






# “Development of financial performance of food retailers as an attribute behind the increase of food insecurity in selected Central and Eastern European Countries”

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<b>ARTICLE INFO</b>	Oksana Dubanych, Jan Vavřina and Josef Polák (2023). Development of financial performance of food retailers as an attribute behind the increase of food insecurity in selected Central and Eastern European Countries. <i>Investment Management and Financial Innovations</i> , 20(4), 416-433. doi: <a href="https://doi.org/10.21511/imfi.20(4).2023.33">10.21511/imfi.20(4).2023.33</a>
<b>DOI</b>	<a href="http://dx.doi.org/10.21511/imfi.20(4).2023.33">http://dx.doi.org/10.21511/imfi.20(4).2023.33</a>
<b>RELEASED ON</b>	Friday, 15 December 2023
<b>RECEIVED ON</b>	Monday, 29 May 2023
<b>ACCEPTED ON</b>	Sunday, 03 December 2023
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<b>JOURNAL</b>	"Investment Management and Financial Innovations"
<b>ISSN PRINT</b>	1810-4967
<b>ISSN ONLINE</b>	1812-9358
<b>PUBLISHER</b>	LLC “Consulting Publishing Company “Business Perspectives”
<b>FOUNDER</b>	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

**39**



NUMBER OF FIGURES

**5**



NUMBER OF TABLES

**11**

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## BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"  
Hryhorii Skovoroda lane, 10,  
Sumy, 40022, Ukraine  
[www.businessperspectives.org](http://www.businessperspectives.org)

**Received on:** 29<sup>th</sup> of May, 2023

**Accepted on:** 3<sup>rd</sup> of December, 2023

**Published on:** 15<sup>th</sup> of December, 2023

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**Conflict of interest statement:**

Author(s) reported no conflict of interest

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# DEVELOPMENT OF FINANCIAL PERFORMANCE OF FOOD RETAILERS AS AN ATTRIBUTE BEHIND THE INCREASE OF FOOD INSECURITY IN SELECTED CENTRAL AND EASTERN EUROPEAN COUNTRIES

## Abstract

Food insecurity is not a new phenomenon even in leading European economies, but this complex problem area is facing new global challenges. This article traces the research gap in addressing food insecurity by focusing on the role of food retail chains in the former "Eastern Bloc" in light of unprecedented food price inflation and the resulting scale of demand for the services of food banks. Through empirical analysis of secondary financial corporate data, a low level of their profitability in the period of 2011–2019 was revealed, which preceded the synchronicity of two unexpected global economic downturns. Specifically, Return on Sales for food retailers located in the Czech Republic and Hungary was generally below 2%, offset by higher Total Asset Turnover figures, consistent with the need to extend the volume of goods for sale. Development in profitability in selected newer EU member states is just as significantly similar to the situation in Ukraine. The mutual interaction of factors of economic size and the country of residence of business was analyzed regarding a possible influence on their financial performance. This study concluded that the presence of unresolved market distortions can both lead to increased food insecurity and, paradoxically, contribute to increased food waste.

## Keywords

food retail chains, business financial performance, food poverty, foodstuff market distortions

## JEL Classification

G32, L81, M38

## INTRODUCTION

Food retailers are very important stakeholder group in the food value chain. First of all, their direct relationships with end consumers are important, and especially important is their provision of business services that help meet nutritional needs of the population. Their market position among EU Member States is narrowly associated with the development in the growth of market concentration in the retail food market, which also affects further changes in the market structures. Changes in the market structures are necessarily reflected in the economic situation of respective entities through the food value chain involved stakeholders, and it inevitably affects the final consumers of food (Beacom et al., 2021; Horvathova et al., 2022; Konieva, 2021).

Development in market structure and competitive environment formation in the food value chain forced EU executives to adopt legislation within antitrust policy and introduce the directive against unfair

trade practices. In that context, respective financial performance indicators of food retailers can be considered as a harmonized proxy to observe mutual relationships among different stakeholders involved, including owners' structures and the inclusion of their short and long-term goals (e.g. Bredin et al., 2022; Lehenchuk et al., 2023; Nes et al., 2021). However, the introduced attributes are treated in practice under diverse conditions for its effective applicability, even when the EU single market is assumed. Modern approaches for ensuring the nutritional needs of the population suffering from food poverty in the developed countries of the world represent a specific challenge. It is not challenging only due to the threat of global crises, but also due to the needs of the strategic development of the agri-food complex towards streamlining its activities Zsarnóczai et al. (2021). Specifically, they try to find a balance between private economic goals and public demand on the corporate responsibility side of their activities because of the need to mitigate climate change's negative effects.

An alternative to establishing a safety net in nutritional needs of the disadvantaged groups of the population can be the concept of food banks and charitable organizations, which focus on areas of support for socially disadvantaged groups of people. This type of presented concept is not new and has a tradition both in the core EU member states and in the newer EU member states, where their gradual development is taking place. However, the food banking safety net is facing a new dynamic of changes, whether it is a pandemic of the new type of coronavirus or the current war of Russia against Ukraine. Therefore, it is very important to constantly revise the boundaries of the possibilities of ensuring nutritional needs on the one hand regarding specific groups of consumers in the population and on the other hand reflecting diverse stakeholders within the agri-food complex and their strategic goals.

The need to transform the food value chain with an emphasis on food security under fair market conditions, quality, safety, and last but not least environmental friendliness of production systems in market economies is a complex task to be solved by an intensive cooperation of public administrations and the private sector. An effort to "redesign" food supply chains covers often topics like inefficient consumption of natural resources, which results in loss of biodiversity and negative health impacts. In addition, aspects that consider the sustainability and economic profitability of the involved entities in market economies should be considered important as attributes in mitigating the presence of food poverty towards supporting a resilient food value chain. Food retail chains and the dynamics of the development of their business activities must be considered important actors in this context.

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## 1. LITERATURE REVIEW

The strategy of public bodies and institutions for meeting the nutritional needs of the population, which includes also pessimistic scenarios for solving the threat of a food supply crisis, cannot be considered a new concept. Specifically, however, prevention against food insecurity represents a broader problem area that needs to be reflected (Platform EU Waste on Food Losses and Food, 2019). The effort to ensure stability, competitiveness, and responsibility in the food market in the EU have to be viewed through various dimensions, which must be considered and further adopted at the relevant level of legislation of the EU member states (European Union, 2019). All the aspects and a wider range of attributes must be considered also in the context of the necessary reforms of the EU's Common Agricultural Policy, re-

specting the key areas of the complex strategic goals of the so-called EU Green Deal and the consequent need for the continuous development in this area (European Union, 2020).

