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Activities of Food Retail Companies in Poland during the COVID-19 Pandemic in the Context of Food Security

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Abstract: This paper deals with a very important topic concerning the adaptive actions of food retail entities, operating in a network model, during threats caused by a pandemic. The aim of the study was to identify and characterize the actions taken by food retail chain entities during the COVID-19 pandemic, in the context of the food security of consumers in Poland (using the example of Wielkopolska). A basic research hypothesis (H0) was generated, stating that the adaptation activities of food retail chain actors varied during the COVID-19 pandemic in Poland with regard to ensuring consumer food security. It was detailed in five sub-hypotheses. In their verification and in the realization of the aim of the study, the methods of literature study and other secondary sources, and induction, survey, comparative, visualization, modeling and descriptive statistics, were used. The research results include (a) the authors' diagnosis of threats to the food security of companies in the food system resulting from the COVID-19 pandemic, and applied ways of adaptation to the new requirements of the environment, based on secondary sources; (b) analysis of data from the empirical survey conducted by the authors in November 2020 on the adaptive actions of companies, among managers/owners of food retail stores of a selected network of a particular franchise type in Greater Poland; (c) the construction of an empirical model of the typical behaviors of food retail units in the chain under study, distinguishing three of their types in the model; and (d) suggestions concerning the directions of future scientific research areas. The article was prepared following the stream of sustainable development theory.

Keywords: food system; food security; food retailing; COVID-19; empirical model; types of adaptive actions; economic policy instruments

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1. Introduction

1.1. Object of Research and Justification of the Importance of the Topic of Work and the Scope of Research

The presented work is theoretical and empirical in nature. The subject of this research is the activities of food trading companies in Poland during the global crisis caused by the COVID-19 virus in 2020. As a result of the pandemic shock, there has been a change in the hierarchy of importance of the main economic and social problems regarding the processes of management. Some of the most important are related to food security. They primarily concern the country's ability and capacity to ensure food security for society (macro-level). This problem, in turn, is connected with the need to undertake new adaptation activities in response to the changes that have occurred in companies operating in the food system, including food retailing entities (micro-level).

In justification of undertaking the presented subject, let us note that managers and owners of companies have had no chance to prepare and adjust to the consequences of events "quietly lurking" in the international environment of an accidental or sudden character, caused by fortuitous factors, e.g., climatic or natural disasters, or pandemics. It is particularly difficult in those sectors of the economy where production is highly dependent on natural conditions and material capital, such as the food system. Thus, the

adaptive capacity of economic entities in this system is lower than that of departments and branches that are largely dematerialized. As F.P. Drucker believes, this adaptation "is concerned with action rather than understanding, with decisions rather than analysis" [1]. It deals with the strategies needed to transform rapid change into opportunities, to turn the threat of change into productive and profitable action that contributes positively to our society, the economy, and the individual. The need to support this ability then requires entrepreneurial actions on the part of the subjects themselves, as well as the application of external economic and institutional stimulants within the framework of the policy of nation-states and organizations representing groupings of countries, e.g., the European Union (EU). An important role in this scope is also played by international organizations, whose goals of functioning are connected with solving the food issue around the world, e.g., the Food and Agriculture Organization of the United Nations (FAO), United Nations Conference on Trade and Development (UNCTAD), and International Organization for Standardization (ISO) [2]. However, it is important to keep in mind a fact pointed out by J. E. Stiglitz, namely, "Implementing the wrong actions now may mean that even more will have to be implemented in the future" [3].

The substantive scope of this work concerns the activities undertaken in the process of the adaptation of food retail units organized in franchising networks. The importance of food retailing relates to its influence on wholesale trade and on consumption, as a result of push and pull effects, and also indirectly on other links of the food system, i.e., logistics, the food industry and agriculture. In justification of the selection of this link for the research, it is worth emphasizing that the possible deterioration of conditions in its activity may pose a threat to the food security of society [4] despite the assumed greatest added value in food supply chains [5]. For, on the one hand, food retailing, as the penultimate link in the food system, is influenced by fluctuations and threats from preceding links in the chain and from consumers. These are fluctuations in demand, changes in the structure of demand, excessive purchases of stock, the avoidance of large stores in favor of small neighborhood stores, and the development of new forms of satisfying food needs (e.g., online ordering services with home delivery, or on-site collection of the readymade order). On the other hand, since retail trade belongs to one of the most important channels of viral infection flow (apart from transport, tourism and the hotel industry, restaurants, hairdressing, cosmetics and sports services), it is forced to bear the high costs of obligatory sanitary protection during its functioning and to change its actions toward remote forms of customer service.

According to McKinsey's research, "Over 60 percent of global consumers have changed shopping behavior, many of them for convenience and value" [6]. The Fraunhofer ISI research institute identifies 50 trends that will affect the European food system on the horizon until 2035 [7]. These include the increased market power of retailers, digitalization of trade, diversification of business models and marketing, changing food systems, civilization diseases on the rise, the scandalization of food waste, and stricter waste regulations.

Poland is currently witnessing an adaptation of the European food retail model, which is characterized by an increasing concentration of companies toward the emergence of large retail units [8–10] (with the number of small stores decreasing by about 5% per year [11,12]. This trend of consolidation in the form of supermarkets or franchise chains continues, which can have a negative impact on access and the price of food products. The conference materials state that "considering the dominant role of supermarkets in the distribution of food products to final consumers, fair competition in the food retail sector is crucial to ensure equitable access to the distribution chain for producers and suppliers" [13]. The Retail Index [14] shows that the total turnover of all European food retailers in 2018 was EUR 3.5 trillion. This was accrued by 240,000 outlets in total. France, Germany, Poland and the United Kingdom have the highest food retail turnover in Europe.

It is worth noting that domestic suppliers in Poland supply 90% of food products to retail chain entities [15]. It is also interesting to note that in the March–September 2020 period studied by the authors, sales in large-format food retail stores decreased by 2% compared to this period in 2019, while sales in small-format stores increased by 6% [16].

Throughout the pandemic, about 15 percent of surveyed EU-5 consumers (in France, Germany, Italy, Spain and Great Britain) have shopped for groceries on a website that they had never used before. Among those consumers, more than 50 percent say that they intend to continue shopping at their newfound site for at least some part of their grocery needs. Additionally, 12 percent of them have also switched to different grocery stores, to take advantage of home delivery or click-and-collect services, both accessible via online ordering [6].

In many OECD countries, the COVID-19 pandemic disrupted, at least for a limited period, and de-organized food supply chains from the farm, through processing, transport links with retailers, and finally, consumer demand. The consumer reaction at the beginning was hoarding, improvisation, shut-up demand, copying, etc. [17,18]. However, supermarket shelves have now been replenished and hoarding behavior disappeared [19]. Prentice et al. argued, "that panic buying appears to correspond to changes in government interventions and measures" [20]. In this case, there were lockdown interventions imposed in many countries.

In the meantime, to increase food safety, the food processing industry had to "bring changes to packaging technology and materials, delivery options, and storage condition" [21]. In France, the initial panic of the COVID-19 crisis put more emphasis on food quality. More than 43% of consumers increased their fruit and vegetable consumption, and 23% bought frozen food [22]. Italian families who were at risk of food insecurity alarm evidenced a percentage that doubled to 16.2% after the pandemic began. Parents reported that their children were eating more "junk food". In addition, 31.8% of the respondents declared an increase in their children's weight [23]. In France, the demand for fresh and bio-organic foods and the home preparation of meals has increased, resulting in lower demand for frozen foods [22].

