demand.

Table 2. The industrial production index dynamics before and during the COVID-19 pandemic at the level of agri-food NACE classes

Agri-food NACE classes	March 2018	March 2019	March 2020	2019 compared to 2018	2020 compared to 2019
1052 Manufacture of ice cream	114.48	131.38	139.68	14.76%	6.32%
1013 Production of meat and poultry meat products	111.02	113.93	135.34	2.62%	18.79%
1085 Manufacture of prepared meals and dishes	110.06	119.59	129.79	8.66%	8.53%
1073 Manufacture of macaroni, noodles, couscous and similar farinaceous products	106.59	115.11	121.31	7.99%	5.39%
1089 Manufacture of other food products n.e.c.	116.94	119.32	120.51	2.04%	1.00%
1107 Manufacture of soft drinks, production of mineral waters and other bottled waters	109.35	112.95	120.37	3.29%	6.57%
1062 Manufacture of starches and starch products	110.19	122.71	120.01	11.36%	-2.20%
1084 Manufacture of condiments and seasonings	109.1	111.33	119.54	2.04%	7.37%
1051 Operation of dairies and cheese making	112.33	116.23	119.42	3.47%	2.74%
1105 Manufacture of beer	113.56	118.82	119.37	4.63%	0.46%
1011 Processing and preserving of meat	99.18	95.83	119.2	-3.38%	24.39%

Agri-food NACE classes	March 2018	March 2019	March 2020	2019 compared to 2018	2020 compared to 2019
1091 Manufacture of prepared feeds for farm animals	109.66	113.26	115.25	3.28%	1.76%
1082 Manufacture of cocoa, chocolate and sugar confectionery	106.46	105.82	114.89	-0.60%	8.57%
1071 Manufacture of bread; manufacture of fresh pastry goods and cakes	107.17	111.51	114.52	4.05%	2.70%
1072 Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes	106.96	108.2	113.03	1.16%	4.46%
1102 Manufacture of wine from grape	104.7	108.62	112.43	3.74%	3.51%
1083 Processing of tea and coffee	93.97	102.19	110.86	8.75%	8.48%
1061 Manufacture of grain mill products	100.4	110.34	110.37	9.90%	0.03%
1020 Processing and preserving of fish, crustaceans and molluscs	106.8	102.99	107.55	-3.57%	4.43%
1032 Manufacture of fruit and vegetable juice	102.22	102.21	106.97	-0.01%	4.66%
1200 Manufacture of tobacco products	105.53	106.2	106.31	0.63%	0.10%
1012 Processing and preserving of poultry meat	98.34	96.95	104.43	-1.41%	7.72%
1041 Manufacture of oils and fats	95.68	98.27	102.61	2.71%	4.42%
1042 Manufacture of margarine and similar edible fats	93.26	102.9	102.46	10.34%	-0.43%
1039 Other processing and preserving of fruit and vegetables	105.34	99.09	102.4	-5.93%	3.34%
1101 Distilling, rectifying and blending of spirits	96.13	92.65	98.7	-3.62%	6.53%
1104 Manufacture of other non-distilled fermented beverages	89.42	94.85	97.59	6.07%	2.89%
1081 Manufacture of sugar	109.34	96.26	91.97	-11.96%	-4.46%
AVERAGE	105.15	108.20	113.46	2.90%	4.86%

Source: own conceptualization based on data extracted from TEMPO Online

Based on the processed data in Table 2, on average, for the month of March (2018-2020), the industrial production index annually increased by 3.88%. Reporting the production index during the COVID-19 pandemic (March 2020) to the production index before the pandemic (March 2019), the agri-food chains under the greatest production pressure were: *1011 Processing and preserving of meat* (increase by 24.39%), *1013 Production of meat and poultry meat products* (increase by 18.79%), *1082 Manufacture of cocoa, chocolate and sugar confectionery* (increase by 8.57%). Moreover, the second research hypothesis is validated, because, in Romania, the production of meat and poultry meat products (class 1013) and the manufacture of farinaceous products (class 1073) were among the agri-food chains which had the greatest industrial production price indices associated in March 2020 among all analysed agri-food chains: 135.54 and 121.31. However, the manufacture of ice cream (class 1052) registered the greatest industrial production index in March 2020, 139.67 – which is by 23.10% greater than the national average industrial production index in March 2020 (113.46), at the level of all agri-food chains. The agri-food chain the least responsive to the new COVID-19 influenced demand was the class *1081 Manufacture of sugar*, in which case the industrial production index contracted by 4.46% in March 2020 compared to March 2019, followed by the class *1062 Manufacture of starches and starch products* (2.20% contraction) and the class *1042 Manufacture of margarine and similar edible fats* (0.43% contraction). Only those three agri-food classes were resilient to an increase in the industrial production index during the pandemic.

