

CHARLES UNIVERSITY
FACULTY OF SOCIAL SCIENCES
Institute of Economic Studies

Bachelor's Thesis

2021

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FACULTY OF SOCIAL SCIENCES

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**How large food manufacturers affect the country and its
population**

Bachelor's thesis

Prague 2021

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Study program: Economics and Finance

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Year of the defense: 2021

Bibliographic note

A Harutyunyan (2021): *How large food manufacturers affect the country and its population*, 60 pages. Bachelor thesis (Bc.), Charles University, Faculty of Social Sciences, Institute of Economic Studies. Supervisor: Ing. Karel Janda M.A., Dr., Ph.D.

Abstract

This work is devoted to the topic "How large food manufacturers affect the country and its population." Since the topic of the work is very wide, it was narrowed down to the area of studying the influence of large manufacturers in the field of fast food and catering establishments on the physical condition of the country's inhabitants. Physical condition in the context of this work was measured in the BMI index.

The main assumption was that fast food and other large food manufacturers lead consumers to overweight, that is, to the risk of health problems. The task of the work was to answer the question of whether this hypothesis is indeed true, that is, whether the presence and number of fast-food restaurants affect the average body mass index in the country.

The main aim of the thesis is to research the statistical correlation between the fast-food sector and the health condition of the people expressed through the BMI index.

The research questions are the following:

1. What are the effects of large food manufacturers' activities on the economy of the country, in terms of its health factors (BMI index)?
2. Is the emergence of a large international food manufacturer beneficial for the physical condition of the inhabitants of a country?

Keywords

BMI, overweight, obesity, fast-food restaurants, McDonald's, multinational companies, NACE Division I.56., Economic freedom.

Abstrakt

Tato práce je věnována tématu „Jak velcí výrobci potravin ovlivňují zemi a její populaci.“ Jelikož je téma práce velmi široké, bylo zúženo na oblast studia vlivu velkých výrobců v oblasti zařízení rychlého občerstvení a stravování na fyzickou kondici obyvatel země. Fyzická kondice v kontextu této práce byla měřena v indexu BMI.

Hlavním předpokladem bylo, že rychlé občerstvení a další velcí výrobci potravin vedou spotřebitele k nadváze, tedy k riziku zdravotních problémů. Úkolem práce bylo odpovědět na otázku, zda je tato hypotéza skutečně pravdivá, tedy zda přítomnost a počet restaurací rychlého občerstvení skutečně ovlivňuje průměrný index tělesné hmotnosti v zemi.

Hlavním cílem práce je zkoumat statistickou korelaci mezi sektorem rychlého občerstvení a zdravotním stavem lidí vyjádřenou prostřednictvím indexu BMI.

Výzkumné otázky jsou následující:

1. Jaké jsou dopady aktivit velkých výrobců potravin na ekonomiku země, pokud jde o její zdravotní faktory (index BMI)?
2. Je vznik velkého mezinárodního výrobce potravin prospěšný pro fyzickou kondici obyvatel země?

Klíčová slova

BMI, nadváha, obezita, restaurace rychlého občerstvení, McDonalds, nadnárodní společnosti, divize NACE I.56., Ekonomická svoboda.

Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.
2. The author hereby declares that all the sources and literature used have been properly cited.
3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague 21.04.2021

Artur Harutyunyan

Acknowledgments:

This thesis is part of a project that has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. 681228.

I would like to thank my supervisor prof. Ing. Karel Janda M.A., Dr., Ph.D. for his continuous support and patient guidance.

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1. Introduction

This thesis is focused on the very actual topic – How large food manufacturers affect the country and its population. This topic has become very much discussed recently, since globalization plays a huge role in world development, and international companies penetrate different countries, changing the situation, the social sphere, and the economy of these countries. Also, large manufacturers strongly affect human health in terms of ecology, job creation, investment in development, and so on.

This paper will analyze the effect of large producers on people's health, on their way of life. The relationship between major food manufacturers and, in particular, fast food, and body mass index, which is one of the most important indicators of obesity, will be analyzed.

The main aim of the thesis is to research the statistical correlation between the fast-food sector and the health condition of the people expressed through the BMI index.

The research questions are the following:

1. What are the effects of large food manufacturers' activities on the economy of the country, in terms of its health factors (BMI index)?
2. Is the emergence of a large international food manufacturer beneficial for the physical condition of the inhabitants of a country?

The thesis will be based mostly on secondary research. The case study method will be applied to investigate how the spread of fast food and restaurant establishments affects the way of life of people. The other indicators as GINI index, openness to trade, foreign direct investment, number of people using the internet, mobile Cellular Subscription will be also considered as covariates, as there is a presumption that the economic level of the country also affects the way and style of life of the people.

The main practical benefit of this work is to determine whether there is a dependence between the activity of large product manufacturers and international gastronomic facilities and people's lifestyles.

2. Related Literature and Hypothesis development

2.1 *Multinational Corporations: Key Definitions*

Before proceeding directly to the analysis of the food market within the framework of this research, it is worth first providing an overview of multinational corporations, starting with the definition of the term.

According to Gershon (2012), a multinational corporation can be defined as “*a nationally based company with overseas operations in two or more countries.*” Wankel (2007, p. 240) states that a multinational corporation is “*a large firm headquartered in one country but with subsidiaries in a number of other countries.*” The author points out that a multinational corporation’s subsidiaries make its integral part. The parent company manages the subsidiaries’ activities, and the latter are dependent on it in both organizational and strategic terms. Furthermore, Wankel believes that the degree of a company’s integration in multinational operations is preconditioned directly by the number of countries in which it has subsidiaries. A similar definition is also provided by Certo and Certo (2009, p. 114): “*a multinational corporation is an organization that is involved in doing business at the international level. It carries out its activities on an international scale that disregards national boundaries, and it is guided by a common strategy.*”

Thus, as the information provided above suggests, despite slight differences, all the definitions suggest that a multinational corporation is basically an entity performing its economic activities beyond the borders of one country and which applies a common strategy within the course of its international business expansion.

Wankel (2007, p. 240) explains that multinational corporations are engaged in a wide range of activities on an international scale, including production, sales, marketing, research, and development, etc. By integrating their different directions or stages of activities across different states, multinational corporations are able to achieve the required economies of scale, which should be considered as one of their key strategic advantages. The strategy of a multinational corporation’s activities is elaborated on the level of the parent company. Regional subsidiaries follow the general strategic guidelines formulated by the headquarters and at the same time adapt their tactical activities to particular specifics of the geographic segment on which they operate and the customers residing in this particular region. The

management of the parent corporation and its subsidiaries cooperates closely in order to attain the desired economic results. Companies often combine the use of foreign and native managers in subsidiaries for the purpose of intensifying the exchange of experiences and maximize performance across all directions.

Gershon (2012, p. 3) suggests that the activities of multinational corporations started back in the early 19th century and gained their greatest development after the end of the Cold War. This was favored by the shift from nationally oriented economies to global cooperation. At the same time, an important reason was the large amounts of capital accumulated by multinational corporations and the pool of technological knowledge they were ready to deploy for the sake of reaching their international expansion. Cohen (2007, p. 43) disagrees on this point and notes that most economists believe multinational corporations to have originated in the 17th century when the British East India Company and the Dutch East India Company were established. These companies were characterized by the fact that they were founded for specific purposes in overseas countries without having achieved commercial success in the metropolitan state. Nevertheless, as such companies indeed performed operations abroad and had their subsidiaries, it can be deemed justified to consider these entities as the first multinational corporations (MNCs).

Today, multinational corporations are powerful global actors. As Boeger, Murray, and Villiers (2008, p. 45) note, they hold significant economic resources, and their capital often exceeds the budgets of smaller states. Thanks to the economies of scale, MNCs often hold a monopolist position in the market in which they operate or establish oligopolies together with other major commercial actors. As the domination of multinational corporations is based largely on technological leadership, they also accumulate vast technological resources. Moreover, multinational corporations have become a powerful political actor in both the domestic political arena of the countries in which they operate and in terms of global geopolitics. MNCs can lobby the decisions of governments, participate in international negotiations and shape the development of relations between states and international organizations in general.