Therefore, the question arises about the nature of activities undertaken by food retailers in Poland during the pandemic to increase food security. The above argument shows that the topic undertaken by the authors is not fully recognized but at the same time has great economic and social importance. In the world literature, there are already scientific publications and reports of a macro character [24,25], and partial reports on the industries particularly affected by SARS-CoV-2 [26–28]. However, there is a lack of research on the adaptive behavior of firms in the food system at the micro-level, with exposure of ex ante findings. Meanwhile, COVID-19 has disrupted the business-as-usual conditions of food traders in all countries [29].

However, the degree of this impact varies, and depends on many factors, including the level of self-sufficiency [30–32] of economic development of the country, and the model of organization of companies in the food trade. Rokicki indicates, using the average synthetic index of economic prosperity, that food and beverages are the branches of the economy in Poland least vulnerable to the adverse effects of the COVID-19 pandemic [24]. The literature still lacks in-depth conclusions drawn from economic research results on the consequences of ex-post and ex-ante epidemic crises for food retailing.

For example, Bell and Lewis, in their paper [33], describe and analyze the implications of the Great Plague in the fourteenth century, the 1918–1919 influenza epidemic, and in modern times, the outbreak of HIV/AIDS and the SARS epidemic. The impact of the MERS, EBOLA, H1N1, and SARS pandemics on agriculture, tourism, food availability and the labor market in several countries has been reported to reach up to USD 80 billion in losses [34]. For example, the macroeconomic effects of the 2006 H5N1 bird-flu epidemic (on the GDP scale) on the supply side were −1.1%, on the demand side, −0.5%, and together, about −1.6% [35]. Authors mention the various effects on trade, output, human activity, mortality, and many other factors. Some demonstrate a short, and others, a long impact. The magnitude and nature of economic effects vary according to the duration and characteristics of the epidemics. Other authors point out the lack of macroeconomic models for estimating losses incurred by the economies of countries affected by epidemics [36]. In turn, Hanna and Yiping [37] pointed out that "risks are greater in countries with poor public

health care, poor sanitation systems, high mobility, or high population density epidemics". Nowadays, but also in the past [38], huge losses as a result of the pandemic were suffered by travel and transport service companies, e.g., airlines and sea tours (cruises). In the above-cited works, the authors also dealt with retail trade, among others.

The empirical studies conducted in this work included the initial period of the pandemic, formally introduced from 13 March 2020 by the regulation of the Minister of Health [39]. At that time, the Polish government also introduced a several-week-long spring lockdown (16 March–24 April), i.e., restrictions on the movement of people and the functioning of many branches of the service and production sphere of the economy [25]. In justification of the research period, it should be emphasized that the negative effects on the studied entities as a result of subsequent pandemic crises may be more profound, so it is important to look for effective ways to reduce them in advance. The results obtained in this work on the adaptive actions of food retail entities, i.e., types of company behavior and their evaluation, can be useful prospectively for a rapid defensive response towards stabilization and consumer food security in the future.

The research process included the following four stages:

- analysis of literature and secondary sources, the conceptualization of the research problem, generation of the purpose of the study and research hypotheses,
- identifying, on the basis of secondary sources, threats to food system companies in Poland, due to the COVID-19 pandemic and applied basic internal measures in adaptation to the changes that have occurred,
- conducting a qualitative study among food retailers on the topic of the impact of the COVID-19 pandemic on food security and actions taken in companies to reduce the resulting risks, and, on this basis, to create an empirical model of the typical adaptive behavior of companies,
- presenting a discussion on this topic and formulating prospective conclusions.

The topic addressed fits into the theory of sustainable development [19,40–43]. Food security issues are raised in most of the basic EU and OECD documents. In addition, it fits into the theory of state interventionism within the paradigm of new structural economics, emphasizing the expediency of the state's allocative actions in times of crisis, respecting the principle of efficiency and the possibility of the future formation of comparative advantages of industry players [44].

1.2. Interpretation of the Basic Definitions of the Categories Adopted in the Paper

Certain categories cited in the paper are defined ambiguously in the literature. This is particularly true for the terms "food system", "food security", "food supply chain", and "franchise business network". Therefore, the meanings adopted for these categories are given below. The "food system" in this article is understood as institutionally connected links with functional relationships in a chain of created value-added goods, including agriculture, food processing, trade and consumption [45,46]. Of course, in the supply chain, food transportation and storage occur repeatedly between its links.

The definition of a food system became a core issue of science approximately 10 years ago, e.g., [47–50]. For example, Ericksen [47,48] put it in a simple way as a chain of "four categories: producing food, processing and packaging food, distributing and retailing food, and consuming food". Moreover, the first three categories constitute the "food supply chain". All of these activities should add economical value to the raw material, but these activities may also significantly alter the appearance, storage life, nutritional value, and content of the raw materials.

Regarding food security, the authors adopt the view put forward by international organizations. The final report of the 1996 World Food Summit offers a broad definition of food security, stating that it "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences, for an active and healthy life" [45].

The concept of food security has evolved over time, and many authors emphasize four components, i.e., availability, access, utilization, and stability [26,51–54]. The level of this security for each economy has been determined by the Economist Intelligence Unit (EIU) since 2014, in the form of the Global Food Security Index [55]. This index takes into account the following components of affordability, availability, quality and safety. In 2019, the overall score of GFSI for Poland based on the aforementioned four parameters was 75.6 out of 100, and gave it a high ranking of 24th among 113 countries in the world, and 15th among European countries. On the other hand, taking into account the stability component indicated by the FAO, this refers to all food security components listed by the EIU. Although it is not detailed in the EIU definition, it is considered to be included in the GFSI index in an indirect way. This is justified by the characterization of detailed food security components [47,56]. In view of this, we consider both definitions (FAO and EIU) as converging.

The formation of the level of food security is influenced by the degree of self-sufficiency of the country, the way food chains are organized [57], and the intellectual level of human capital in individual links of the chain [58]. As Chiffoleau and Dourian observe, "The contribution of SFSCs to food systems resilience becomes particularly relevant in the context of the COVID-19 crisis: even if global chains have been resisting this unforeseen shock, their vulnerabilities have been highlighted (e.g., high dependence on logistics and on hired labor force, among others)" [27]. Darrot et al. comment regarding the SFSC, "However, their current/potential role has to be more deeply examined in relation to possible shocks, as demonstrated during the COVID-19 crisis, in which they played a key role in reassuring consumers . . . " [59]. The COVID-19 pandemic has cast a new light on the functionality of food systems, and has highlighted the strong interconnections between food and health. "What began as a health crisis quickly became an economic, employment, energy, and social crisis, highlighting the inherent interdependencies of global risks" [28]. This knowledge might be useful in reimagining the food system in the future. Short chains have an impact on maintaining freshness, the nutritional value of products, and the speed of supply. Thus, they make it possible to reduce food losses, especially in organic foods, which are characterized by less resistance to microorganisms, transport conditions, storage, temperature changes, etc. [60–63].

Food security in a broader sense is the ability of a country to cover its expenditure on the import of food raw materials and processed food products with the proceeds from their export. Poland belongs to countries with a high degree of food security. This is related to the high rate of food self-sufficiency of the country [64,65] and the growing import of food products in the international input-output and intra-industry trade. Poland has a positive balance of international trade in food products and is a net exporter of existing food surpluses (Table 1). In 2020, exports of food, live animals, oil and fat amounted to 11.4% of Poland's total exports in nominal terms, and imports to 7.8% [66]. By importing products, the diversification of the supply of food products in the domestic market is strengthened.

Table 1. Import and export of food (and live animals) by sections according to SITC in Poland.