As can be seen from the empirical evidence, the effects of the recent COVID-19 crisis have been reflected in national markets to varying degrees, depending on the strength of the given marketplace, the level of regulation, the supply chain status, and other variables (Hamulczuk & Skrzypczyk, 2021; Ryciuk, 2022). The collapse of the food industry is socially unthinkable, although, for example, due to the possible effects of the current war of Russia against Ukraine or the climate change, it cannot be described as impossible. The long-term sustainability of this industry is a condition not only for ensuring a sufficient supply of safe and nutri-

tionally valuable food to retail chains (Antonioli & Santeramo, 2021; Ilhan, A. & Füredi, F., 2023). It must also ensure safe supplies to food banks to meet the basic nutritional needs of vulnerable population groups when considering the possible other negative societal consequences, if not addressed operationally (Hannus & Sauer, 2021; Nagpaul et al., 2022; Zlati et al., 2023).

According to Hasnain et al. (2021), food banks are non-profit organizations that collect and distribute food donations to people in food need within their catchment areas. For this activity, they take into account three criteria such as equality, effectiveness, and efficiency. The efficiency criterion aims to minimize the cost of transportation when considering further interrelations of business transactions in agri-food complex (Heinrichs et al., 2021). Despite all efforts to rationalize the entire process, there is a noticeable dependence on sufficient sources of funds and food for the operation of food banks towards the support of people in material need. However, this may contrast with initiatives for more environmentally sustainable approaches to agricultural land management and consequent food production, which lead to lower yields (Ali, Ang, & van der Fels-Klerx, 2021).

Setting up a system that would be efficient and fair is not an easy task as the example from the United Kingdom represents. Reeves and Loopstra (2021) examined the effects of the introduction of Universal Credit payment by the UK government. These authors also identified, along with the expansion of the support payment from the government, an increase in the distribution of food parcels. Research was conducted in areas where food banks are represented. It is therefore possible to assume that the food insecurity associated with the application of a new system is also hidden in areas where food banks are not available. There are quite critical views on the introduction of this type of public payment. Beck and Gwilym (2022), Farnsworth and Irving (2020), and Harrison (2022) even characterized the years 2010 to 2020 in the UK as a decade of austerity measures with a transition to reducing state social security.

The human factor should also be mentioned as an unforgettable weakness that can act despite all the optimization efforts mentioned (Wahdat & Lusk,

2022). Turkkan (2021) identified the inadequacy of the system setup in Istanbul's food banks, in which food bank worker classifies applicants into one of two groups, namely into "deserving" and "undeserving". However, the classification may be subject to the individual preferences of the relevant worker, who discriminates against applicants based on age, ethnicity, gender, employment, and marital status.

Many scientific articles discuss the noticeable effects of the COVID-19 pandemic on the economy and business (Belas et al., 2021; Kumar et al., 2022; Skare & Riberio Soriano, 2022; Wahdat & Lusk, 2022; Juhász et al., 2022). Belas et al. (2021) in their study of a large sample of small and medium-sized enterprises in the Czech Republic and Slovakia confirmed that the COVID-19 pandemic affected the financial performance of these companies. These businesses are forced to look for new survival strategies in times of great economic and social uncertainty and new crises with hard-to-predict consequences. In addition, the broader role of stakeholder groups is also stressed in the context of developed European economies. An empirical study from Southeast Asia points out that meeting business goals is inevitably interrelated with the ability to adopt innovations to increase the efficiency of the respective industry branch. The role of ownership concentration is regarded as an important aspect behind the financial performance of businesses as stakeholder groups encourage managers of businesses to reach efficiency goals (Triyonowati et al., 2023).

The state of the food sector before the recent crisis in the EU was further evaluated by Trnková and Žáková Kroupová (2021). These authors evaluated the technical and scale efficiency and technological change of the Czech food industry (respectively for companies representing 74% of total turnovers of the food processing industry in the subsectors) in the period 2016–2019 with a focus on competitiveness and profitability. They found that the analyzed subsectors were scale-efficient. On the other hand, their production technologies exhibited a prevailing technological regress.

In the context of inefficiencies, it can be specifically mentioned a food processing industry branch, where the cause of identified inefficiencies was

the consumers' behavior in the years before the COVID-19 crisis. From a food quality perspective, Kapelko et al. (2022) identified that the focus on food health and wellness is still growing in consumer preferences. In their research, they coped with the dietetic food manufacturing sector. Overall, they state that the most inefficient factors are investments, output, materials, and employees. From the facts mentioned, it is clear that the food processing industry cannot be perceived as a single monolith, and that it is still necessary to reflect the individual sector's specifics in respective countries. Their results are consistent with the findings of other authors who point out the reduction in costs through improvements in efficiency side (Kokemohr et al., 2022; Lowrey et al., 2022; Ivanov et al., 2021).

Soboń et al. (2021) state that the identified business patterns will allow them to take these characteristics into account for forecasting sales for the following periods. Moreover, the business patterns can be helpful also in adjusting the decision-making system of the enterprise, taking into account the seasonality of the business data evidence and the results of the previous period.

Using the empirical basis, this article aims to identify similarities and differences in the development of key financial performance indicators of food retail chains among a diverse sample of EU member states concerning their country of location and economic size, including Ukraine as a non-EU member country. In addition, Ukraine is involved in the sample of countries both as the representative of a substantial share of the total agri-food complex production in Europe and as the country with the candidate on EU entrance currently granted status. The observed period covers the years 2011–2019, which provides an important insight into processes of forming nowadays market structures and situations in the competitive environment, while recently facing a high level of inflation on the supply side of the food value chain with its unprecedented growth trend. Specifically, the Czech Republic is the representative of the country with the highest inflation of foodstuff in Europe, regarding the year 2022. In the aforementioned context, the sample of food retailers is considered via the assumption of being an important stakeholder in ensuring the nutritional needs of the population. Their role in the

food value chain, specifically in relation to food insecurity that is mostly directly affecting vulnerable groups of the population, is therefore necessary to be embedded in the concept of their business goals. Business goals then can be partially analyzed by employing a systematic financial approach.

The following hypotheses are explored:

*Hypothesis H1 and its partial hypotheses: Categorical factors – economic size and country of location of food retailers – explain the variability of dependent indicators ROE (H1a), ROS (H1b), and TAT (H1c) in selected Visegrad 4 member countries.*

*Hypothesis H2 and its partial hypotheses: Categorical factors – economic size and country of location of food retailers – explain the variability of dependent indicators ROE (H2a), ROS (H2b), TAT (H2c) in a group of countries of Czechia, Hungary, and Ukraine.*

*Hypothesis H3 and its partial hypotheses: Categorical factors – economic size and country of location of food retailers – explain the variability of dependent indicators ROE (H2a), ROS (H2b), TAT (H2c) in a group of countries of Czechia, Hungary, Estonia, Latvia, and Lithuania.*

## 2. METHODS

There are employed approaches for the identification of similarities and dissimilarities in the development of key financial performance indicators of food merchandisers, using categorical predictors of economic size and country of location as distinguishing factors within the identified scope of accessible strategic financial data behind food merchandisers based in selected European countries. Namely, to follow a diverse situation in the EU regarding negative price inflation development, it involves the following groups of countries: Czechia, Hungary, and Poland as representatives of Visegrad 4 countries; Estonia, Latvia, and Lithuania as representatives of Baltic area countries. And Ukraine as a representative of a non-EU member country with a substantive amount of European agricultural production. Database

ORBIS of Bureau van Dijk (Bureau van Dijk, 2020) is used as the source of corporate financial data. It is assumed normality of data is due to a sampling procedure for identifying active food retailers.