Diaconu (2012, pp. 142-145) explains that, as multinational corporations perform a wide range of activities and need to develop a unified strategy to be followed by all their subsidiaries, such companies have a range of international strategies to be chosen between. Thus, the first option is the global strategy. In this case, the multinational corporation focuses

on expanding worldwide through the expansion of the same strategy. Its products are sold in different countries with minor adaptations, and the global brand plays an essential role in customers' preferences. The second option is the so-called multi-domestic strategy. This strategy is applied in cases where there are significant differences between different national markets in which a company operates. As the economies of scale become less notable, the multi-domestic approach can be applied to achieve greater international differentiation, with strategies adapted to particular geographic regions. Another option available is the translational strategy. As Dicaonu (2012, p. 145) argues, "*the transnational corporation does not centralize or decentralize the authority, but it settles responsibilities, for each organizational task, to that unit of the organization that could be able to reach out the purpose of efficiency and flexibility*".

Analyzing multinational corporations, it should be borne in mind that such companies are most often incorporated in either developed or dynamically developing states. At the same time, such corporations direct their investment to the developing countries to locate their production facilities in locations with cheaper workforce and smaller taxes and for achieving domination on these segments. Therefore, it is worth analyzing in more detail the benefits and disadvantages of MNCs for developed and developing states.

As Kordos and Vojtovic (2016, pp. 153-156) explain, for countries of incorporation, the main advantage associated with MNCs is that they act as a powerful tool of economic, political, and cultural expansion. Thus, for instance, American corporations such as GMC, Ford, McDonald's, Wal-Mart, and so on are not only economic actors, but those brands which shape the United States' global presence. On the other hand, their economic contribution should not be underestimated either: such companies create additional value and pay large amounts of taxes. Their innovativeness and technological leadership contribute to developed states' further development and growth. By expanding abroad through mergers and acquisitions, MNCs open new markets for other companies from developed states, thus making the market wider. In the long run, the activities of multinational corporations are one of the most important factors ensuring globalization.

Among the main negative factors associated with MNCs for countries of incorporation, Kordos and Vojtovic (2016, pp. 153-156) and Ferdausy and Rahman (2009, pp. 116-118) note that such companies can monopolize the market and affect free competition: as a result, they can set higher prices for customers and constrain the development of the whole

economy in general. Also, even though multinational corporations seek to place their production facilities in less developed states, they still represent a significant environmental threat.

For receiving developing states, Ferdausy and Rahman (2009, pp. 116-118) state that multinational corporations are important as they create a great number of jobs: investment from such companies contributes to smaller unemployment and higher standards of living. At the same time, MNCs invest in local infrastructure in corporate social responsibility (CSR) activities. For performing their activities, they transfer technologies: as the level of innovative activities in developing states is inherently smaller, this transfer of technologies contributes to their more dynamic growth. Another important benefit is that such companies pay significant taxes to the local budgets, which makes an important contribution to economic growth in general.

As for the disadvantages for developing states, Linarelli, Salomon, and Sornarajah (2018, p. 97) note that the risks of monopolization are significantly higher compared to developed countries. Thus, MNCs can easily drive the less-powerful local competitors out of the market, becoming the sole dominator. Another important shortcoming is that such companies do not seek to equal the work conditions of the locals to the ones available in developed states: most often, they place their subsidiaries in developing states for sparing on the workforce, and the work standards applied are inferior. As already noted earlier in this chapter, multinational corporations can use their political power and economic domination for manipulating the decisions of local governments. The environmental threat associated with MNCs' activities is considerably higher. As the environmental standards are lower in developing countries, the activities of multinational corporations can be a major ecological harm.

Based on the overview provided above, it can be stated that the activities of multinational corporations have both their inherent advantages and risks. Nevertheless, despite the existing threats, it can be confirmed unequivocally that the economic activities of such companies represent one of the most important driving factors contributing to the development and growth of international business in general. This trend has been persisting for several decades and, given the current conditions, it will be likely to persist in the future. The effort of individual states' governments and the international community should be directed at developing common rules of play to be followed by all multinational corporations, including

those related to fair play and free market, commitment to sustainable growth, and guarantees of high social standards. This would contribute to the maximization of positive effects and at the same time to the minimization of associated risks.

Given the findings outlined above, it is now possible to focus on the investigation of the food market and its particular specifics.

2.2 Food Market and Its Specifics

The specifics of the food market on both the domestic and the international scales are associated with the main product sold there. This product includes all kinds of foods and beverages.

The food industry, in general, embraces a wide range of particular fields, namely agriculture, manufacturing, food processing, marketing, and so on. Agriculture includes all processes related to the cultivation of plants and cattle, which products are thereafter used in processing for delivering end products to target customers. Adams et al. (1998, pp. 19-20) note that a specific feature of agriculture production is the fact that it depends largely on weather conditions and geography, i.e. on factors that are beyond the control of manufacturers. Due to differences in climate and weather, soils, areas available for pastures, and so on, different countries tend to focus on the development of different segments of agriculture. At the same time, the focus on agriculture is more inherent in developing countries, while developed states focus on the tertiary sector. Thus, food processing is dependent directly on the successful development of agriculture. Within the stage of food processing, raw materials delivered by agricultural manufacturers are processed to a stage where they can be delivered to the end customer. Due to the specifics of agricultural production noted above, large food corporations most often have to cooperate with a great number of agricultural manufacturers all over the world, ranging from large companies to small private farms and households. This allows procuring sufficient raw foods to be processed on the one hand and guarantees effective diversification on the other hand. The opportunity to get supplies from other sources in an uninterrupted manner, regardless of weather conditions and other external factors, is one of the main ways to achieve effective performance on the food market.

A particularity of the food market is the fact that food products are perishable. Although this is more inherent of raw materials, even in the case of processed products, their lifespan is

significantly smaller compared to other industries. Hsiao (2009, p. 16) suggests that this entails practical consequences for food manufacturers and consumers. Thus, companies need to organize their international networks with effective logistics, to minimize time expenditures and ensure proper integration of all stages of production.

Another important specific feature of the food market pointed out by Aramouni and Deschenes (p. 4) is the large amount of legislative control applied on the part of the state. This is because food products are consumed by customers directly and affect not only their health but also their longevity and the overall quality of life. Governments tend to impose requirements as regards the contents of particular food products, and on the performance of marketing procedures as directed to particular categories of customers, for instance, to children. Rigorous requirements apply to the production processes, including the sanitary standards of the workplace and storing of food. Specifics also exist as regards the packaging of food products.

Particularities also exist at other stages of the cycle. Thus, Aramouni and Deschenes (pp. 1-3) state that the food market is developing dynamically. The high competition on it and the availability of a wide range of substitute products make companies constantly develop, change and modernize the products they sell. According to the authors, developing and introducing a new food product to the market takes from 6 months to 5 years. The process of market screening is generally similar to other industries. However, the food market is more sensitive in terms of local preferences. Therefore, large corporations require thorough studies to learn in detail about the specific preferences of their customers on different geographic segments and to adapt their product ranges specifically to the wants and needs of such customers.

Kaynak (2014, pp. 3-4) states that food marketing should be performed not only in compliance with the legal requirements in force but also with due account for the aforesaid region-specific customer preferences. The sales of products depend on the logistics systems deployed, as the products are perishable. Most often, large international food manufacturers cooperate with wholesale and retail resellers such as large supermarket networks and other similar distributors. The Internet channel is used widely nowadays to ensure proper sales as well.

Earle and Anderson (2001, pp. 50-51) state that the food market is characterized by integrity. A change in any stage of the abovementioned processes leads to general changes on the

market: *“In particular, innovations in the primary producing industries produce new ingredients, which then advance to new consumer products.”* At the same time, the authors point out that, compared to other markets such as electronics, the food market is more mature and stable. It is hard to invent new products, and consumers are more cautious in their change of products to be used. The biological processes take much time, as plants or cattle have to be cultivated. Despite this, the implementation of innovations in the sector is important for manufacturers to raise the quality of their production and to achieve higher profit margins in the long run.

Earle and Anderson (2001, p. 51) also note another specific feature: marginal returns on the food market are smaller compared to other sectors such as the sales of pharmaceutical products or information services. Also, it is worth mentioning the environmental impact of agricultural production and food processing. Given the current trends for sustainable development, companies are required to invest funds to comply with ecological standards and minimize the harm brought to the environment.

Taking into consideration these specifics of the food market, it is now worth providing a statistical overview of the sector on the global scale in the next chapter.