Year	Balance of Foreign Trade in Food (Million EUR)	Share of Food Exports in Total Product Exports (%)	Share of Food Imports in Total Product Imports (%)
2013	5470	10.96	7.35
2014	5777	10.85	6.56
2015	6561	10.85	7.25
2016	6404	10.95	7.61
2017	7288	10.99	7.48
2018	8212	10.80	6.98
2019	8644	10.73	7.64

Source: [67] Yearbook of Foreign Trade Statistics of Poland, 2020, Warsaw, p. 28; [68] Yearbook of Foreign Trade Statistics of Poland, 2018, p. 46.

The retail sector in Poland is structurally diversified and significantly networked [69]. Among small food retail companies, specialized entities focused on meeting basic food needs (housing estate stores, petrol stations, minimarkets in urban areas) dominate in number. Apart from private units and cooperative retail chains, there are most often small and medium-sized companies with foreign or national capital, organized in franchising networks, whose functioning is dependent on the franchisor. A franchise network organization is a collection of independent entities with no capital ties, constituting a contractual network [70,71]. Contractual agreements can be hard franchise networks, e.g., Żabka, Dino, ABC, Stokrotka (100% of purchases are made by the stores at the Eurocasch wholesaler) or soft franchise networks with Polish capital (only 30% of purchases must come from the Eurocasch wholesaler), e.g., Lewiatan, Chata Polska, and Delikatesy Centrum. In the second case, the stores retain their independence of operations and have only a partially common distribution policy with the franchisor [69]. In this situation, it is a distribution network to which the franchisor provides its assortment, identification system (trademark, logo), and influences the interior design and the display of private labels. It also provides, as part of the franchise agreement, the right to use training and promotional and advertising activities [72].

1.3. Research Problem, Objectives and Hypotheses

The research problem consisted of the following questions: were the adaptive actions of individual firms in food retailing in Poland differentiated in the first period of the pandemic? Were these actions only of a current nature, correcting operational plans, or were they part of creating greater resilience to disruptions in the functioning of companies in the longer term, such as future crises? Were the ways in which the pandemic impacts were countered by food retailing used to better change operations in the future, by shaping new competitive advantages? [44]. If not, how should companies effectively mitigate threats to this change and gain a stable realization of food security through external support instruments? After all, the current crisis is likely to be followed by another as yet unknown one in the near future. This is indicated for example by the fact that for many serious diseases (about 10) there are no vaccines so far, and only for two diseases are there experimental studies in humans [73]. The aim of this study was to identify and characterize those actions taken by food retailers during the first period of the COVID-19 pandemic, in the context of consumer food security in Poland (using the example of Wielkopolska). In order to achieve the goal formulated in this way, the research hypothesis H0 was generated as follows**:** the adaptive actions of food retail entities in the first period of the COVID-19 pandemic, due to ensuring consumer food security, were varied.

In order to support the main hypothesis, several sub-working hypotheses were necessary.

Hypothesis 1 (H1) : *The sales volume in food retail units relative to the same period in 2019 was directionally different*. [74].

Hypothesis 2 (H2) : *The quality of food products offered to consumers during the pandemic period remained unchanged*.

Hypothesis 3 (H3) : *The diversity of the sales mix of food items did not decrease*.

Hypothesis 4 (H4) : *The supply of food products to retail units within supply chains did not threaten consumers' access to food*.

Hypothesis 5 (H5) : *Internal company actions to reduce the negative effects of the pandemic were both immediate and developmental*.

2. Methods and Data Sources

The literature study and other secondary sources, induction, survey, comparative, visualization, modeling, and descriptive statistics methods were used to achieve the objectives of the study and verify the formulated hypotheses. We conducted our research in two steps. First, we completed a comprehensive systematic literature analysis in order to explore research gaps and to (in)form our experimental research. In the latter, we carried out pool research.

The method of systematic literature review enables a formalized and objectified synthesis of the scientific achievements to date [75]. It allows the identification of explored areas and makes it easier to see the unexplored areas [76]. Thus, it offers incentives to define a new framework for further research [77]. The systematic literature review applied for the purpose of our research covered three stages [76,78]: (1) determining the purpose of the study and the basic literature; (2) selecting suitable publications and developing a database; (3) analyzing the content and verifying the applicability of the results obtained for further research. In the first phase, several databases have been used: Google Scholar, Ebsco, ProQuest, Web of Science and Scopus, all of which are recommended for a systematic review of the literature in the context of social and economic sciences [79].

The pilot research was performed in November 2020 in the Wielkopolskie Voivodeship, using a survey form. The choice of this region was deliberate, because in the light of economic indicators it is one of the more developed in the country, and agricultural production here is highly efficient [80–82]. It is characterized by a high concentration of foreign capital (FDI) engaged in Poland and high investment expenditures per capita, higher GDP/pc per capita than the average in the country and a higher labor force participation rate [66]. Among 16 regions (NUTS 1) in Poland, Wielkopolska occupied in 2019 the fourth position in the country in terms of gross value-added p.c. created, which was 75% against the EU average taken as 100%, and the second in terms of the share of trade, transport, storage and other non-financial services in the structure of national gross value added [82]. In turn, the commodity production of Wielkopolska's agriculture represented 18.3% of the entire production in the country in 2018 [83]. All in all, the region creates favorable market conditions on the food supply and demand side for the operation of food retail companies.

The choice of food retail stores of the "Lewiatan" chain for the study was also intentional. This was supported by the fact that its organization is based on soft (light) franchising, which gives more freedom to store managers in choosing directions and ways to adapt their companies to changes created by the environment during the pandemic period. Moreover, the rationale for choosing this network was also the possibility of representative execution of the study for the units cooperating in it, coordinated regionally.

A non-random method was used in the selection of units, taking into account the principle of proportionality to the existing number of each class of store area ranges (format), out of 234 stores located in Wielkopolska in 2020. The chain is ranked fourth in terms of the value of food sales by retail chains in Poland, and 17th among the 500 largest companies in

Poland [84]. It was assumed that in the subject area under study, managers/owners have the best knowledge of operational and investment activities in the facilities being analyzed. Therefore, they were the respondents to the survey of the selected 40 retail stores of the Lewiatan chain, which accounted for 17% of the total set of retail facilities of this food chain in the province. The survey was representative of the food retailing of the "Lewiatan" chain of stores in the studied region.

The survey was conducted in an e-mail form. Its purpose was to assess the adaptation measures taken in food trading companies for reducing the resulting threats to food security during the COVID-19 pandemic. The questionnaire form was structured and contained, in addition to a metric, 34 closed-ended questions, situated in five separate sections, regarding the impact of COVID-19 on food product store turnover and quality, on the management of tangible capital, intangible capital, and organizational capital, and on the evaluation of food product supply to the trade. The method of descriptive statistics and visualization was used in data preparation.

Limitations of the scale of quantitative-qualitative analysis in the study were due to the lack of available data from 2020, spread over different periods of the pandemic, and the difficulty of obtaining reliable qualitative data from a larger number of respondents without cost. To guarantee the consistency of the study, units of one store chain were adopted and the survey form was distributed electronically with the cooperation of the management of the provincial branch of this retail chain. Its results allow to perform the stated purpose of the work and verify the research hypotheses. The credibility of the achievements was also ensured by the support of the results of other national and international entities.