The following search strategy was applied for gathering financial data samples of food retailers from the aforementioned database for the period of 2011–2019, as it was known till December 2020: EU NACE industry classification G – Wholesale and retail trade, resp. EU NACE code 4711 – Retail trade with a predominance of food, beverages and tobacco products in non-specialized stores; active economic status of a business entity; country of the basement in the respective aforementioned observed country; economic size category of business entity. Classification of a single business entity's economic size in the sample is the following:

- Large companies: annual operating revenue higher than 10 million EUR; total assets for a year-period higher than 20 million EUR; a number of employees higher than 150;
- Small and medium-sized companies: annual operating revenue lower than 10 million EUR; total assets for a year-period lower than 20 million EUR; a number of employees lower than 150.

The sample of food retailers consists of the following structure of size categories of businesses identified in the corporate database Orbis of Bureau van Dijk (2020) (see Table 1).

**Table 1.** Number of enterprises in the sample for categories of economic size of observed active food retailers in 2019

Country/ Economic size of business entities	SME	Large
Czech Republic	6131	66
Hungary	3898	46
Poland	1688	194
Ukraine	3949	164
Estonia	336	24
Latvia	986	21
Lithuania	104	18

Selected key indicators for analyses of financial performance are derived as median values from the accessible financial statements in the corporate database Orbis of Bureau van Dijk (2020).

These indicators include financial remuneration of the equity capital involved and its development represented by Return of Equity (ROE) and its analytical breakdown, namely into Return on Assets (ROA) and Financial Leverage (FL). For a further analytical breakdown, involving a dynamic scope, the dynamic index-type breakdown was employed to reveal a contribution to the dynamics of indicators ROE and ROA. Regarding its breakdown components and their mutual relationships, namely by contribution of Financial Leverage to ROE, Return on Sales (ROS) to ROA, Total Assets Turnover (TAT) to ROA, Total Assets (TA) to TAT, Sales to Net income and Total Cost (TC) to Net Income.

The involved indicators, which cover also respective hierarchical breakdown components ( $a_i$ ), namely Total Assets ( $a_1$ ), ROS ( $a_2$ ), Sales ( $a_3$ ), Total Costs ( $a_4$ ), TAT ( $a_5$ ), FL ( $a_6$ ) and the respective aggregated indicators within their breakdown hierarchy ( $AGG_i$ ), namely ROE ( $AGG_1$ ), ROA ( $AGG_2$ ), Net Income ( $AGG_3$ ), TAT ( $AGG_4$ ), are enumerated as following:

$$AGG_1 = \frac{AGG_3}{Equity\ Shareholders\ Funds}, \quad (1)$$

$$AGG_2 = \frac{AGG_3}{a_1}, \quad (2)$$

$$a_2 = \frac{AGG_3}{a_3}, \quad (3)$$

$$AGG_3 = a_3 - a_4, \quad (4)$$

$$(a_5) \text{ and also } (AGG_4) = \frac{a_3}{a_1}, \quad (5)$$

$$a_6 = \frac{a_1}{Equity\ Shareholders\ Funds}. \quad (6)$$

Enumeration of the respective hierarchical breakdown component contribution ( $a_i$ ) considers either mutual multiple-based or subtraction-based relationship within the aggregated indicators ( $AGG_i$ ) in their breakdown hierarchy as it is defined in formulas (1) to (6). Consequently, the dynamic Year-on-Year (denoted as  $\{t/(t-1)\}$ ) logarithm or index-based approach for the multiple relationships is applied using the generalized algorithms (7) or

(8), resp. (9) for the subtraction-based relationship. Contribution of the dynamic breakdown component  $a_i$  changes on  $\Delta AGG_i$  using a logarithm-based algorithm is based on formula (7):

Influence of  $a_i$  on Y-on-Y change of

$$AGG_i = \frac{\ln(a_{i,t}/a_{i,t-1}) / \ln(AGG_{i,t}/AGG_{i,t-1})}{AGG_{i,t}/AGG_{i,t-1}} - 1. (7)$$

Where the logarithm-based formula (7) cannot be applied due to negative input values, the Year-on-Year ( $t/t-1$ ) index-based ( $I_{AGG_i}$ ) approach for revealing partial contributions is employed using the following generalized algorithm for respective aggregated indicator ( $AGG_i$ ) and its partial dynamic breakdown components ( $a_i$ ) in formula (8):

Influence of component  $a_i$  change on

$$I_{AGG_i} = \frac{AGG_{i,t}}{AGG_{i,t-1}} = \frac{\{(a_{i,t}a_{i,t-1}) \cdot (a_{i,t-1}a_{i,t-1})\}}{\{(a_{i,t}a_{i,t}) \cdot (a_{i,t}a_{i,t-1})\}}. (8)$$

Consideration of the subtraction-based relationship allows us to reveal the influence of a partial dynamic breakdown component ( $a_i$ ) on the respective aggregated indicator ( $AGG_i$ ). The following generalized algorithm (9) is then specifically applied for the indicator Net Income ( $AGG_3$ ) and respective breakdown components *Sales* ( $a_3$ ), *Total Costs* ( $a_4$ ):

Influence of  $a_i$  on

$$\Delta AGG_i = \{ \ln(a_{i,t} / a_{i,t-1}) / \ln(AGG_{i,t} / AGG_{i,t-1}) \} (I_{AGG_i})(a_{i,t} - a_{i,t-1}) / \Delta a_i \} / (I_{AGG_i} - 1). (9)$$

The two-way ANOVA method was used to determine the sources of variability in relation to the qualitative factors of Economic size and Country of location of food retailers determined by the respective hypotheses. In this context, the decomposition of the total variance of the observed empirical financial indicators into components of known variability and sources of unexplained variability is processed. Subsequently, respective hypotheses about the statistical significance of individual sources of variability are tested (Meloun & Militký, 2004).