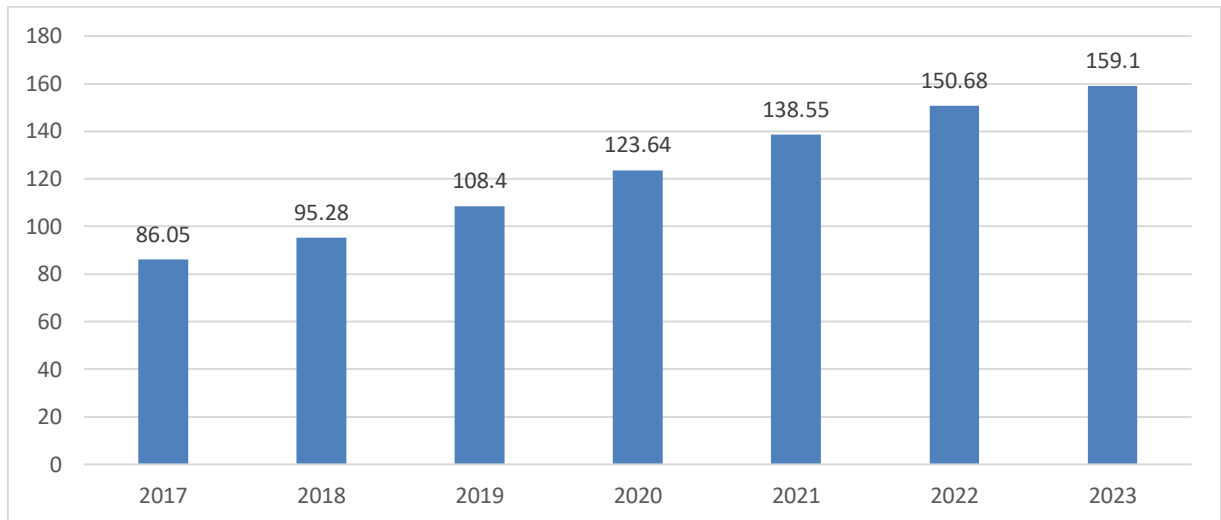
2.2.1 Statistical Overview of the Global Food Market

Given the specifics of the global food market outlined in the previous chapter of the thesis, it can be confirmed that the market's products are indispensable for the living of people, and therefore all of the world's population consumes food manufacturers' products to some extent. However, to understand better the current situation in the market, it is worth focusing more on its recent dynamics.

As can be seen from Figure 1 below, the food market has been on a steady rise in recent years, and, as experts' estimates suggest, this growth should be expected to persist in years to come. Thus, in 2017, the aggregate global food market revenues amounted to USD 86.05 billion. In 2018, this figure grew by 10.7 % and achieved a total of USD 95.28 billion. Further growth by 13.8 % is expected to be achieved in 2019. By the year 2023, revenues on the global food market are expected to increase by as much as 70 % compared to 2018. These tendencies testify to the high potential of the market. It should also be noted that the constant

growth of the global food market is associated directly with the steady growth of the global population.

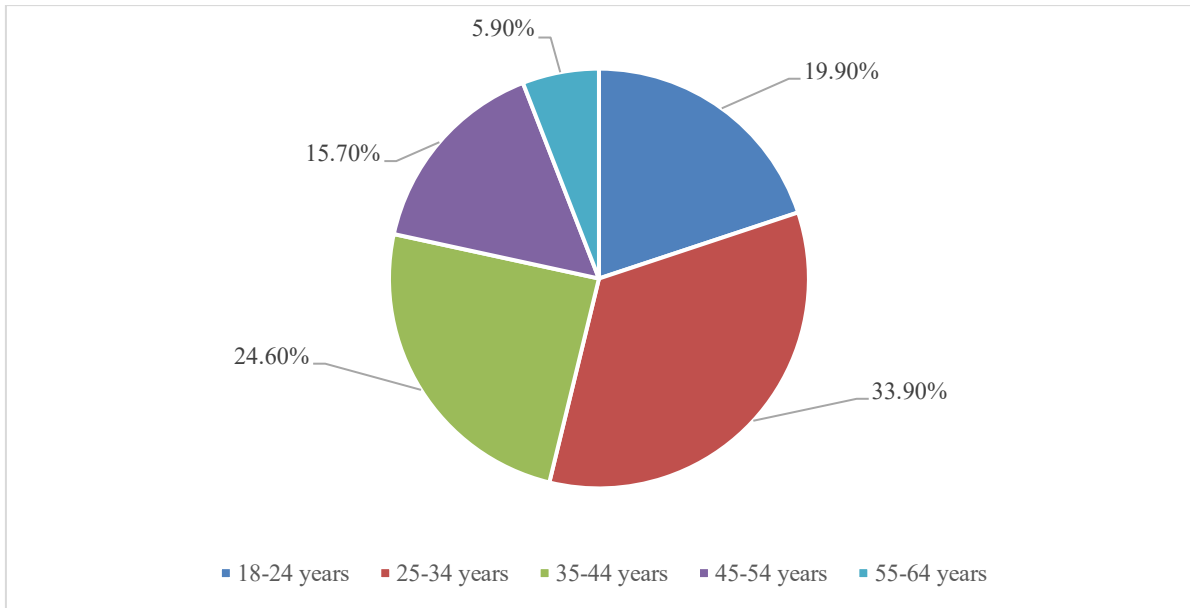
Figure 1: Revenues on the global food market in 2017-2018 and as projected to 2023, in USD billion



Source: Statista.com, 2019.

As Figure 2 shows, the structure of the global food market consumers by age is dominated by persons aged 25 to 34 years old, whose share exceeds 1/3. The second most important group is persons aged 35 to 44 years old with 24.6 %. Other groups' shares are smaller. This structure can be explained by two main reasons. On the one hand, the purchasing power of people aged 25 to 44 is higher compared to both older and younger persons. On the other hand, such people are more prone to exploring something new. Moreover, this structure is also affected by the global population's general age structure.

Figure 2: Consumers on the global food market by age, as of 2017

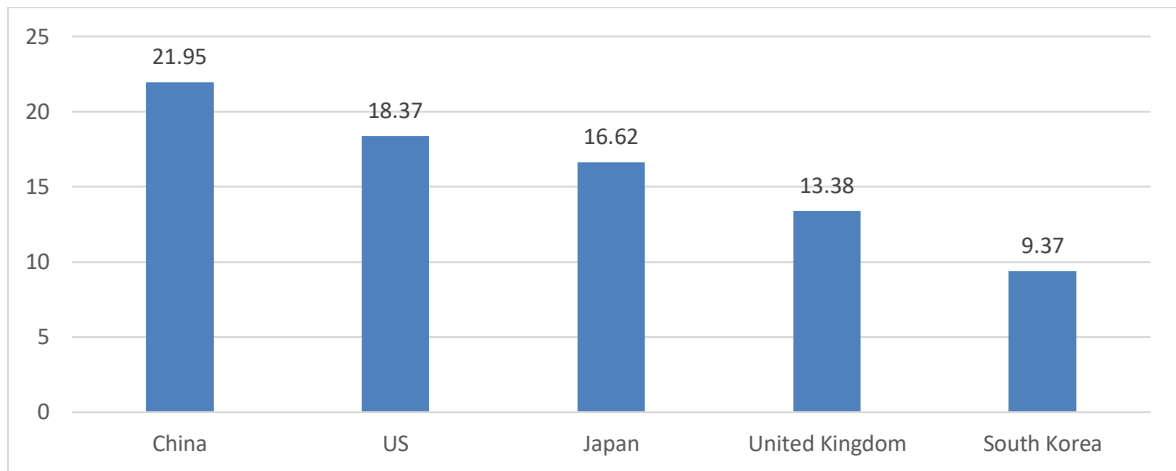


Source: Statista.com 2019a.

As Figure 3 highlights, the world's absolute leader in terms of food market revenues is China, with a figure of USD 21.95 billion in 2019, followed by the United States (18,37), Japan (16,62), the United Kingdom (13,38), and South Korea (9,37). Chinese domination on the global food market can be explained by the size of China's population and the need of local food manufacturers to fulfill all of the population's needs in foods and beverages. At the same time, China is also a powerful exporter of food products on another global scale.

The United States also contributes very strongly to the food market revenue. Primarily, the United States has to fulfill the demand of the local inhabitants, which are 328,2 million people. On the other hand, many local manufacturers export food and beverages to other countries in the World.