3. Results

3.1. Findings of Food Safety Hazards Caused by the COVID-19 Pandemic in Poland, and Actions Taken to Mitigate Their Negative Effects—Results of Desk Research

There are many courses of action taken at the micro, meso and macro levels to eliminate the threats caused by crises. Some of them, related to the COVID-19 virus, are already presented in the literature [85], as "recommendations for desirable courses of action in the face of regional challenges" [86] and strategic development goals [25]. They are of different natures and are the responsibility of many actors: companies, local governments, the state, NGOs, financial and other organizations. At the micro level, they can be launched for a short period or a longer time, either immediately or after obtaining support from the external environment. Table 2 presents the authors' classification of the type of threats to businesses caused by the COVID-19 pandemic, and defensive responses.

Table 2. Threats caused by COVID-19 to companies in the food system and undertaken adaptive actions to changes to the environment in 2020 in Poland.

Gro- ups	Response Range	Types of Threats	Sub-Entities	Directions of Counteracting the Negative Effects of COVID-19	Ways and Instruments of Action
II	Internal: Corporate	Resources Capital Structural Organizational Cooperation Communication Efficiency	Firms	Increasing the mobility of workers, maintaining jobs, activating labor resources Acquisition of new knowledge by employees, and new technologies to perform tasks Forming competitive advantages of flexibility and innovation Implementation of new models Industry 4.0 and Marketing 3.0 Maintain production capacity and financial liquidity Ensuring sanitary and health regimeat work	Changes of employment forms Training Digitalization Inclusion of financial reserves (savings) Increasing protective discipline in operations and during recreation Stimulating appropriate behavior through punishment and reward
III	External: micro, meso and macro environment	Institutional Demand-side Supply-side	Government, Self-government NGO, and other non-governmental bodies	New regulations Preventing decline in demand forfood products Stimulating increased demand for eco, fresh, healthy products Increasing control of compliance with existing rules and principles in the food supply chain Financial and fiscal industry shields	Retraining grants Tax incentives Reductions in PIT advance payments Exemptions from social security contributions Intervention in the foreign exchange Standstill Other [X]
IIII	External International	Logistics Commercial Communications Marketing Institutional support to mitigate unemployment risks in an emergency state	Government International Organizations Diplomacy MNCs	Strengthening national competitive advantages through intervention policy To assist in creating the image of companies Supporting companies in linking value-added chains Development of an ecosystemof companies Support to exporters.	EU: the creation of SURE [XX]; Additional funding for scientific research projects Aid funds Credit assistance Facilitating food transitEIB (increase and make financing more flexible; guaranteed loans). World Bank and IMF—easier access to loans Central Banks of countries—interest rate cuts

Others [X]: tax deferrals, domestic tourism vouchers, higher benefits, wage subsidies, government bond purchases, support for human capital development company funds, business grants for online sales, service tax for hotels, social security debt forgiveness (PIE, 2020, s.40–42). [XX] SURE—support to mitigate unemployment risks in an emergency.

There is an ongoing discussion in the literature about pandemic risks and how to mitigate them, from which the following conclusions emerge:

1. Not to impose agriculture export restrictions and refrain from implementing unjustified trade barriers on agriculture and agri-food products, and key agricultural production inputs. Improve our preparedness and responsiveness to regional or international pandemics, including multilateral coordination to limit unjustified agriculture export restrictions [87].
2. Additionally, Murphy insists that " ... revisiting the claims made about what trade can and cannot do for food security, and under what conditions. Food security challenges are many, complex and varied ... " with time [88].
3. The importance of the global food trade and its contribution to food security puts an obligation on all countries to put in place systems to appropriately protect human, animal and plant health while facilitating trade [89].

3.2. Performance of Polish food Retail Companies during the COVID-19 Pandemic for Consumer Food Security, as Assessed by Respondents

All units participating in the November 2020 survey, as indicated by the survey questionnaire metric, offered customers a full range of plant, animal and secondary processing products (i.e., bakery, confectionery, food concentrates, and soft drinks). The size of the store area varied. Units with an average area of 100–200 m^2 (14) and from 200–500 m^2 (18) predominated. Stores smaller than 100 m^2 were five units, while the large ones with an area of more than 500 m^2 were only three units. There were 10 questions in the first part of the questionnaire. The first two were to assess the level of sales of food products during the COVID-19 pandemic, and their quality compared to 2019, in three options: (a) the same, (b) increased, (c) decreased. A greater number of stores, in the opinion of respondents, saw a decrease in the volume of sales (18) or there was no change in sales (17), and only five indicated an increase, as shown in Figure 1. In view of this, the hypothesis (H1) stating that: "The volume of sales in food retail units compared to the same period in 2019 has been shaped in different directions" can be accepted. The analysis shows that the activities of the units of the trade under study varied in this regard, and the influence factor to be evaluated was the store area. It transpired that, among the five smallest stores (up to 100 m^2), only one maintained sales, two increased them, and two decreased them. Of the 14 stores between 100 and 200 m^2, sales decreased in nine. In seven units up to 500 m^2, sales remained unchanged, and in another seven they decreased. Only in the largest stores was no impact of the pandemic on turnover observed. In conclusion, it should be stated that 50% of small and medium-sized entities (up to 500 m^2) decreased their sales, and the share of companies that increased their sales turnover is similar.

As far as food safety is concerned, as many as 85% of respondents report that the quality of goods delivered to consumers remained unchanged. Only two respondents believed that it had improved, and four respondents indicated its deterioration. This allows us to accept hypothesis (H2) which reads: "The quality of goods offered to consumers during the pandemic remained unchanged".

In the context of the impact of food retailing on food security, it is still important to assess product losses and wastage in the surveyed units. Half of the respondents assessed their total level, compared to last year, as greater than 10%, and eight respondents indicated an increase between 10% and 20%. Larger losses of between 20–40% compared to 2019 were declared by 10 large stores of 200–500 m^2. Thus, in this case, also, there is a varied evaluation of the studied phenomenon by the respondents. Figure 2 shows that larger losses were incurred by medium-sized stores.