The two-way ANOVA method is accompanied by an additional comparison of observed mean val-

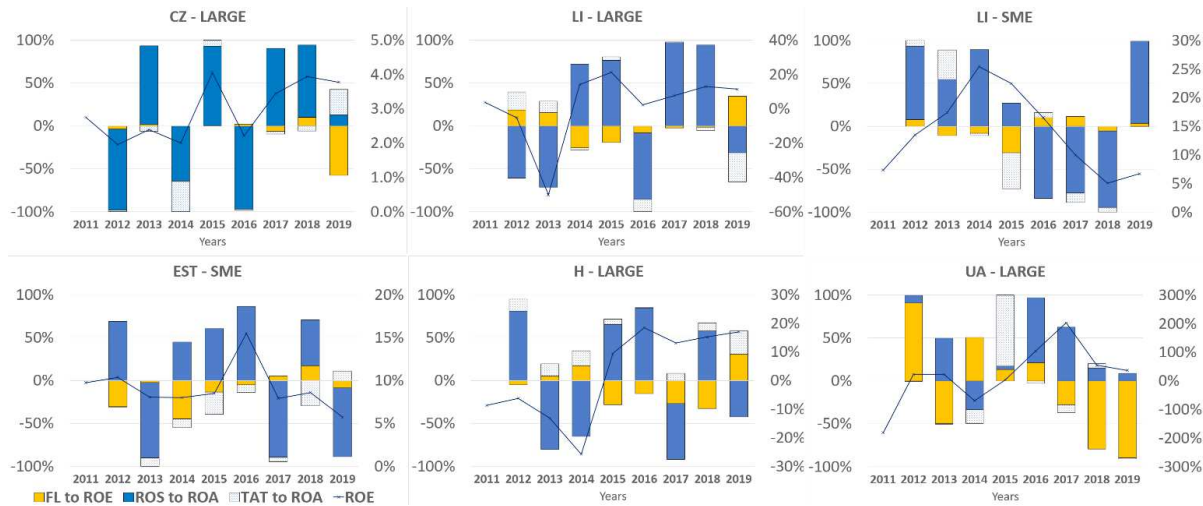
ues of the financial indicators by employing the Scheffé test. This post hoc type of test focuses on the factor country of companies' basement via comparison of column mean values combinations within the observed financial indicators to reveal possible homogeneity groups among observed countries.

### 3. RESULTS

The initial point of view on the financial performance of respective samples of food retailers – and thus also a proxy for market relations – is the identification of dynamics within the development of the observed indicators on their financial performance. Namely, the partial analysis of profitability development was conducted using the dynamic breakdown of indicator ROE (see Figure 1).

The category of the economically largest food retailers settled in Lithuania and Czechia belongs to the group of countries with the lowest growth of the profitability indicators among all observed countries as can be seen in Figure 1. Namely, for businesses settled in Lithuania that do not achieve even 1% average annual growth in terms of ROE. For companies based in the Czech Republic, the average ROE growth rate reaches 4%. Conversely, the highest average growth rate of the profitability indicators was observed in the period of 2011–2019 in Latvia and Hungary. However, the case of Hungary accompanied also the highest observed variability in its development, differing for the mean value in the given period by more than 400%. On the other hand, the observed country with the most stable development of the profitability indicator ROE belongs to both the sample of the largest food retailers and SMEs in Estonia. The dynamic decomposition of the ROE indicator reveals the prevailing influence of indicator ROS on its development in the observed period with the only exemption – the case of the largest businesses settled in Ukraine, with the prevailing influence of financial leverage on the observed development of ROE.

Similarly to the results of the development of profitability indicator ROE and its dynamic breakdown, the highest average increase of the indicator ROA among economically largest food retailers was ob-

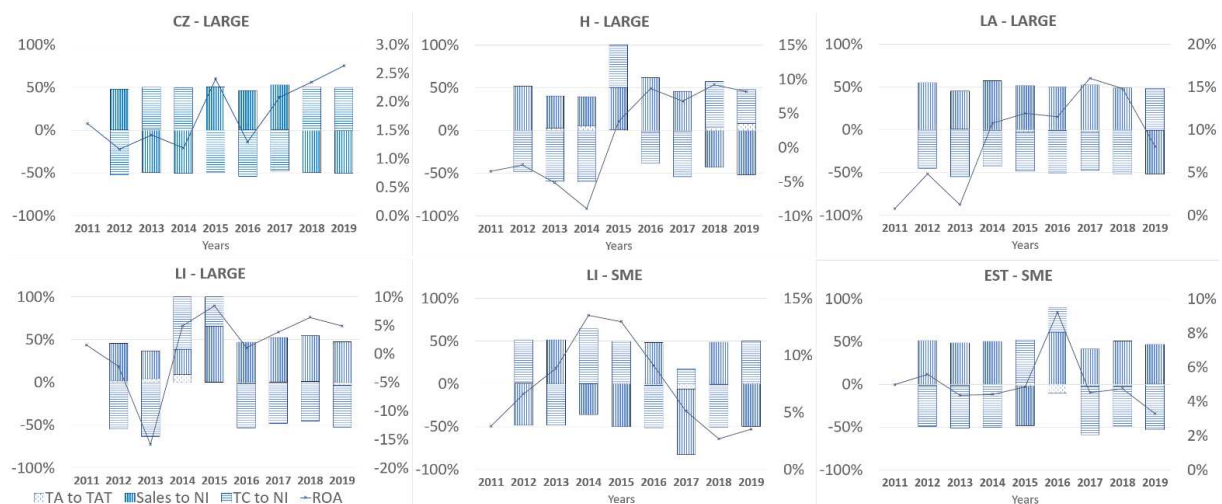


Note: Left vertical axis is the relative proportion of ROE breakdown components FL, ROS and TAT in %; right vertical axis is the value of ROE indicator in %.

**Figure 1.** Dynamic breakdown of indicator ROE according to the economic size of food retailers in selected countries in 2011–2019

served in Latvia and Hungary. Namely, the case of businesses settled in Latvia exceeded the average annual growth rate value of 33%. Contrarily, the lowest average growth rate of indicator ROA was observed in Czechia and Lithuania for both – the largest and SME size categories of businesses. The dynamic decomposition of the ROA indicator reveals the prevailing influence of indicator Sales to Net Income while being compensated by observed dynamics of the breakdown component Total Cost to the indicator Net Income (see Figure 2).

In addition to the development of observed breakdown components of the indicator ROA, the most stable development can be stated in the case of retailers based in Estonia. Namely, indicator ROA reaches only up to a 15% difference from the mean values in the observed period of 2011–2019. In contrast, one can declare more than 260% difference from the mean values of the indicator ROA for the same time period in the case of the largest businesses based in Hungary.



Note: Left vertical axis – the relative proportion of ROA breakdown components TA, Sales, TC in % ; right vertical axis – the value of ROA indicator in %.