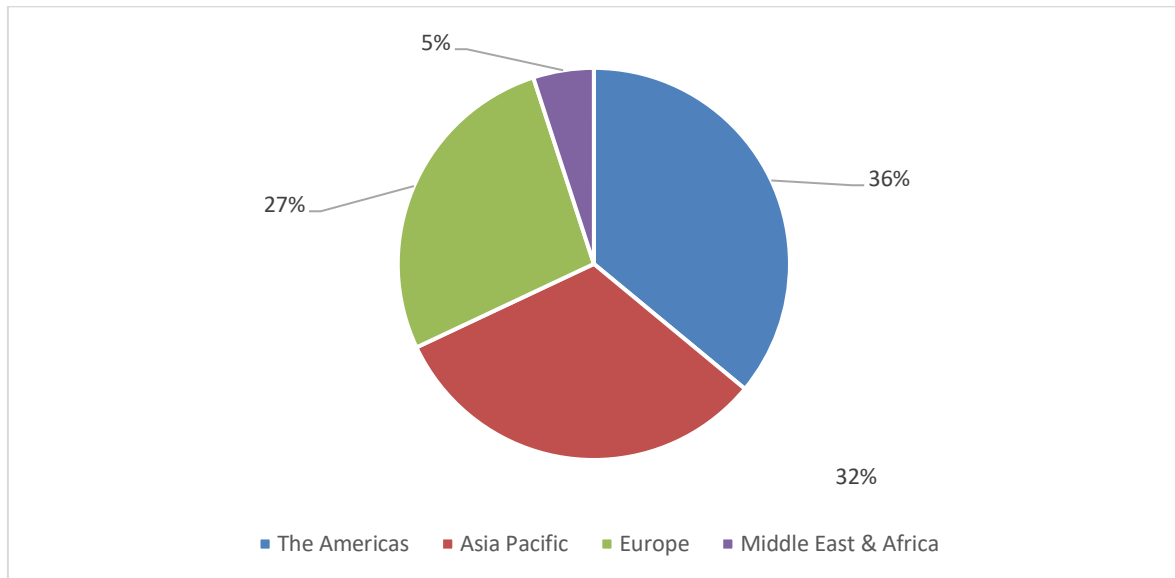
Figure 3: Top 5 countries by aggregate food market revenues, in USD billion



Source: own processing, Statista.com 2019a.

Exploring the eating out segment of the global food market, the tendencies noted above as regards the geographic distribution of revenues can be confirmed. Thus, as Figure 4 below illustrates, the Americas and the Asia Pacific dominate the sector, with their respective shares of 36 % and 32 %. Europe's share is smaller and amounts to 27 %, while the Middle East and Africa account for only 5 %, which can be explained primarily by the lower purchasing power of the African population.

Figure 4: Regional distribution of revenues on the eating out segment of the global food market



Source: Cushman & Wakefield 2017, p. 15.

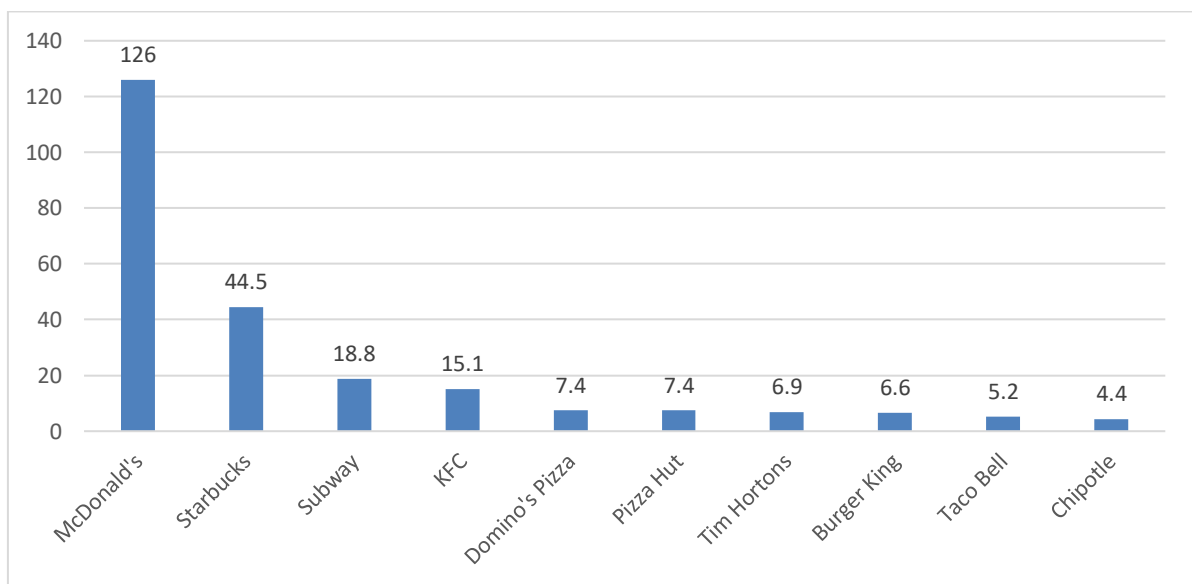
According to Cushman & Wakefield (2017, p.14), a prominent tendency on the eating out segment of the global food market is that the regional markets of the United States and Europe are mature and demonstrate more moderate growth. Thus, the average growth in the period from 2006 to 2016 amounted to 9.8 % in the Asia Pacific, 7.4 % in the Middle East & Africa, 6.1 % in the Americas, and 4.2 % in Europe. The projected growth figures for 2017-2026 amount to 7.5 % for the Asia Pacific, 7.4 % for the Middle East & Africa, 5.5 % for the Americas, and 4.9% for Europe.

Similar trends can also be observed in the market of raw materials, namely in terms of agricultural production. Thus, as noted by the OECD and FAO (2018), “Global agricultural and fish production is projected to grow by around 20 % over the coming decade, but with considerable variation across regions. Strong growth is expected in Sub-Saharan Africa, South and East Asia, as well as the Middle East and North Africa. By contrast, production growth in the developed world is expected to be much lower, especially in Western Europe.”

Analyzing the fast food market segment, it can be stated that international fast food networks incorporated in the United States dominate around the globe. As can be seen from Figure 5 below, 9 out of the world’s top 10 fast food brands are American (except for Tim Hortons

incorporated in Canada). Thus, McDonald's is the world's absolute leader, with an estimated brand value of USD 126 billion. It is followed by Starbucks (USD 44.5 billion) and Subway (18.8 billion). These figures testify that American brands have the greatest global coverage. At the same time, such expansion allows them not only to succeed in financial terms but also to spread the American culture worldwide.

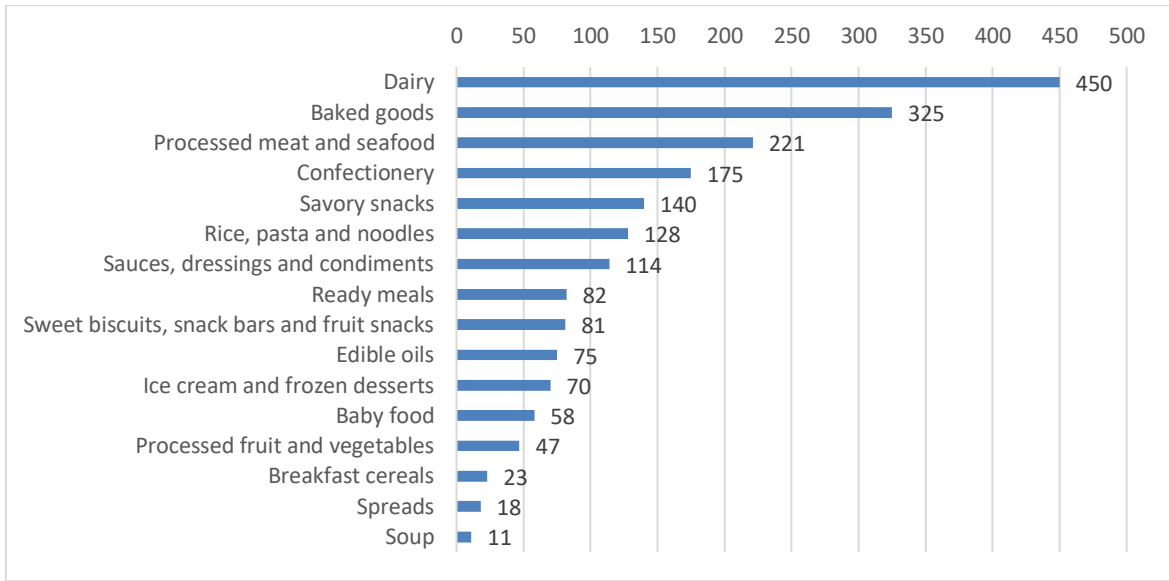
Figure 5: The brand value of the 10 most valuable fast food brands worldwide in 2018, in USD billion



Source: Statista.com, 2019b.