In order to comprehensively study the short-term effects of the COVID-19 pandemic on the agri-food value chains in Romania, another relevant indicator was considered: the average prices of agri-food products sold on the Romanian markets, before and during the COVID-19 pandemic.

Table 3. The average prices of agri-food products sold on the Romanian markets, before (January, February 2020) and during the pandemic (March, April 2020) (measurement unit: RON per kilogram, with the exception of milk: RON per litre and with the exception of eggs: lei per piece)

	Before the COVID-19 pandemic (Average of January and February 2020)	During the COVID-19 pandemic (Average of March and April 2020)	Percentage change (Prices during the pandemic compared to prices before the pandemic)
Autumn cabbage	RON 2.23	RON 2.86	28.25%
Autumn potatoes	RON 2.53	RON 3.06	20.95%
Dry onion	RON 3.64	RON 4.22	15.96%
Barley malting barley	RON 1.01	RON 1.16	14.93%
Carrots	RON 3.52	RON 3.90	10.95%
Apples	RON 3.31	RON 3.67	10.88%
Dry garlic	RON 16.01	RON 17.67	10.34%
Kidney beans (dried)	RON 10.19	RON 10.65	4.52%
Cows milk	RON 3.05	RON 3.16	3.61%
Cow cottage cheese	RON 18.39	RON 18.85	2.50%
Nuts	RON 7.91	RON 8.04	1.64%
Sheep cheese	RON 24.68	RON 24.91	0.95%
Honey	RON 28.10	RON 28.28	0.62%
Oats	RON 1.10	RON 1.08	-1.82%
Hen eggs	RON 1.04	RON 0.88	-15.38%

Source: own conceptualization, based on the available data (TEMPO Online)

Unfortunately, the processed data in Table 3 is limited to certain agri-food products, at the moment data was taken over from TEMPO Online. The greatest increase in the average price during the COVID-19 pandemic was caused by the vegetables value chain: autumn cabbage (greatest increase in price during the pandemic, 28.25%), autumn potatoes (20.95%), dry onion (15.96%) and others. On the other hand, the hen eggs average price decreased by 15.38% during the pandemic – from RON 0.88 per piece (average during March and April 2020) to RON 1,104 per piece (average during January and February 2020). Lastly, the third research hypothesis is validated, because during the COVID-19 pandemic, the average price of agri-food products sold on the Romanian markets did not increase, on average, by more than 10%, compared to the average prices of the same products before the pandemic.

6. Conclusions

The objective of this research paper was achieved and the short-term impact caused by the COVID-19 pandemic on the Romanian agri-food value chains was quantified, based on the most relevant and reliable available statistical data at the moment this paper was written. All research hypotheses were validated: in Romania, the turnover value index of wholesale companies was the greatest during the COVID-19 pandemic in the case of companies operating in the field of wholesale of agricultural raw materials and live animals (201), compared to the national average of wholesale companies (153.7). The production of meat and poultry meat products (class 1013) and the manufacture of farinaceous products (class 1073) were among the agri-food chains which had the greatest industrial production price indices associated to March 2020 among all the analysed agri-food chains: 135.54 and 121.31. When analysing the national average price for agri-food products, it did not increase by more than 10% during the first months of the COVID-19 pandemic (March and April 2020), compared to the period before the pandemic (January and February 2020).

The main limits of this study refer to the fact that the analysed timeframe was short (the first months of the pandemic) and some statistical data are still classified as temporary data by the Romanian National Institute for Statistics. This study can be extended as more data is gathered. Even though this study was focused on the short-term effects of the COVID-19 pandemic on the agri-food value chains, the long-term effects are more complex to study and require additional indicators to be considered, as well as additional research methods.

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