**Figure 2.** Dynamic breakdown of the ROA indicator according to the economic size of food retailers in selected countries in 2011–2019



**Table 2.** Results of testing effects of all intended factors on indicators ROE, ROS and TAT for a group of countries: Czech Republic, Hungary and Poland

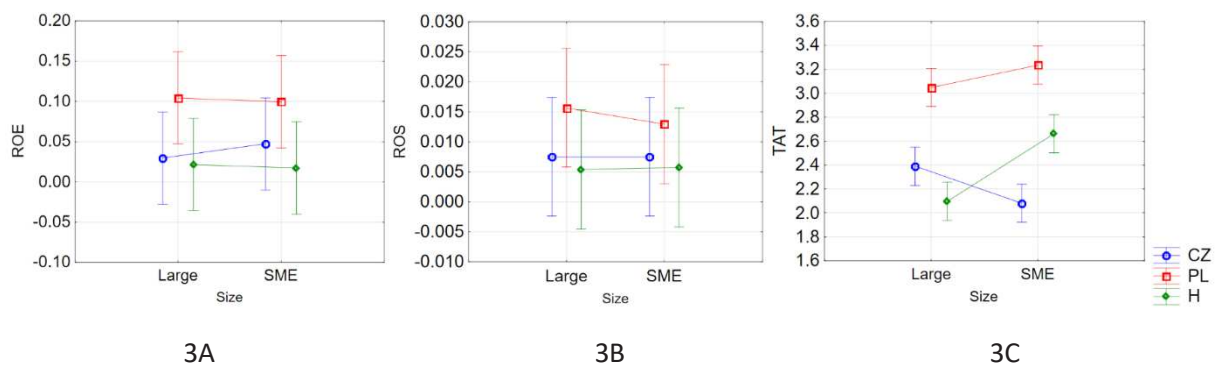
Effect on ROE / Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	.067	2	.034	4.619	.015*
Size	.000	1	.000	.015	.904
Country*Size	.002	2	.001	.104	.902
Effect on ROS / Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	.001	2	.000	1.744	.186
Size	.000	1	.000	.039	.845
Country*Size	.000	2	.000	.058	.943
Effect on TAT / Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	8.519	2	4.259	75.09	.000*
Size	.293	1	.293	5.16	.028*
Country*Size	1.721	2	.860	15.17	.000*

Further analyses of observed indicators on the financial performance of a sample of food retailers were focused on testing the hypotheses, using mutual interconnections between researched factors. Namely, the country, where the food retailer is based and the economic size of the business as the respective categorical predictors serve to identify sources of variability.

Hypothesis *H1a*, which explains the variability within observed development of financial indicator ROE via factors of economic size of a business entity and country of location of food retailers for the sample of food retailers based in selected Visegrad 4 member countries, is rejected. Only isolated statistically significant difference for the indicator ROE was revealed for the factor country of basement (see Table 2).

Figure 3, subchart A, provides a summary insight into the observed mean values of the financial indicator ROE in the sample of selected Visegrad 4 countries through the whole observed period 2011–2019. The highest mean values of the indicator ROE were observed both for the sample of large and SME businesses in Poland. Figure 3, subchart A, also depicts the possible interaction of explored factors using the two-way ANOVA approach under hypothesis *H1a*, i.e. combination of observed categorical predictor country of businesses entity basement and economic size of food retailers. But no statistically significant interaction was observed between those factors regarding the sample of selected Visegrad 4 member countries.

However, the post hoc test for the homogenous groups within observed values of the ROE indica-



**Figure 3.** Two-way ANOVA interaction plot regarding the studied factors – size and country of the basement for the indicator ROE (subch. 3A) and its breakdown components ROS (subch. 3B) and TAT (subch. 3C) in the sample of businesses based in Visegrad 4 member countries in 2011–2019

**Table 3.** Results of the post hoc Scheffe test regarding the country effect for homogenous group identification within observed values of indicators ROE, ROS and TAT among selected Visegrad 4 member countries

Variable ROE (Countries_CZ_H_PL) Homogenous Groups, alpha = .05 Error: Between MSE = .0073, df = 48				
Cell No.	Country	ROE Mean	1	2
3	H	0.019	****	
1	CZ	0.038	****	****
2	PL	0.102		****
Scheffe test; variable ROS (Countries_CZ_H_PL) Homogenous Groups, alpha = .05 Error: Between MSE = .0002, df = 48				
Cell No.	Country	ROS Mean	1	
3	H	0.005563	****	
1	CZ	0.007499	****	
2	PL	0.014319	****	
Scheffe test; variable TAT (Countries_CZ_H_PL) Homogenous Groups, alpha = .05 Error: Between MSE = .0567, df = 48				
Cell No.	Country	TAT Mean	1	2
1	CZ	2.235773	****	
2	H	2.380300	****	
3	PL	3.141248		****

tor revealed – despite rejection of hypothesis *H1a* – a statistically significant difference of food retailers located in Czechia and Hungary, so they constitute a homogenous type of group against food retailers located in Poland (see Table 3).

Analysis of categorical predictors for Visegrad 4 member countries reveals statistically non-significant differences for the indicator ROS regarding both the country of basement and size category of businesses (see Table 3). So, hypothesis *H1b* is rejected, including the non-existing interaction between the categorical predictors: country of basement and size category of food retailers.

Figure 3, subchart B, provides a summary insight into the observed mean values of the financial indicator ROE in the sample of selected Visegrad 4 countries through the whole observed period of years 2011–2019. The highest mean values of the indicator ROS were observed both for the sample of large and SME businesses in Poland. Figure 3, subchart B, depicts the possible interaction of studied factors using the two-way ANOVA approach under hypothesis *H1b*, i.e. the combination of observed categorical predictor country of business entity basement and economic size of food retailers. However, no statistically significant

interaction was observed between those factors regarding the sample of selected Visegrad 4 member countries. The post hoc test for the homogenous groups within observed values of indicator ROS did not distinguish any differing groups of food retailers (see Table 3).

Analysis of the categorical predictors for Visegrad 4 member countries reveals statistically significant difference for the indicator Total Assets Turnover regarding both single standing factors country of basement, economic size category of businesses, and the interaction between those two factors (see Table 2). Hypothesis *H1c* is not rejected, it proves the interaction between the categorical predictors: country of basement and size category of food retailers (see Figure 3, subchart C for further insight into the between factor interactions). While SMEs based in Poland are outperforming large and SME businesses in other observed countries regarding the total assets turnover mean value. A different pattern was observed in the Czech Republic, where large businesses outperform SMEs in total assets turnover.

The post hoc test for the homogenous groups within the observed values of the TAT indicator proves a statistically significant difference between food

**Table 4.** Results of the post hoc Scheffe test of the economic size effect for homogenous groups within observed values of the indicator TAT and the size effect

Cell No.	Scheffe test; variable TAT (Countries_CZ_H_PL) Homogenous Groups, alpha = .05000 Error: Between MSE = .05673, df = 48.000			
	Size	TAT Mean	1	2
1	Large	2.512144	****	
2	SME	2.659403		****

**Table 5.** Results of testing effects of all intended factors on indicators ROE, ROS and TAT for a group of countries: Czech Republic, Hungary and Poland

Effect or ROE / Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	.036	2	.018	.091	.913
Size	.102	1	.102	.518	.475
Country*Size	.239	2	.119	.603	.551
Effect on ROS / Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	.001	2	.000	1.836	.170
Size	.000	1	.000	.873	.355
Country*Size	.000	2	.000	.950	.394
Effect on TAT/ Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	1.020	2	.510	6.99	.002*
Size	.921	1	.921	12.62	.001*
Country*Size	5.792	2	2.896	39.70	.000*

retailers located in Czechia and Hungary, which creates a homogenous type of group against food retailers located in Poland (see Table 3).