Considering the segment of packaged foods, as can be seen from the figure illustrated above, the largest retail value is generated by dairy products (USD 450 billion in 2016), baked foods (USD 325 billion), processed meat and seafood (USD 221 billion), confectionery (USD 175 billion), savory snacks (USD 140 billion), and a range of other products. From this information, it can be stated that customers around the globe have extensive access to different kinds of packaged products, which means that they are offered significant opportunities of choice. The popularity of packaged products themselves can be explained by their convenience for sale and consumption.

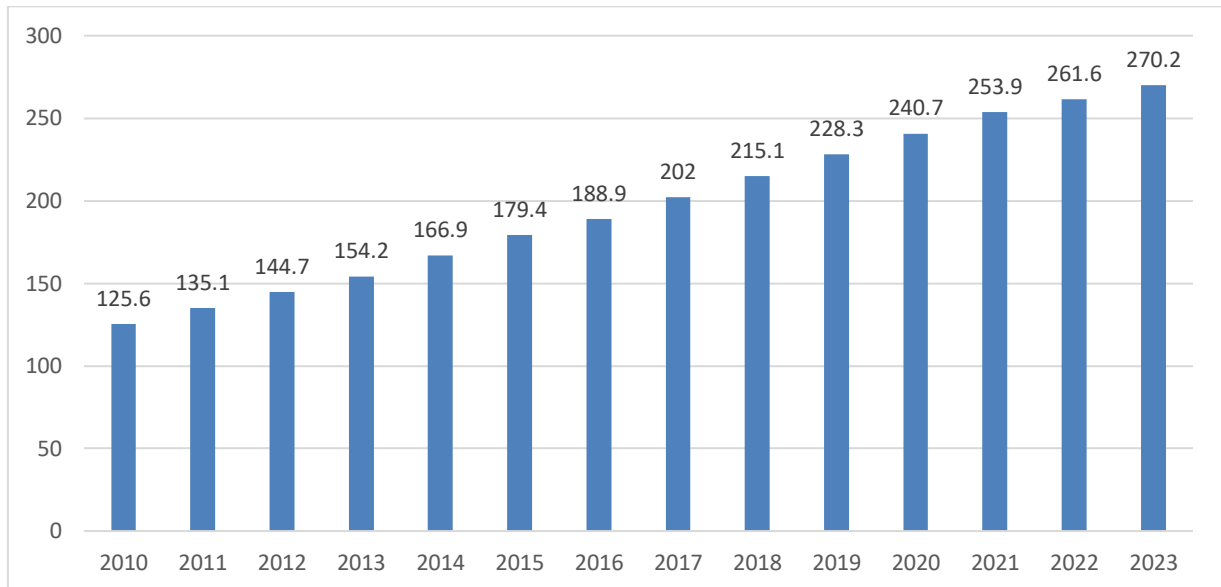
Figure 6: Packaged food retail value in 2016, by category, in USD billion



Source: Statista.com, 2019c.

As Figure 7 below shows, the market of ready food products has been steadily growing in recent years as well. Thus, the global revenues of the segment amounted to USD 125.6 million in 2010. By 2018, this indicator grew to USD 215.1 million, i.e. by more than 71 %. This growth is expected to continue further, achieving USD 270.2 million of total revenues by 2023 (+25.6 % compared to 2018). These dynamics can be explained by the fact that ready products take less time for people to cook. Given the growing involvement of the population all over the world in professional activities, this can be seen as an important advantage. Possible concerns include negative health effects, and it can be expected that manufacturers' efforts in the future will be directed to make such products healthier.

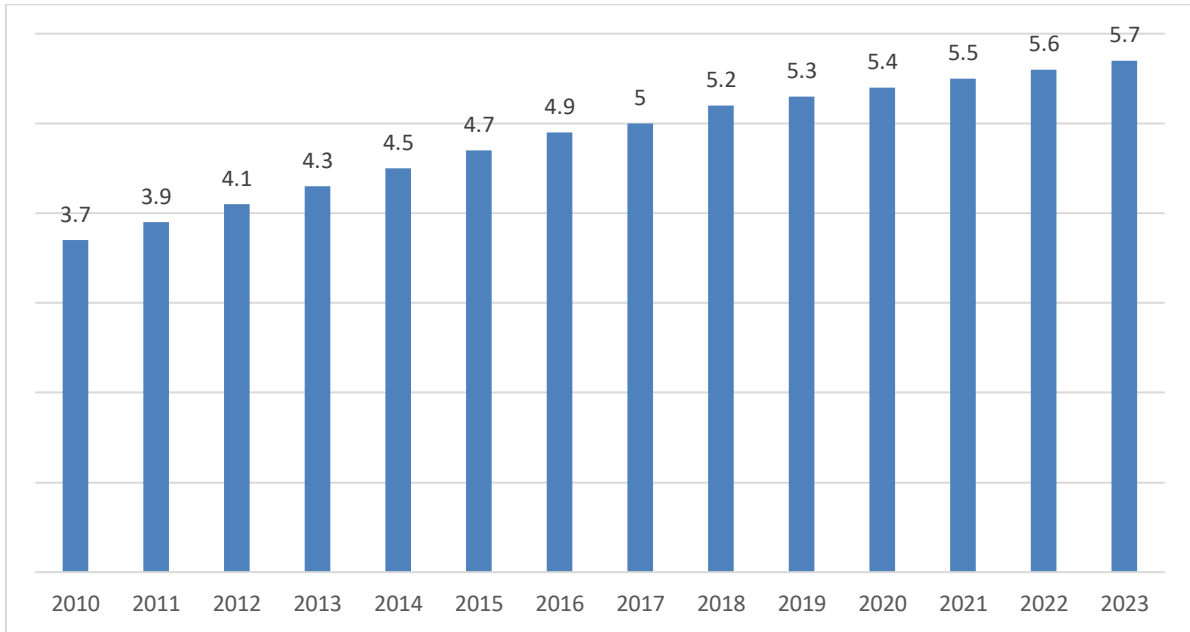
Figure 7: Global revenue of the ready foods segment in 2010-2018 and as projected to 2023, in USD million



Source: Statista.com 2019d.

To confirm the findings above, it should be noted that the ready meals segment is growing not only thanks to absolute sales. Thus, as can be seen from the chart provided below, the average absolute consumption of ready foods by people all over the world tends to keep growing every year. Thus, in 2010 an average person consumed 3.7 kilograms of ready meals every year. In 2018, this figure already amounted to 5.2 kilograms. By 2023, the projected value is 5.7 kilograms. This testifies that the segment is potentially beneficial and thus attractive for large food manufacturers. Moreover, subsequent customization of the market and the application of innovations can raise the manufacturers' profit margins and at the same time promote customers' greater purchases.

Figure 8: Average volume of ready foods consumed per capita in 2010-2018 and as projected to 2023, in kg



Source: Statista.com 2019d.

Given the findings outlined above, it can be stated that the global food market is developing actively. The specifics of food products and the constantly growing need for foods and beverages on the part of customers all over the world precondition the market's further expected growth in the near future. In order to understand better, the opportunities which the market has and the potential effects, the current global trends will be investigated in the next chapter of the thesis.

2.2.2 Current Global Trends on the Food Market

Investigating the current global trends on the food market, it is worth providing an overview of the tendencies dominating the market on both the consumer's and the manufacturer's sides. This should allow making conclusions on the market's future directions of growth.

One of the common trends worth noting in the consideration of the consumer side of the global food market is customers' proneness to follow healthy lifestyles. Coutts and Fielder (2009, pp. xiii-xiv) argue that the recent growth of the 'free from' and functional products on the food market is due to the fact that customers belonging to different age groups wish

to follow the common trends. Thus, large multinational corporations modify their product ranges, offering more products containing no artificial ingredients. Another common trend is the growing consumption of organic foods. For instance, companies offering their cattle or poultry free pasture and natural food can enjoy greater popularity among target customers nowadays. The growing numbers of vegetarians, vegans, and other similar groups of customers make manufacturers expand their product ranges on such different segments of the food market as well. The trend affects also fast-food restaurant chains, which are commonly believed to be manufacturers of unhealthy foods: such large companies change their product range to meet the expectations of customers and to comply with the existing tendencies, offering more vegetables, limiting the use of semi-finished products, and so on. Tarabella and Burchi (2018, p. 122) suggest that the aforesaid trends toward healthy lifestyles are actively used by marketers all over the world. In addition to applying their appropriate positioning and advertising to make particular food products more appealing to target customers, companies often resort to deceptive practices. Thus, a popular modern trend on the food market is the promotion of so-called bioactive foods for the prevention and treatment of diseases. Even though any such affirmations lack scientific evidence, people following the general trend are prone to buy bioactive foods.