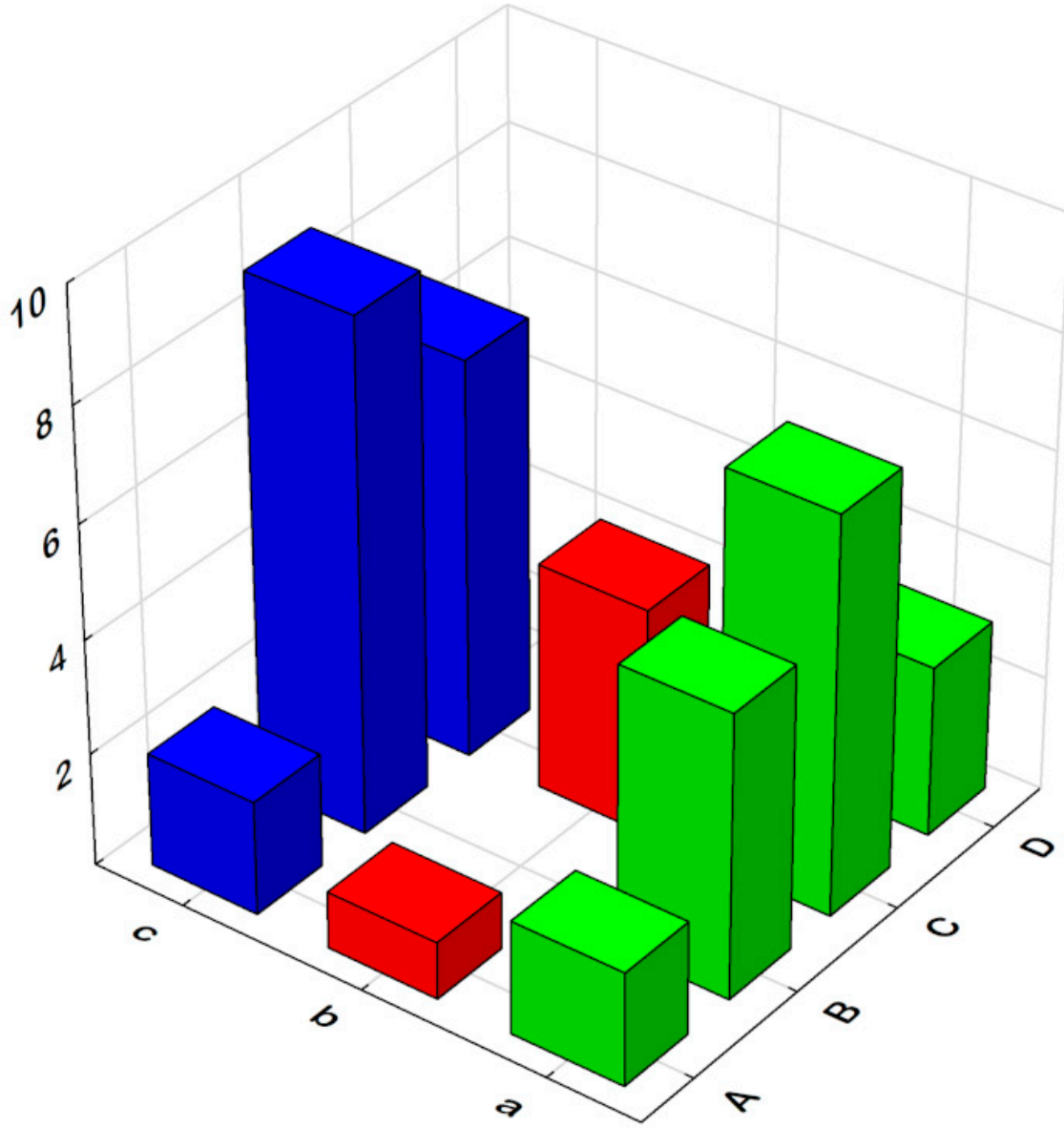

Figure 1. The relationship between store size, sales size and number of stores. Explanatory note: X-axis—store size (A—less than 100 m^2 to D— more than 500 m^2), Y-axis—sales size, (a—no change, b—larger, c—smaller), Z-axis—number of stores.

The reasons for this situation were sought among the four variants of answers: a—excessive stocks (11 indications), b—carelessness of employees (13 indications), c—worse quality of delivered products (7 indications), and d—fewer customers (23 indications). Some units gave two reasons simultaneously: b + d, four times, and a + d, seven times.

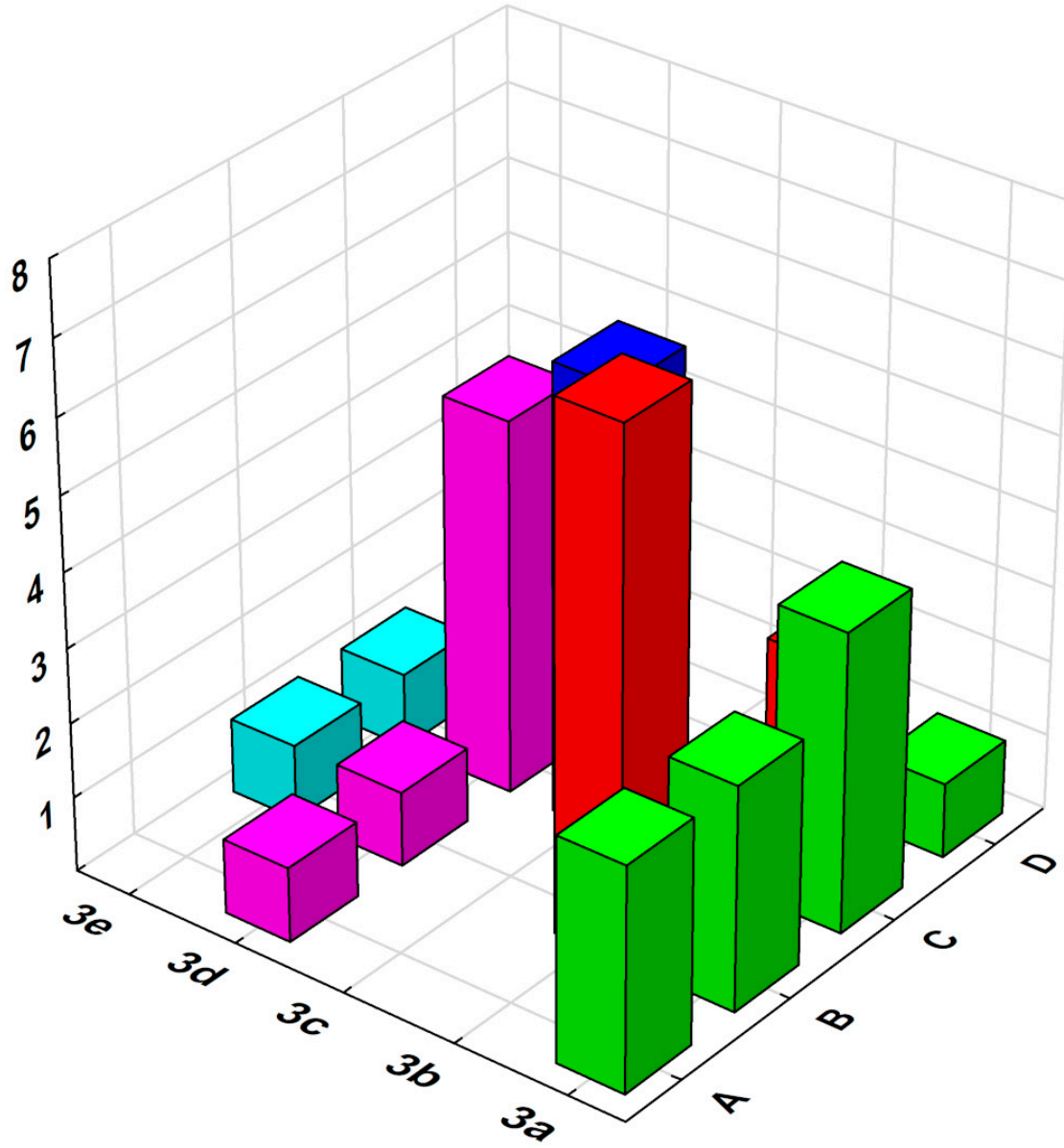

Figure 2. The relationship between the size of stores, their losses and the number. Explanatory note: X-axis—store size (A: up to 100 m^2, B—101–200 m^2, C—201–500 m^2, D—larger); Y-axis—losses (a—up to 10%, b—10–20%, c—20–30%, d—30–40%, e—more); Z-axis—number of stores.

Trade, by providing a diverse range of foodstuffs, makes it possible to better satisfy the varied preferences of existing consumer needs, which strengthens their satisfaction and contentment. It thus fits into the third element of the definition of food security, i.e., food utilization. Trends in the development of food retail trade in Poland confirmed this aspiration through internet sales: e-stores and e-commerce [90]. Thus, the opinion of the majority of respondents (90%) that the structure of sales in their units remained unchanged should be evaluated positively. Respondents indicating changes (10%) defined them in the direction of less processed products and producer brands. Two units additionally report a decrease in the share of imported goods in the structure of product offerings. The analysis of the responses to the shaping of this phenomenon in the surveyed entities allows us to accept the hypothesis (H3) that reads: "The diversity of the foodstuff sales assortment has not decreased".