It was also proved by employing the post-hoc test that the factor economic size as the categorical predictor is economically very different from SME food retailers in the selected Visegrad 4 member countries (see Table 4).

An analysis of categorical predictors was conducted for the previously identified homogenous group of food retailers based in selected Visegrad 4 member countries, i.e. those creating a homogenous group within the observed time period, namely food retailers located in Czechia and Hungary were put into the comparison with food retailers located in Ukraine. Ukraine is involved in the analysis as a representative of the country outside the EU with an outstanding amount of domestic agricultural production in Europe.

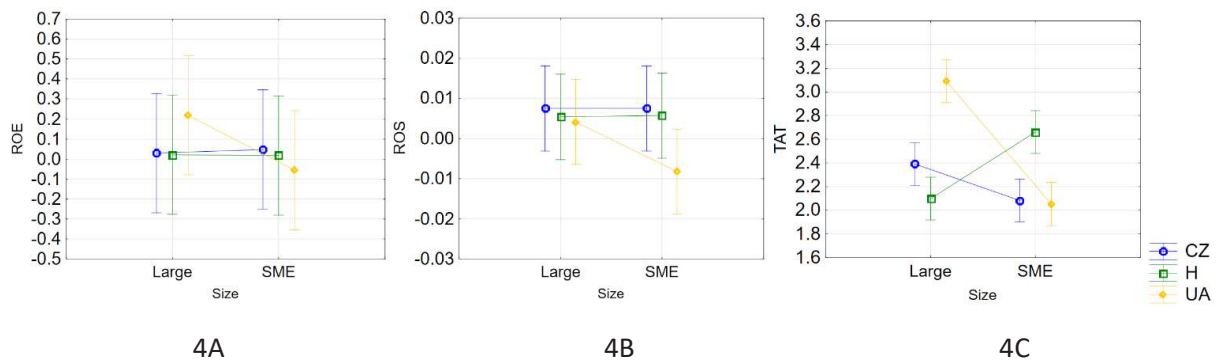
Hypothesis *H2a*, which explains the variability in the observed development of the financial indicator ROE via factors of economic size of business entity and country of location of food retail-

ers for the sample of businesses based in Czechia, Hungary and Ukraine, is rejected (see Table 5).

Figure 4, subchart 4A, depicts the observed mean values of the financial indicator ROE in the sample of businesses based in Czechia, Hungary, and Ukraine regarding the whole observed period of years 2011–2019. The highest mean values of the indicator ROE were observed both for the sample of large businesses and SMEs in Poland. This can also point out a possible interaction of researched factors using the two-way ANOVA approach under the hypothesis *H2a*, i.e. the combination of observed categorical predictor country of businesses entities basement and economic size of food retailers. But no statistically significant interaction was identified between those factors regarding the sample of selected countries.

The applied post-hoc test did not prove the factor country of the food retailer's basement as the categorical predictor groups for the indicator ROE in any of the observed samples in Czechia, Hungary and Ukraine (see Table 6).

Statistically insignificant differences were observed for the group of countries of Czechia, Hungary,



**Figure 4.** Two-way ANOVA interaction plot regarding the studied factors; size and country of the basement for the indicator ROE (subch. 4A), and its breakdown components ROS (subch. 4B), and TAT (subch. 4C) in the sample of businesses based in Czechia, Hungary and Ukraine in 2011–2019

and Ukraine regarding the indicator ROS (see Table 5). Figure 4, subchart B, provides, besides no statistically significant interaction of the observed categorical predictors, an observation of very low mean values of the financial indicator ROS in the samples of entities based in Czechia, Hungary, and Ukraine through the whole observed period of years 2011–2019. Hypothesis *H2b* is rejected. The post hoc test for the homogenous groups within observed values of ROS revealed no statistically significant homogenous groups among businesses based in Czechia, Hungary, or Ukraine, either (see Table 6).

Hypothesis *H2c*, which explains the variability in the observed development of financial indicator TAT via factors of economic size of business entity and country of location of food retailers for the sample of businesses based in Czechia, Hungary, and Ukraine, is not rejected. It is pointed out that all tested effects are statistically significantly explaining the variability among business samples (see Table 5).

The post hoc test for the homogenous groups within observed values of indicator TAT statistically significantly distinguishes regarding the country

**Table 6.** Results of the post hoc Scheffe test regarding the country effect for homogenous group identification within observed values of indicators ROE, ROS, and TAT in the sample of countries: Czechia, Hungary, and Ukraine

Scheffe test; variable ROE (Countries_CZ_H_UA) Homogenous Groups, alpha = .05 Error: Between MSE = .1977, df = 48				
Cell No.	Country	ROE Mean	1	
2	H	0.019442	****	
1	CZ	0.038341	****	
3	UA	0.081063	****	
Scheffe test; variable ROS (Countries_CZ_H_UA) Homogenous Groups, alpha = .05 Error: Between MSE = .0003, df = 48				
Cell No.	Country	ROS Mean	1	
3	UA	-0.002060	****	
2	H	0.005563	****	
1	CZ	0.007499	****	
Scheffe test; variable TAT (Countries_CZ_H_UA) Homogenous Groups, alpha = .05000 Error: Between MSE = .07295, df = 48.000				
Cell No.	Country	TAT Mean	1	2
1	CZ	2.235773	****	
2	H	2.380300	****	****
3	UA	2.571307		****

**Table 7.** Results of the post hoc Scheffe test for homogenous groups within observed values of indicator TAT and the size effect among samples in Czechia, Hungary, and Ukraine

Cell No.	Scheffe test; variable TAT (Countries CZ_H_UA) Homogenous Groups, alpha = .05000 Error: Between MSE = .07295, df = 48.000			
	Size	TAT Mean	1	2
2	SME	2.265200	****	
1	Large	2.526386		****

**Table 8.** Results of testing effects of all intended factors for countries Czechia, Hungary, Poland, Estonia, Latvia, and Lithuania regarding the observed indicators ROE, ROS, and TAT

Effect on ROE/ Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	.298	5	.060	5.819	.000*
Size	.002	1	.002	.171	.680
Country*Size	.156	5	.031	3.046	.014*
Effect on ROS / Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	.002	5	.000	2.391	.043*
Size	.000	1	.000	.010	.921
Country*Size	.003	5	.001	3.773	.004*
Effect on TAT / Statistics	SS	Degree of Freedom	MS	F-statistics	p-value
Country	20.57	5	4.114	48.75	0.000*
Size	.14	1	.138	1.63	.204
Country*Size	3.42	5	.684	8.11	.000*