Hammoudi et al. (2015, p. 20) note that one of the present-day tendencies in the food market is the struggle that governments lead for making the products sold healthier. On the one hand, this is in line with the previously noted tendencies toward the adoption of healthy lifestyles by end customers, including the youth. On the other hand, the implementation of rigorous legislation in the field of the harmlessness of food products should be seen as a way for governments to protect their domestic market against the impact of foreign companies. The creation of an integrated food market allows boosting domestic production in compliance with the established quality standards, at the same time improving competition between local manufacturers.

The trend for healthy lifestyles is generally associated with the overall trend for sustainable growth. Thus, Farmer (2013 pp. 2-3) notes that large food manufacturers are also trying to gradually change the packaging of their products, limiting the use of plastic and polypropylene to minimize the harm brought to the global environment. Other important initiatives in terms of packaging include the use of light-weighting materials, material reductions, recycling, and waste efforts. Companies adopting a holistic approach to their

business can not only ensure appropriate market positioning but also guarantee their positive brand image. In the near future, the importance of the aforesaid trends will only tend to grow in line with the shifting customer preferences and rising environmental responsibility.

Cushman & Wakefield (2017, p. 8) notes that an important tendency in the global food market is the customization of products offered to customers. Thus, a common trend all over the world is that the range of flavors, tastes, and products offered to customers tends to keep growing. Restaurants are gradually moving toward the customization of their menus. This leads to the emergence of new dishes and cuisines. Manufacturers seek fulfilling customers' desire for exploration and innovation. The socialization of business is also common, as customers are offered opportunities to mix their own tastes and prepare their own dishes.

Deloitte (2016) points out that social impact is gaining an ever-growing role in the food market: *“As consumer expectations increase, experience beyond the actual product or service can elevate satisfaction, trust and loyalty.”* According to the research company, to succeed in the food market, contemporary manufacturers should engage with their customers through both direct cooperation and partnerships with retailers. Another important specific feature is that customers seek greater transparency. Therefore, food companies need to provide the consumers with a full range of information on their products. On the social plane, this also means that companies should maintain the greatest transparency in terms of paying taxes, thus showing their commitment to the community.

The way of interaction between the manufacturers or service providers and the customers on the international food market tends to keep changing as well. Thus, as Cushman & Wakefield (2017, p.9) explains, today, the process of sales and marketing is shifting toward greater use of online channel and especially social networks. Through online features, customers are offered an opportunity to order directly from their home, paying just in a mouse click. Companies develop applications to simplify the process even more through the use of smartphones. Furthermore, the online channel represents a powerful channel for promotion and advertising. By reaching their target customers online, companies adapt their policies and can maximize the effectiveness of marketing messages, which leads to higher sales and thus revenues.

Investigating the general geographic trends on the market, it is worth citing RSM (2019), who notes that uncertainty will persist. This is explained by the fact that *“Chinese tariffs, for example, are creating excess supplies and driving down other prices (e.g., pork, soybean).*

Other uncertainties include rising labor costs, the tightening labor market, transportation's truck driver shortage and planned interest rate hikes." As international competition on the market should be expected to rise, prices for food products can be subject to fluctuations, which in its turn will affect the overall market turnover and will have appropriate effects on consumers. RSM also notes that a trend worth expecting soon is the growing amount of mergers and acquisitions on the part of both private equity firms and large multinational corporations. The main targets of such deals will be smaller and prospective start-up companies, innovative manufacturers, and niche companies having a unique product or business model to be offered.

Taking into account the findings of the theoretical part, it is worth now proceeding to the practical part of the research.

2.2.3 The industry of fast food

"Fast foodism" is now a normal part of an unhealthy and hurried diet. Under "fast food" everyone will surely imagine a large hamburger, hot dog, fries, langoustines, sugary lemonades, sausages of all kinds, and a pleasant smell that lurks on every corner. For human bodies, this type of snack is mostly an excessive supply of hidden energy in the form of sugars, animal fat, salt, and cholesterol.

Fast food is typical of these features: *"it is often processed, with heated (often rancid) oil, typically packaged, and calorie- and chemical-dense"* (Kesten, Scherwitz, 2020, p. 150). Inappropriate technological adjustments are used for food preparation, mainly in way frying or frying in overcooked oil. At the same time, these establishments also lead us to consume food faster, without any effort, standing, or moving.

Among the more unknown fast-food chains that prepare food cheaply and quickly are KFC, Burger King, McDonald's, McCafé, Subway, Pizza Hut.

The USA is considered a power in fast restaurants and the consumption of their products. According to Limdico (2020), *"around 20 % of American meals are consumed inside the vehicle, a concept which was not a statistic prior to the establishment of fast food. 9 in 10 American kids go to a McDonald's restaurant each month. 80 % of Americans dine in a fast-food restaurant at least once each month"*.

“TitleMax published The Top 10 Fast-Food Restaurants by sale¹ in the U.S.:

- *McDonald’s: \$37 billion in system-wide U.S. sales;*
- *Starbucks: \$13 billion in system-wide U.S. sales;*
- *Subway: \$10.8 billion in system-wide U.S. sales;*
- *Burger King: \$10 billion in system-wide U.S. sales;*
- *Taco Bell: \$9.8 billion in system-wide U.S. sales;*
- *Wendy’s: \$9.3 billion in system-wide U.S. sales;*
- *Dunkin’ Donuts: \$9.2 billion in system-wide U.S. sales;*
- *Chick-fil-A: \$9 billion in system-wide U.S. sales;*
- *Domino’s: \$5.9 billion in system-wide U.S. sales;*
- *Pizza Hut: \$5.5 billion in system-wide U.S. sales. (Hallman, 2021)”*

McDonald’s

Schlosser and Wilson (2016, p. 7) point out that visiting Fast food restaurants has become routine these days, for example, eating a hamburger with ketchup and a Coca-Cola. According to Science Kids *“Undeniably, McDonald’s is the most famous fast-food chain around the world. Globally, there are numerous McDonald’s stores spread over a hundred countries serving more than 40 million customers per day”* (Limdico, 2020). “McCompany” buys more processed beef, chicken, pork, apples, and potatoes than any other company. It spends more money on advertising and marketing than any other company that sells groceries. As a result, it is America's most famous food brand. *“The impact of McDonald's on the way we live today is truly staggering. Golden arches are now more recognized than the Christian cross,”* accordingly to Schlosser and Wilson (2016, p. 7).

Brothers Maurice and Richard McDonald founded the first McDonald's in 1948, by converting their barbecue restaurant into a hamburger and milkshake restaurant. It was located in San Bernardino, California, and was the brothers' second venture in the food industry. Their first was a hot dog stand owned by the brothers near the Santa Anita track.

The original McDonald's focused on its hamburgers, fries, and cocktails, selling them at half the price and at half the time of competing restaurants. The McDonald brothers

¹ including all system-wide sales (which includes franchise sales)

revolutionized the burger business. Instead of relying on waiters and waitresses, the McDonald brothers installed a self-service counter. Instead of cooking every meal to order, they prepared their burgers in advance and kept the meal warm under high-powered heat lamps (Reed, 2020).

In 1961 Kroc bought out the company completely and led it himself. While Maurice and Richard McDonald created the first restaurant and its business model of catering services, it is probably Ray Kroc who founded McDonald's as the world now knows it. He was able to turn the San Bernardino restaurant into a mass market.

2.3 Obesity

Obesity, also known as fatness, is simply an excess of body fat. The possibilities of storing this fat are almost limitless in the body. Fats are readily accepted into the body if the organism allows them to.

Both overweight and obesity belong to "civilization diseases". However, it no longer applies only to adults but also to children. Although a healthy living style has been increasingly promoted recently, humans are getting fatter.

The World Health Organization (WTO) (2020) defines obesity as *“a complex condition with a sincere social and psychological dimension that affects virtually all age and socioeconomic groups and threatens to overwhelm developed and developing countries alike”*. The WTO reports an alarming numerical evolution of obesity. *„In 1995, there were an estimated 200 million obese adults worldwide, and another 18 million children under the age of five were classified as overweight. Since 2000, the number of obese adults has risen to more than 300 million. (WHO, 2020)”* However, it should be pointed out, at the moment, obesity has spread around the world, which is why it is also often called the "3rd Millennium Epidemic." The obesity epidemic is not limited to industrialized societies; in developing countries, more than 115 million people are estimated to suffer from obesity-related problems (WHO, 2020).