The next issue that needs clarification is the forms of consumer food access offered by the surveyed entities. The pandemic and the resulting limitations of in-person contact

caused 20% of the stores surveyed to state that they were changing the way that they sell. To the question compounding this problem, "If so, toward an online form?" only one store answered in the affirmative. This is all the more puzzling, because "in this pandemic era, the importance of the e-commerce channel is even greater than before..." [91]. All respondents stated that the supply of food goods to retail stores was 100% stable during the pandemic period and that there had been a change of suppliers in exceptional situations, as indicated by only 10% of respondents. Thus, the hypothesis (H4) that "Availability of food commodities at retail within existing supply chains was not compromised" was confirmed.

Food retailing plays an important role in shaping the economic accessibility of customers indirectly, through its relationship with the price level and purchasing power of the population. Meanwhile, the majority of respondents reported an increase in prices to the consumer, while only nine reported a decrease. Increased wholesale prices (20), social costs (11), increased employee wages (6), and other variable costs (16) are cited as reasons for this increase. The impact of retail prices on the possible weakening of the economic availability of food to consumers during a pandemic requires additional research and correction in the context of the existing increase in the wages of workers employed in the economy, and financial instruments to stimulate consumer demand within the framework of the already existing interventionist social policy of the state toward children, pensioners and the lowest earners.

Currently, attention is paid to the socioeconomic trend of company development based on the paradigm of sustainable development, the social responsibility of organizations and quality in capital management [57,92–94]. Its representatives see, in the model of sustainable competitiveness, ways to counteract the disastrous effects of the pandemic, in which the structural relations of capital, the efficiency of its use, and innovation secure and strengthen the resistance of companies to future crises, including pandemic situations. The answers to the questions in the second part of the survey, concerning the management of capital of the surveyed entities during the pandemic crisis, seem to only partially confirm this direction of change. In fact, it transpires that, in the surveyed period, the respondents of most stores (about 81%) found stability in the management of physical capital. They did not purchase new fixed assets, including electronic sales systems, or invest in the internet of things (IoT); but neither did they reduce building floor space. Survey respondents report that employee productivity remained the same compared to last year, which had to do with maintaining the existing technical armamentarium of work. However, in terms of intangible capital management, they state that there were reasons to reduce the number of employees. In two companies they were reduced by >10% or >20%, and two drastically, by more than 30%. In a small number of units (6), employment contracts were changed while maintaining the workplace.

The responses show full awareness and the concern of management and employees for their own and customers' safety. This is evidenced by the reinforcement of knowledge regarding the effects of COVID-19 by management and all employees. There is a declared strengthened adherence to good business practices, hygiene rules, HACCP rules, ISO 9000, etc., compared to the previous period in as many as 95% of the units. Half of the surveyed stores applied promotions at a higher level during the difficult period of pandemic crisis, performing the function of communication with customers and thus strengthening their position in the food retail market.

The pandemic situation also affects the organizational capital of the units, both from the infrastructural side and the management processes. Regarding IT infrastructure, improving communication systems in trade, as was so necessary during the lockdown period, there are still neglected investments, as mentioned later in the article. However, it is interesting that in the surveyed sample, 15 respondents stated that organizational improvements were introduced at the suggestion of employees (in 15 stores), and in the remaining units, at the suggestion of management. This indicates a good relationship between management and employees. The researched entities were also, in 27 cases, prepared substantively through training to change the work position, if necessary. A significant number of re-

searched stores (57.5%) created a so-called "shadow cabinet" able to manage the store in case of illness or other indisposition of the management member. The vast majority of respondents (87.5%) stated that security rules have been generally strengthened, through quality control of goods sold (in 78%) and product-receiving control (in 83%). From the point of view of management theory, these activities are ongoing. The analysis performed confirms the adoption of hypothesis H5 as follows: "The internal activities of the companies, reducing the negative effects of the pandemic, were both ad hoc and developmental".

3.3. Adaptive Actions Taken by the Surveyed Companies in the Opinion of Respondents

As already mentioned, in the assessment of their operational (current) activities performed by the managers of the surveyed store units, changes in the forms of sales were indicated in about 50% in the direction of online ordering and home delivery or personal collected "takeaway". More of their activity occurred in the management of intangible capital. First of all, the quality of human capital was strengthened by training employees in new knowledge and skills. Their topics were related to the state of the risks caused by COVID-19 and the ways of actions to reduce them, the improvement of skills necessary for other jobs in the case of the necessary replacement of other employees, the rules on taking care of the quality of products, in accordance with the current standards, HACCP, ISO 9001, good manufacturing practice rules, certificates, as well as the need to apply stricter hygiene rules and the consequences of its absence, etc. The acquired competencies (knowledge, abilities, skills) in the resource theory [95] constitute the basic attribute of human capital, and in the social capital theory, the attribute of trust is a dimension of this capital [96]. An increase in the level of social capital of companies has further occurred through an increase in, firstly, the strengthening of compliance with norms, which are a resource in the architecture of this capital, and secondly, an increase in the trust of employees in the management of companies, thanks to decisions to maintain the state of employment, possibly changing the existing form of contract in the existing job.

Moreover, the established principles of epidemiological safety in store operations through training and inspections fostered the cooperation of people inside the companies and with the surrounding entities, thus increasing the evaluation of the responsibility of these entities as an important attribute of trust. This caused not only an increase in social capital but also an increase in the identity of the studied food store chain, based on reputation capital. We can conclude that there is a clear perception, in a period of uncertainty and pandemic risk among many of the entities studied, of the value of the ability to respond flexibly to change, through the adaptation and development of intangible resources. This view is also strengthened by the entrepreneurial approach of the representatives of the studied entities to trade promotion. It is worth noting that in the literature, similar insights as to the role of intellectual and structural capital during a pandemic are described by other authors [58].

Nowadays, consumer-oriented sales promotions are an important competitive factor in the management of a retail company, as an additional component of the promotion mix. According to the research, it supports the information and reminder activities of stores' personal selling through the use of tools such as special offers, coupons, discounts, contests, in-store exhibitions and bonuses. Their increased role during the pandemic period, according to the respondents of the analyzed entities, was aimed at stimulating demand, building reputation, presenting innovative products and encouraging their purchase, and building consumer loyalty. Such actions led to potential effects, i.e., creating value for the customer, and indirectly, the value of the company, which strengthens their position in the market. The above analysis allows the authors to strengthen the assessment, to positively verify hypothesis (H 5), which reads: "Internal actions of companies, reducing the negative effects of the pandemic, were both ad hoc and developmental".

In contrast, owned tangible assets (fixed capital), in the form of mechanical equipment, refrigeration equipment and technology infrastructure, were of less interest to store management during this period and were limited to restitution. New investments planned in

tangible assets, including information systems, were postponed due to uncertainty about future sales volumes, financial liquidity and the ability of entities to continue operating. At the same time, the respondents' answers indicated that working capital in the form of inventory has increased in stores. In our opinion, this is an important observation of the functioning of companies, indicating the need in the period of crisis to create buffer inventory not only in manufacturing companies but also in services, including the food trade, despite the trend of digitization in logistics processes. This trend may strengthen if we take into account the weakness of institutional settlements, related to the observance of the principle of "just in time" during the pandemic in international logistics [97].

4. Discussion

During the 2020 pandemic, the negative supply-side impulse in Poland, resulting from reduced economic activity, reduced employment and income of the population, and increased uncertainty of the society, influenced the increase in prices and the decrease in demand for food, but to a small extent [98]. This is because it was characterized by low income and price elasticity on average. It was only in the segment of the poorest population that there were high coefficients of income elasticity of demand (consumption) and expenditure on food in Poland [64]. The situation is different in the case of consumer demand for manufactured goods, where there has been a deferred demand, a reorientation of preferences by the public, and a reduction in the satisfaction of further needs that are not necessary.