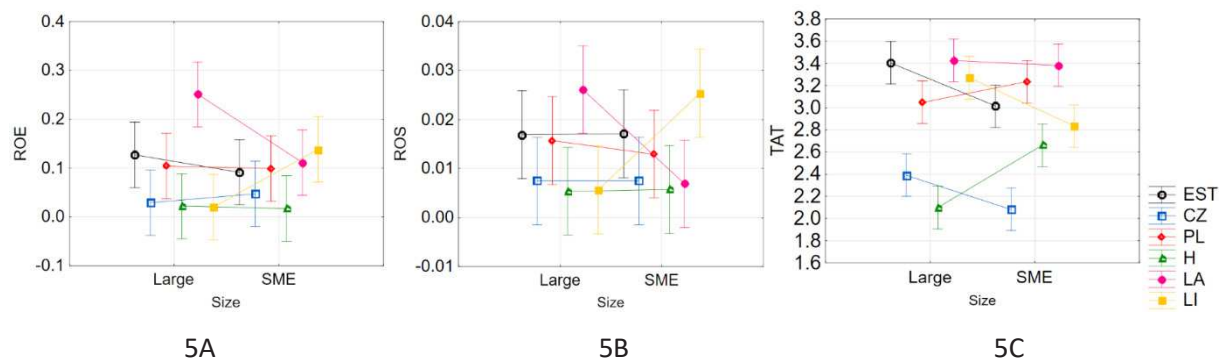
effect observed samples of food retailers located in Czechia against those in Ukraine (see Table 6).

The post hoc test for the homogenous groups within observed values of indicator TAT, and specifically the economic size effect, statistically significantly distinguishes the observations of small and large food retailer samples observed in Czechia, Hungary, and Ukraine during the period of 2011–2019 (see Table 7).

Analysis of categorical predictors for Visegrad 4 countries, which were prevailingly revealed as those creating homogenous groups within the observed time period, namely food retailers located in Czechia, Hungary and Poland, was also put into a comparison with food retailers located in Baltic countries, i.e. Estonia, Latvia, and Lithuania. Table 8 provides statistics for conducted two-way ANOVA and all hypothesized effects for sample countries and indicators ROE, ROS, and TAT. It reveals statistically significant country effects in all observed financial indicators. Conversely, the factor of the economic size effect was not statistically significant for any observed

financial indicator. On the other hand, the interaction of factors of country of basement and economic size of food retailers is identified as statistically significant for all financial indicators ROE, ROS, and TAT. So, hypotheses *H3a*, *H3b*, and *H3c* are not rejected for the mutual interaction of these factors: country of basement and economic size of food retailers regarding the selected Visegrad 4 and Baltic countries. In detail, large food retailers – settled in Latvia, Estonia, and Lithuania – and SME food retailers based in Lithuania and Estonia over-perform regarding mean values of the ROS indicator both large and SME food retailers based in Czechia and Hungary.

Figure 5 and its respective subcharts show the observed mean values of the financial indicator ROE (subch. 5A), ROA (subch. 5B), and TAT (subch. 5C) among the sample of businesses based in selected Visegrad 4 and Baltic countries. It regards the whole observed period of 2011–2019 and depicts the mutual interaction of intended factors: country of location and economic size. Together with the outputs of the post hoc test, the following partial results could be stated.



**Figure 5.** Factorial ANOVA results using categorical predictors for the indicator ROE (5A) and its decomponents ROS (5B), TAT (5C) for food retailers in selected Visegrad 4 and Baltic countries in 2011–2019

The post hoc test for the homogenous groups within observed values of the ROE indicator revealed a statistically significant homogenous group of food retailers located in Czechia and Hungary against those located in Latvia. The samples of Estonia, Lithuania, and Poland do not meet any of the statistically distinguished groups (see Table 9).

The post hoc test for the homogenous groups within observed values of the ROS indicator regarding

the sample of selected Visegrad 4 member countries and a sample of selected Baltic countries can be seen in Table 10.

Finally, the post hoc test for the homogenous groups within the observed values of the indicator TAT revealed a statistically significant homogenous group of food retailers located in Czechia and Hungary, the self-standing groups of food merchandisers located in Lithuania and Latvia,

**Table 9.** Results of the post hoc Scheffe test for homogenous groups within the observed values of the ROE indicator and the country effect regarding the samples of Czechia, Hungary, Poland, Estonia, Latvia, and Lithuania

Cell No.	Scheffe test; variable ROE (Countries_CZ_H_PL_Baltic) Homogenous Groups, alpha = .05 Error: Between MSE = .01023, df = 96			
	Country	ROE Mean	1	2
4	H	0.019442	****	
2	CZ	0.038341	****	
6	LI	0.079066	****	****
3	PL	0.101904	****	****
1	EST	0.109466	****	****
5	LA	0.180956		****

**Table 10.** Results of the post hoc Scheffe test for homogenous groups within observed values of the ROS indicator and the country effect regarding the sample of Czechia, Hungary, Poland, Estonia, Latvia, and Lithuania

Cell No.	Scheffe test; variable ROS (Countries_CZ_H_PL_Baltic) Homogenous Groups, alpha = .05 Error: Between MS = .00018, df = 96		
	Country	ROS Mean	1
4	H	0.0055634079	****
2	CZ	0.00749947263	****
3	PL	0.0143189371	****
6	LI	0.0155052365	****
5	LA	0.0165065977	****
1	EST	0.0170091673	****

**Table 11.** Results of the post hoc Scheffe test for homogenous groups within the observed values of the indicator TAT and the country effect regarding sample of Czechia, Hungary, Poland, Estonia, Latvia, and Lithuania

Cell No.	Scheffe test; variable TAT (Countries_CZ_H_PL_Baltic) Homogenous Groups, alpha = .05, Error: Between MSE = .08439, df = 96.000				
	Country	TAT Mean	1	2	3
2	CZ	2.235773			****
4	H	2.380300			****
6	LI	3.052001	****		
3	PL	3.141248	****	****	
1	EST	3.209204	****	****	
5	LA	3.404670		****	

and then indistinguishable cases of food merchandisers located in Poland and Estonia (see Table 11).

None of the conducted post hoc tests for the observed samples of food merchandisers located in selected Visegrad 4 countries and Baltic countries identified statistically significant homogenous groups of observations when considering the economic size of a business categorical predictor.

Consistently, the results of the post hoc test for homogenous groups of countries did not distinguish statistically significant diverse groups of Visegrad 4 member countries' sample and the sample of covered Baltic countries.

#### 4. DISCUSSION

It is evident from the partial findings and results of this article that the corporate sector is constantly making efforts to respond flexibly to market changes and the legislative framework set. Empirical evidence on a recent COVID-19 disease outbreak as the cause of the recent global economic crisis points out a certain market disruption. An empirical research study on country self-sufficiency levels in Europe identified no statistically significant relation between export and import operations and price levels on the respective domestic market, while a statistically significant negative relationship was proved between export/import ratios and price changes in the periods of the 2nd quarter and 3rd quarter of 2020, i.e. a period of the COVID-19 disease massive outbreak (Hamulczuk & Skrzypczyk, 2021). Similarly, other authors stress the role of Russia's war against Ukraine in rising food prices and its negative consequences

for stakeholders of the food value chain in a newer EU Member State, namely in Slovenia (Travnikar & Bele, 2022).