2.3.1 Factors affecting obesity

Some global processes, such as economic growth, modernisation, urbanisation, and the globalisation of retail chains, are contributing to the onset of the obesity problem. Other

factors are the trend of over-consumption and the tendency to reduce a person's physical activity (less physical activity on the job, use of passenger car transport, technology, and modernisation of the household contribute to both facilitating work and reducing mobility activity). According to Fuller (2019, p. 13), „*one of the most common causes of obesity is brought about by overeating and lack of physical exercise. Ultimately, the body weight is determined by metabolic, genetic, behavioral, environmental, and cultural factors*”.

Overweight precedes obesity. The difference between the two is determined by the BMI (Body Mass Index). Overweight is referred to in the range BMI 25-30. The higher values indicate obesity, which varies depending on the higher BMI. The following symptoms will help to identify obesity and therefore warn against being fat (Fuller, 2019, p. 54):

- a large body weight;
- excessive fat accumulation on one's upper arms, thighs, and waist;
- an unproportioned facial structure like having a double chin;
- skin problems mainly brought about by moisture accumulating around skin folds;
- sleep apnea;
- breathing problems;
- lethargy;
- varicose veins;
- gallstones;
- whiteish and purplish patches around the abdomen.

2.3.2 Health risks – Metabolic Syndrome

The higher the level of obesity, the greater the health risks. For instance, risk of higher pressure, type 2 diabetes, higher risk of cardiac vascular diseases such as myocardial infarction or stroke, higher blood fat levels, etc. Metabolic syndrome refers to the sum of several medical conditions that are usually related to obesity. It is simply the name of a group of risk factors. In addition to high levels of blood fats and high blood pressure, other risk factors include a large waistline, low HDL (good) cholesterol, which helps to remove bad LDL cholesterol arteries and high blood sugar fasting, early signs of diabetes, coronary heart disease, abnormal blood fats, atrial fibrillation, cancer, osteoarthritis, sleep apnea, asthma, kidney disease, etc. People with at least three risk factors are diagnosed with Metabolic syndrome (Lavie, Loberg, 2014, p. 54).

Obesity treatment is most successful when carried out in collaboration with multiple experts, like an internist, a diabetologist, a nutritionist, a surgeon, a gastroenterologist, and, last but not least, a psychologist. Obesity counselling is a significant part of the whole treatment. Each patient's treatment is very individual, and an appropriate combination should be determined to help reduce weight and gain healthy self-esteem.

Elementary treatment approaches for obesity:

- Conservative treatment is always the first step in the fight against obesity, including individuals perform examinations, lifestyle changes, diet modification, post-hypoactivity, appropriate medication. The main role of medicines in the treatment of obesity is that they suppress appetite by creating a strong sense of satiety.
- Surgical treatment will permanently resolve obesity problems, helps treat type 2 diabetes, hypertension, and other serious diseases.

2.3.3 Weight calculators

There are many possibilities how to measure weight. As examples can be mentioned: “*BMI Calculator, Calorie Calculator, Army Body Fat Calculator, Body Fat Calculator, BMR Calculator, Weight Watchers Points Calculator, Anorexic BMI Calculator, Carbohydrate Calculator, Ideal Weight Calculator, Body Type Calculator, Lean Body Mass Calculator, Healthy Weight Calculator*” (Singh, 2014).

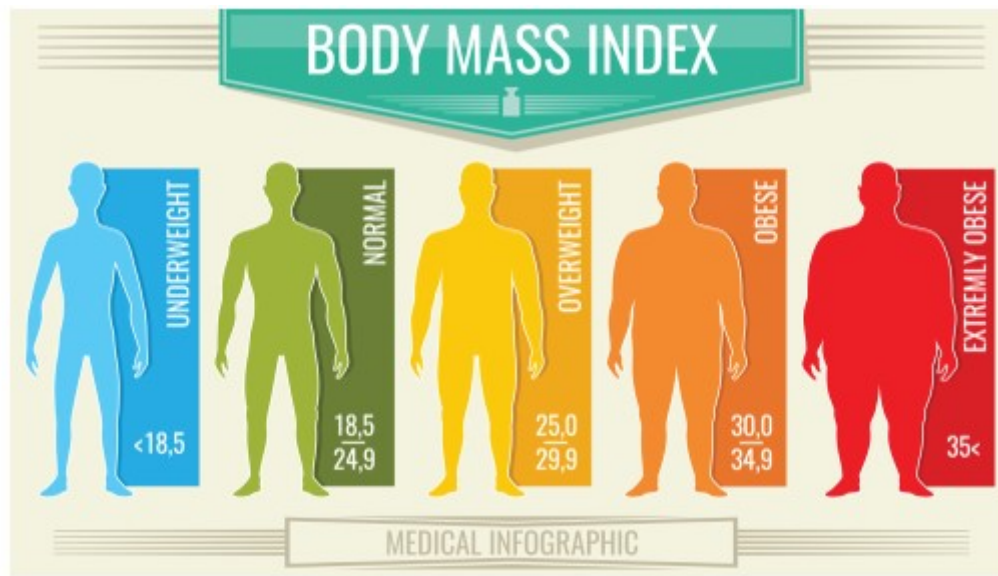
Body Mass Indicator – BMI

BMI is generally considered more of a statistical indicator. It points to the line between overweight and obesity. For a particular individual, it cannot be considered an accurate measurement. The calculation is very simple, however, it disregards a large number of important factors. Its basic calculation consists of the following data (Singh, 2014):

- “ $BMI = weight (kg) / height^2 (m^2)$ (Metric Units).
- $BMI = 703 * weights (lb) / height^2 (in^2)$ (U.S. Units)”.

The Body Mass Index gives less accurate data especially for children, older people, and active athletes. A more accurate body weight assessment than the BMI calculator is performed by a physician who includes other parameters such as gender, age, muscle volume, and build type.

Figure 9: Body Mass Index



Source: Vectorstock.com, 2021

The observational research published in The Clinical Infectious Diseases Journal looks at the risk of hospitalization by body mass index, or BMI. Scientists found that obese adults under the age of 60 had a higher risk of hospital and intensive care admissions compared to people who were a healthy weight, says lead author Dr. Jennifer Lighter (Scribd, 2021).

3. Data Analysis

In this part, the analysis is conducted. The dataset for this research combines data on the presence of overweight and obesity in different countries, along with the number of McDonald's outlets in the selected countries.

However, because of the lack of information on the number of McDonald's outlets, the sample size is limited both in terms of timeline and countries included. (24 countries for the 2016 year). Therefore, in order to test the hypothesis on a larger sample, and to be able to examine the association over time, I have decided also to include data on the number of enterprises in Food and beverage service activities (NACE Division I.56) and its subgroup – number of enterprises in Restaurants and mobile food service activities. The countries were selected based on the available data, to maximize the sample size.

All models include Ordinary Least Squares regression analysis (OLS), however as it might be the case that the real causal relationship is that people in countries with a higher prevalence of overweight and obesity have a higher demand for fast food outlets and other food and beverage service enterprises, I have included Instrumental Variable (IV) analysis, with the degree of economic freedom as the instrument, which also allows examining the possible impact of market deregulation on the prevalence of overweight and obesity among the country's population. (De Vogli, R., Kouvonen, A., Gimenez, D. 2013)

The dataset also includes 9 social and economic parameters, such as GDP per capita PPP (expressed logarithmically in constant 2017 international dollars), the portion of population living in urban areas, GINI index, openness to trade, foreign direct investment, number of people using internet and number of mobile cellular subscriptions, the prevalence of insufficient physical activity among adults, Prevalence of moderate or severe food insecurity in the population.

3.1 Dependent variables

In order to examine the impact of the fast food restaurants on obesity, I have selected the prevalence of overweight and obesity among adults as my dependent variables. Data on those variables were taken from the World Health Organization Database, where overweight prevalence is defined as proportion of adults with body mass index (BMI) ≥ 25 Kg/m²,

while the obesity prevalence is the proportion of adults with body mass index (BMI) ≥ 30 Kg/m².

3.2 Independent Variables

Density of McDonald's Outlets

Firstly, it has been decided to take the density of the McDonalds outlets in the selected countries as the main explanatory variable. In order to calculate the density, the data on the number of McDonald's outlets in 24 countries were taken from the McDonalds website and Statista website, while data on the population of the selected countries taken from The World Bank was used to determine the density of McDonald's outlets per 100,000 people. This value was then transformed into a natural log indicator. The reason, why McDonald's brand is selected as a proxy on the number of fast food outlets is that it is the leading and most popular fast food chain in the selected countries, and it also has the largest number of outlets.