Let us note that in Poland the share of expenditure on food and non-alcoholic products in total consumption expenditure is still high, albeit decreasing over the years (in accordance with Engel's law), and in 2016 it was on average 23.5%, but in the lowest income group (20% of the surveyed population), this share was 46.1%, and in the highest, 16% [65]. However, the variation in expenditure on food in absolute terms, across the six socio-economic groups of households surveyed by CSO, was not large and was on average (median) per person in 2018 from PLN 257.95 (Me = 240.67) in blue-collar jobs, to PLN 360.58 (Me = 333.67) in pensioners [99]. The existing demand impulse is therefore not a threat to the stable realization of food security functions by food retailing. In particular, one should not, in connection with the ongoing pandemic crisis and recurring lockdown periods, see in the future a decrease in the role of small and medium-sized food retail units (a decline in sales turnover and reduction in the number of stores) in shaping the safe availability of food to the public in Poland. On the contrary, the pilot study conducted in this paper, indicating the diversified behaviors of food retail entities in the process of adaptation in the period of the pandemic, shows that there are entrepreneurial types among them.

Taking into account the diverse behavior of the studied companies, the authors attempted to isolate the types of stores with different modes of adaptation activities during the COVID-19 pandemic, which situate their future position in the competitive market. They are presented in the form of an empirical model (Figure 3). Assuming that the success of the company occurs in the situation of the best adaptation of activities to the expected changes in the market of demand and supply, three types of adaptation were distinguished: (1) passive, (2) active and traditionally entrepreneurial, and (3) entrepreneurial—innovative. The first one is characterized by survival orientation, decreasing sales turnover and product structure, as well as increasing losses and wastage, meaning less care for quality and food safety. What is more, corporate capital management activities there are limited to ongoing hygiene activities to protect employees and customers from the effects of a pandemic. Thus, this type of store did not perform the food safety function satisfactorily. The second type of company is characterized by active activities in the management of intangible capital, in improving the qualifications of employees and their knowledge and skills through training, as well as the growth of such resources of social capital as trust, credibility and cooperation. It influences through its decisions to increase the quality of goods, does not reduce turnover, shapes non-traditional, more friendly forms of sales, albeit already being known in the

market, and maintains the existing diversity of assortment. Food security is not threatened in this case. The third type of store is characterized by the highest degree of its realization, thanks to the entrepreneurial decisions of managers in the application of innovative technologies in serving consumers, the spread of online sales, the application of the internet of things (IoT) in storage (warehouses, cold stores, refrigerators), and through active measures in the development of human and social capital. The result is an increase in the size and structure of products on sale, while losses are decreasing and the quality of goods is not compromised. In the studied chain, this type of store still occurs in limited numbers.

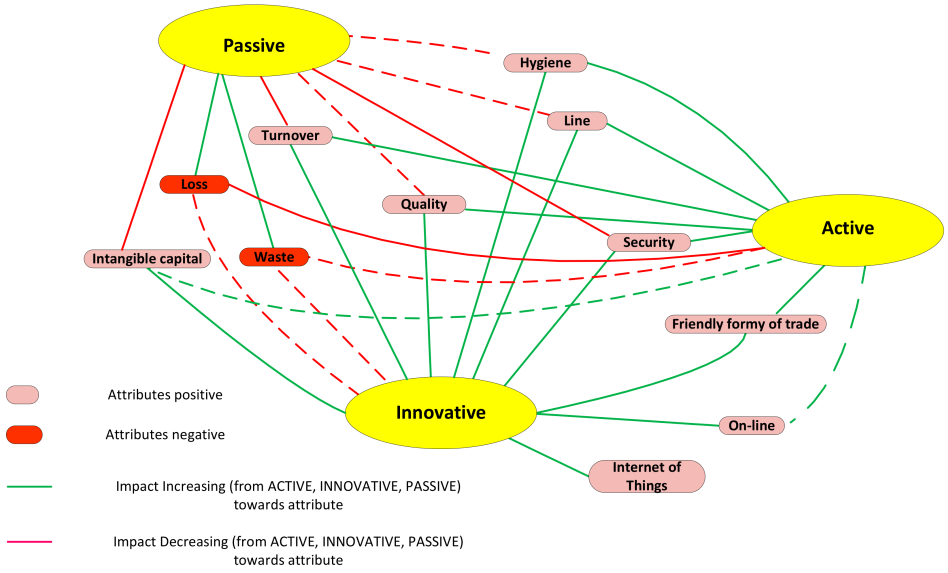

Figure 3. Model of future competitive position in the market between passive, active and innovative food retailers.

It should also be noted that the soft franchise agreement, while determining a certain unification of rules for the commercial activities of companies in the network, allows considerable freedom to the store managers in economic and operational activities. It can be hypothesized that the success of the company is determined by the manager who chooses the active approach, with flexible adjustments of his company during the pandemic crisis, and thus decides on the security of its future operation. Moreover, the view of the flexible adaptability of small and medium-sized commercial units for sustainable operation is reinforced by the fact that the food supply chains to the stores, at this stage of the pandemic, have not been broken down. However, there is a risk of their disruption as a result of emerging cross-border transport congestion, due to sanitary restrictions and the obligation of drivers to document the result of vaccination or the blocking of a transport route (the case of the Suez Canal in March 2021).

An important role in mitigating the effects of this phenomenon may be played by the existing strategic stocks of food in the country, as well as state policy instruments that stimulate the functioning of links in the food system such as fiscal policy (reduction of rents of premises, taxes) and financial policy (targeted financial support for entrepreneurs, reduction of % rates of loans) [25]. However, the main driving factor in Poland, a country with full self-sufficiency in basic food products [67,68], is the tendency to maintain short supply chains of local (domestic) producers or so-called alternative, in the case of organic food, within the nearest countries. They make it possible to preserve food of high-quality parameters (energy value, pro-health, nutritional components) and to minimize food losses and waste. This is in line with the trend of developing an economy that is part of the implementation of the European Green Deal strategy [41].

The pandemic is creating a rare opportunity for radical change, adopting a plus-one diversification approach to transform food supply chains and build resilient, sustainable

and democratic agri-food systems, including in the design of financial agricultural support [100,101]. The discussion about threats and the questionable advisability of prolonged maintenance of short goods supply chains in the future, in our opinion, is not valid in relation to the food market in Poland [102]. However, let us remember that no country is fully self-sufficient, especially in the light of growing and varying population preferences and climatic disturbances. Therefore, the international commodity exchange of food products should have a priority of transport services, guaranteed by the institutional and financial support of national governments, international organizations and representing groupings of integrated economies, e.g., the EU.

In this context, we would like to draw attention to the growing importance of technical measures in the surveillance of food chains, especially complex ones. This refers to rapid border clearance in terms of meeting technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures imposed by international organizations [61,103]. This will be supported by the implementation of transport green lines [104] This regulation suggests that: "Border crossings should not take more than 15 min on internal land borders, including any checks and health screening of transport workers. The 'green lane' border crossings should be open to all freight vehicles, whatever the goods they are carrying".