The findings of this article are based on the explorative analysis that employs empirical secondary data on the development of food retailers' financial performance indicators. The sample of businesses consists of food retailers based in diverse EU member countries and Ukraine, which is the representative of the EU country with the granted candidate status for EU entrance and simultaneously the representative of the country with an outstanding scope of domestic agricultural production in the European area. The factors such as country of basement and the economic size of food retailers' samples were explored according to the set of hypotheses to prove their effect within the explanatory potential behind the development of their financial performance from 2011 to 2019. In detail, the isolated significant country effect on the observed Return on Equity indicator of food retailers was identified in Czechia, Hungary, and Poland as the selected Visegrad 4 member countries. It was also identified in the extended sample of countries covering the Baltic countries Estonia, Latvia, and Lithuania. That country effect also specifically distinguished the homogenous observation of country groups, namely Czechia and Hungary against Latvia.

The mutual interaction of factors between country and economic size that affect Return on Equity was observed only in the group of countries covering the selected Visegrad 4 members and Baltic countries. That interaction of observed factors identifies that large and small food retailers based in Czechia and Hungary do not significantly dif-

fer in the Return on Equity, while large food retailers based in Latvia outperform the small ones with more than twice as much Return on Equity mean value in the observed period. Considering these findings, low financial performance regarding the profitability of businesses in the competitive marketplace within the food value chain under the need for capital expenditures opens up pressure on achieving the shareholders' goals in profitability.

The partial findings of this article regarding the Return on Sales indicator reveal the factor country of location as the isolated significant effect on observed Return on Sales indicator mean values only for the group of selected Visegrad 4 members and the Baltic countries sample. However, no statistically significant homogenous groups of single-standing countries in this sample were identified.

This partial finding on differences in profitability is consistent with the findings of other studies on business models adopted by food retail chains, reflecting income levels of the respective country of location, e.g. discriminatory pricing strategies when identical products are priced differently in a comparison of countries (Nes et al., 2021).

An isolated significant country effect was identified for the observed Total Assets Turnover indicator that was reported by food retailers for all

observed groups of countries, including the sample of Ukraine. This researched country effect also specifically distinguished the homogenous observation of country groups, namely Czechia and Hungary against Poland, in the extended sample, including Baltic countries. In detail, it is distinguished between Czechia and Hungary and self-standing cases of observations in Lithuania and Latvia. The observations among food retailers in Lithuania and Latvia identified the Total Assets Turnover indicator higher than 3, i.e. higher for more than 36 % in comparison with the observations in Czechia.

According to partial findings in this article, it would be inevitably appropriate to accept the pressure of the private sector on the financial performance even for future periods. However, the adopted legislation still reflects changes in the respective industry branches to promote business sustainability and the fair competition. Such a development has the potential to enhance both the quality of the relevant business environment and meeting public needs in crucial areas. Consistently, with the possibility of adopting an internalized concept of voluntary type of activities to follow a known type of corporate social responsibility approaches. This type of responsibility and activities are in their nature not in concurrence with the need for profitability and sustainability of business activities.

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## CONCLUSION

The results of this article fill a specific research gap in addressing food insecurity, with a particular focus on the role of food retail chains in the former "Eastern Bloc" countries in this area. The analysis conducted, which is based on the empirical evidence regarding the sample of food retailers from a selected diverse sample of Central and Eastern European countries, while involving Ukraine as an EU entrance granted candidate status state, revealed a very low Return on Equity (ROE indicator) at levels far below 5% for the samples of food retailers located in Hungary and Czechia, and also low profitability of sales (ROS indicators) at levels mostly below 2% in the period of 2011–2019. In detail, the set of hypotheses *H1a* and *H2a* are rejected, so there is no proven statistically significant interaction of the categorical factors of economic size and country of location of food retailers regarding their explanatory power for the observed variability in ROE indicator in the sample of Visegrad 4 member countries, covering food retailers located in Ukraine. In contrast, when considering the sample of food retailers located in Visegrad 4 countries, extended for food retailers located in the selected Baltic countries, hypothesis *H3a* is not rejected, so for this case the economic size and location of food retailers are proven to be significantly explaining factors behind the empirical observation of variability in Return on Equity among food retailers.



The observed low levels of Return on Sales indicator are then counterbalanced with the Turnover of Total Assets that is reaching – specifically in Baltic countries and Poland – values over 3 EUR of Sales per 1 EUR of Total Assets amount. Regarding the set of respective hypotheses *H1c*, *H2c* and *H3c*, they are not rejected. So, the explanatory power of interaction between categorical factors economic size of food retailers and the country of locations on the observed variability of the Total Assets Turnover indicator was proved. This fact is also influencing the dynamic side of profitability development of food retailers measured by Return on Equity, as a representative of a common key performance indicators for shareholders of business entities. However, for the case of Ukraine and the sample of economically large food retailers, the observed dynamics within the years 2011–2019 are influenced mainly by the Financial Leverage indicator development.

The other partial findings consider specifically the researched factor of economic size of food retailers for explaining the variability of selected financial performance indicators such as the development of the indicator of Total Assets Turnover and low level of Return on Sales among observed samples of food retailers based in Czechia, Hungary, and Ukraine. In detail, hypotheses *H1b* and *H2b* were rejected, so the interaction of categorical factors of economic size and country of location of food retailers do not explain the observed variability in the Return on Sales indicator in a separate sample of Visegrad 4 member countries – similarly they do not explain the sample extended for financial data regarding food retailers located in Ukraine. In contrast again, if we consider the extension of the sample for food retailers located in Visegrad 4 countries and in the selected Baltic countries, hypothesis *H3b* is not rejected. This means that for this case, the economic size and location of food businesses regarding the observed variability in Return on Sales is proved to be significantly explained.

This article, using its empirical findings, provides space for further discussion on the impact of planning on the financial performance of food retailers, which is consistent with the need to maintain and increase their competitive advantage in the food market, and the possible negative consequences for the deepening of food poverty. The competitive struggle on the food market between retail chains thus artificially co-creates a time phase of artificially low food prices, which negatively affects all levels of the food value chain.

Further research could be related to the analysis of empirical data that would include other factors affecting the financial performance of food retailers in relation to purpose-built food tourism, as it can continuously help to empirically reveal market failures in relevant food value chain structures, specifically in the context of consumer behavior and food merchandising.

## AUTHOR CONTRIBUTIONS

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## ACKNOWLEDGMENT

The authors are thankful to the Internal Grant Agency of Mendel University in Brno for financial support to carry out this research as the partial output of the project No. IGA-PEF-TP-23-015 “Zajišťování

výživových potřeb obyvatelstva vzhledem k aktuálním výzvám v oblasti regenerativních přístupů při vykonávání hospodářských činností podniků agropotravinářského komplexu se zaměřením na roli tuzemských potravinových bank”.

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