There are four basic premises important for strengthening the food chain: protecting the health of consumers, preventing the spread of the virus, maintaining the supply and distribution of food at the required level, and implementing sanitary restrictions. In addition to the previous tools useful for achieving this goal, we now have a number of new ones. These include Industry 4.0 technologies, information and communication technologies (ICTs), the internet of things (IoT), and big data platforms. Artificial intelligence can be used to collect real-time data to improve communication between suppliers and buyers (e.g., wholesalers), and simplify food redistribution, e.g., [105]. In addition, these tools allow monitoring and recording of conditions of transportation (e.g., unforeseen stops, failure of means of transport), storage, including temperature, humidity, atmospheric composition, etc. Moreover, ICT will be helpful in controlling unmanned means of transport. Michael E. Porter points to the role of augmented technology [106].

Government policy instruments can play a large role in reducing the barriers to food retail operations for food security. Due to various lockdown constraints, business entities in Poland have received and continue to receive government assistance under anti-crisis financial, industry and other shields [25,107,108]. Their purpose is to stabilize the financial situation of companies, counteract layoffs of employees, cover the costs of retraining employees, implement a sanitation regime, mitigate the effects of new consumer behavior, etc. This is because in the first period, according to respondents, they were only protective in nature, so they did not stimulate permanent changes in the management of the surveyed entities. Nevertheless, external support by instruments within the framework of state financial shields was positively evaluated by the recipients in the performed survey. Moreover, it induced confidence in managers of commercial units in the formal institutions of the state.

The study confirms that the behavior of food system link participants is influenced not only by legal–organizational and other formal institutions, but also informal institutions such as social capital (values, trust, credibility, cooperation) are very significant. This is because the micro- and meso-environments in which the food trade operates are becoming more and more multicultural, requiring the increase of the competencies of participants in this link of the supply chain and the level of social capital presented there, which determines the effectiveness of material factors applied in them. Thus, it can be concluded that taking care of these intangible capital resources resulted in their significant contribution in food retailing to maintaining the food security of that society. An important finding of the study is the existence of variation in the behavior of firms during the pandemic period. Some of them showed an entrepreneurial attitude to change while others showed a stable attitude, e.g., in terms of customer shopping facilitation. This implies the need to examine the success factors of food retail actors ex ante. The fact that companies have

responded successfully so far does not guarantee their resilience to barriers caused by the crisis without the additional "bypasses" of government intervention over the longer term of the pandemic [108].

An important problem, in the situation of a greater negative impact of the pandemic, especially in countries with low food self-sufficiency, is the effectiveness of support for companies by state policy instruments [109]. It is worth quoting the OECD opinion on this research: "Food systems have made significant achievements, but much more needs to be done—immediately—to address the COVID-19 crisis and in the longer term to meet the triple challenge: food security, livelihood protection, and environmental sustainability" [108]. The rationale for intervention states that: "The unexpected COVID-19 shock underscores the urgent need to move from 'business as usual' policies to a more forward-looking policy package for global food systems". In contrast, the European Union has prepared a package of science and research programs with a budget of about EUR 450 billion over the next few years [110]. In terms of increasing the rationality of state intervention policies, an index of selective support for retail units during a pandemic could be helpful, generated by taking into account their types of adaptation to change. In order to avoid the universality and uniformity of state intervention policy, there is, therefore, a need to create an index of the characteristics of the adaptive types of firms, for the application of differentiated state policy instruments.

5. Conclusions

The presented work is cognitive in nature, with elements of normative inference. The process of adjustment of the food retail chain companies, especially in countries with a medium level of economic development, is not recognized; therefore, an empirical study in the form of a diagnostic survey is new and constitutes an introduction to further research. In a broader interpretation of the obtained results, it is worth emphasizing that the activities of the surveyed companies were cautious during the crisis. This is evidenced by the limited adjustment in the management of their own capital. The authors, accepting as documented the statement that every crisis is an opportunity for change [1,111], sought in their research to answer the problematic questions posed, concerning the use of these opportunities by food retail chain stores in Poland. They conclude that in 2020, this change has not been fully exploited to a more widespread formation of innovative forms of cooperation with the consumer, using technological opportunities.

The authors' own contribution to the paper is as follows:

- threats to the food system companies in Poland, due to the COVID-19 pandemic and supportive actions from the external environment, were recognized, based on secondary sources,
- a pilot study was conducted on the effects of the COVID-19 pandemic in food retail companies and the actions taken to reduce the resulting threats to food security in the first phase of the 2020 pandemic,
- based on the analysis, it was found that during the pandemic the units surveyed ensured food safety for consumers, although their actions in this regard varied,
- an empirical model of the adaptive actions of units was developed, in which three types of the surveyed entities were distinguished—entrepreneurial-innovative, active-traditional entrepreneurial and passive,
- future directions of the research areas were indicated, including the need to create an index of the characteristics of adaptive companies, to apply differentiated instruments of state policy in supporting the adaptive activities of companies to changes in the environment due to the pandemic.

Taking into account the achievements of the authors, and the discussion of research results, it can be concluded that in the research problem the authors filled the cognitive gap by fulfilling the aim of the study. The H0 hypothesis was unequivocally confirmed, which means that the examined entities made a positive contribution to the realization of the food security function of Polish society, mainly in the areas of food availability and

food safety. However, activities related to food access, food utilization and stability were assessed at a slightly lower level. The actors of this trade took internal actions, neutralizing the threats from the pandemic for their functioning, by meeting the needs of consumers. This was expressed in the construction and strengthening of defensive bases, mostly of a temporary nature, such as current sanitation, the creation of new forms of sales, and increasing stocks. In addition, these units have taken actions aimed at building and using intangible factors, e.g., related to the growth of human and social capital, and they are part of the strategy of managing the company more permanently, immunizing it from this perspective. In order to increase the efficiency of this process, it is necessary to support it with technological capital, as is necessary in the process of digitalization of customer service, improving and increasing their access to food and improving communication with customers, for example, in the identification of the needs that these studied entities can satisfy. This should be a matter of concern and urgent action for the units, in cooperation with the Board of Directors of Lewiatan Holdings S.A. Headquarters, and the regional companies of the network.

Conclusions from the existing recognition of the entities' behavior in this work, however, need to be deepened from the point of view of the sustainability of their functioning in the food market and their development toward modern entities, meeting the expectations of the consumer 4.0. The basis of such a study should be to increase the sample population and perform a study that is fully representative of food retailing in the country, after one and a half years of the ongoing pandemic. The authors see future directions for expanding substantive areas of research in the search for:

- innovative models for food retail company operations that take into account firstly, resilience factors to pandemic crises, and secondly, solutions to counteract consumer health risks, e.g., automatic regulation of the number of people entering the store or for in-store information, etc. [112], the effective use of sector economic targets for food retailing as instruments of state interventionism, for the prospective change of the units of this trade toward a more flexible and competitive model,
- models of sustainable food supply chains, taking into account the high degree of concentration of food retail trade and the low degree of concentration of agricultural production in Poland,
- the effective use of industry economic shields for food retailing, as instruments of state interventionism, for the prospective change of the units of this trade in a more flexible and competitive direction,
- a synthetic index of features of the adaptation activities of companies, enabling selective support of the process of adaptation of food retail entities by economic instruments of state policy, for the maintenance and growth of food security.

Future research on the firms that are the links in the food system in the 3rd decade of the 21st century is essential. They can, using large databases, make it possible to create assumptions for shaping new, effective pathways for food retail firms to adapt during a pandemic and to evolve in the post-pandemic period, in countries with different levels of food self-sufficiency [24]. A vision for food system in future has been presented lately by Fanzo et al. [28]. Finally we quote the opinion of American researchers "By better understanding the RFE (retail food environment) adaptations that have characterizes the COVID-19 pandemic, we hope to gain greater insight into how our food system can become more resilent in the future" [113], which opens new research frontiers and perspective.

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