Density of enterprises in Food and beverage service activities

As it might be the case, that Mcdonald's solely does not fully represent the food industry, I have also examined the density of enterprises in Food and beverage service activities (NACE Division I.56). This division consists of three subgroups: Event catering and other food service activities, Restaurants and mobile food service activities, Beverage serving activities.

The data on the number of enterprises were taken from Eurostat, while the density was calculated in the same manner as for the density of Mcdonald's outlets, using the population of the country.

Density of enterprises in Restaurants and mobile food service activities

I have also separately used the density of enterprises in Restaurants and mobile food service activities as another possible explanatory variable. This is one of the subgroups mentioned above.

The data on the number of enterprises were taken from Eurostat, while the density was calculated in the same manner as for the above-mentioned variables.

3.3 *Covariates*

Prevalence of insufficient physical activity among adults

This indicator shows whether adults living in the country have enough physical activities and sports. Physical activity and sports are compensation for office life and long sitting hours.

The data was taken from the WHO database and is limited to the 2016 year only. There are no datasets of the same data for the later period.

Prevalence of moderate or severe food insecurity in the population

This indicator means that adults of young children are faced with food insufficiency or the necessity to cut costs on food. That may be the reason for low food quality and insufficient quantity of nutrients.

The data was taken from the WHO database and is limited to the 2016 year only. There are no datasets of the same data for the later period.

GDP per capita PPP (expressed logarithmically in constant 2017 international dollars)

This indicator shows, which part of the total GDP can be counted on every inhabitant of the country. The indicator is calculated by dividing the GDP by the total population in the country.

The data was taken from the World Development Indicators database of The World Data Bank.

Portion of population living in urban areas

This indicator shows the total urbanization of the society. It may also affect the total BMI index, as urban life is quite different from the country life. The indicator is calculated by dividing the total population of the people living in the urban zones.

The data was taken from the World Development Indicators database of The World Data Bank.

GINI index

The Gini index shows how income is distributed in a country. The Gini index can reach values in the range from -1 to 1, the lower the value, the less fair the division of income in the state is considered, respectively, the less social the state is.

The data was taken from the World Development Indicators database of The World Data Bank.

Openness to trade

This indicator shows how the country is opened to international trade and the total engagement to the international trade system. This index is calculated as the ratio of the sum of exports and imports on the total GDP of the country.

The data was taken from the World Development Indicators database of The World Data Bank.

Foreign direct investment

This indicator shows the total amount of money that foreign enterprises or other countries invest in another country. In particular, this indicator shows the overall conditions in the country for foreign investments.

The data was taken from the World Development Indicators database of The World Data Bank.

Number of people using the internet

Internet penetration is also a very interesting indicator, which shows the overall progress in the country. This is usually called the digitalization index.

The data was taken from the World Development Indicators database of The World Data Bank.

Mobile Cellular Subscription

Mobile phone usage is another index, which shows the level of digitalization of the country as well as the stage of its development. It can also show the stage of the overall development of the country not only in terms of digitalization.

The data was taken from the World Development Indicators database of The World Data Bank

3.4 Instrumental Variable

For the Instrumental variable regression, an additional variable should be added as an instrument, which should be correlated with the endogenous variable (the density of the restaurants) and not directly correlated with the dependent variable (prevalence of overweight and obesity). Therefore, after preliminary correlation tests, two following variables have been selected.

Index of economic freedom (market deregulation)

This indicator shows how free relations and rules in the economy are for entrepreneurs and free trade. The freer the economy of a state is, the more developed a country is.

The data was taken from the World Development Indicators database of The World Data Bank.

Ease of doing business index

This indicator shows how easy it is to open and run a business in the country. The index is considered complex because it considers many different factors, including administrative conditions, taxes, and business freedom.

The data was taken from the World Development Indicators database of The World Data Bank.

4. Model Framework, Data and Regression Results

4.1 McDonald's restaurants density model

Description of the model

The first OLS regression model contains BMI25 (overweight) and BMI30 (obesity) as dependent variables, the density of McDonald's restaurants as the main explanatory variable, and 9 covariates which are GDP per capita PPP (expressed logarithmically in constant 2017 international dollars), the portion of population living in urban areas, GINI index, openness to trade, foreign direct investment, number of people using the internet, number of mobile cellular subscriptions, the prevalence of insufficient physical activity among adults, and prevalence of moderate or severe food insecurity in the population.

The full regression equations are the following:

Overweight:

$$\text{BMI25} = \beta_0 + \beta_1 * \text{rest.dens} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \beta_8 * \text{Food.insecurity} + \beta_9 * \text{Insufficient.activity} + \varepsilon_i$$

Obesity:

$$\text{BMI30} = \beta_0 + \beta_1 * \text{rest.dens} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \beta_8 * \text{Food.insecurity} + \beta_9 * \text{Insufficient.activity} + \varepsilon_i$$

The same dataset was used to conduct Instrumental Variable Regression (IV), with the Ease of Doing Business index as the instrument.

The equations for the IV regressions are the following:

Overweight:

$$\text{BMI25} = \beta_0 + \beta_1 * \text{rest.dens} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \beta_8 * \text{Food.insecurity} + \beta_9 * \text{Insufficient.activity} + \varepsilon_i$$

$$\text{Rest.dens} = \beta_0 + \beta_1 * \text{Ease.of.Doing.Business} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \beta_8 * \text{Food.insecurity} + \beta_9 * \text{Insufficient.activity} + \varepsilon_i$$

Obesity:

$$\text{BMI30} = \beta_0 + \beta_1 * \text{rest_dens} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \beta_8 * \text{Food.insecurity} + \beta_9 * \text{Insufficient.activity} + \varepsilon_i$$

$$\text{Rest.dens} = \beta_0 + \beta_1 * \text{Ease.of.Doing.Business} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \beta_8 * \text{Food.insecurity} + \beta_9 * \text{Insufficient.activity} + \varepsilon_i$$

The total sample size of this model includes 24 observations – 24 countries for the 2016 year. The main limitation for enlarging the dataset is the data on the number of Mcdonald's outlets, which is considered confidential data for some countries.

Table 1: Summary statistics

Summary Statistics					
Statistic	N	Mean	St. Dev.	Min	Max
BMI25	24	58.638	2.259	54.300	62.300
BMI30	24	22.708	2.156	19.700	26.400
Restaurant.Density	24	1.149	0.609	0.213	2.232
logGDP	24	10.555	0.389	9.898	11.614
Ease.of.Doing.Business.Index	24	75.934	4.301	66.900	84.500
Urban.population	24	73.161	12.520	53.900	97.919
GINI.index	24	31.771	3.899	24.800	40.600
Mobile.cellular.subscriptions	24	122.247	13.133	102.041	145.513
Openness.to.Trade	24	122.863	70.818	55.368	390.663
Foreign.direct.investment	24	9.347	16.236	-7.316	54.239
Moderate.or.severe.food.insecurity.in.the.p opulation	24	8.625	3.735	3.800	16.600
Individuals.using.the.Internet	24	79.232	10.571	59.504	98.137
Insufficient.activity	24	32.108	6.282	16.560	43.400

Source: own processing

Table 2: Regression results

Regression Results				
	<i>Dependent variable:</i>			
	BMI25	BMI30	BMI25	BMI30
	<i>OLS</i>		<i>Instrumental variable Ease of Doing Business</i>	
	(1)	(2)	(3)	(4)
Restaurant.Density	-2.045*	-1.974	-0.513	1.847
(std. er.)	(1.045)	(1.325)	(3.564)	(5.359)
logGDP	0.100	-1.582	-1.660	-5.972
(std. er.)	(1.847)	(2.342)	(4.365)	(6.564)
Urban.population	0.078**	-0.008	0.099	0.044
	(0.035)	(0.044)	(0.060)	(0.090)

GINI.index	0.207*	0.267*	0.151	0.129
(std. er.)	(0.107)	(0.135)	(0.168)	(0.252)
Mobile.cellular.subscriptions	-0.096***	-0.069*	-0.082*	-0.033
(std. er.)	(0.029)	(0.037)	(0.044)	(0.067)
Openness.to.Trade	0.005	0.008	0.010	0.022
(std. er.)	(0.009)	(0.011)	(0.015)	(0.023)
Foreign.direct.investment	0.031	0.028	0.029	0.024
(std. er.)	(0.034)	(0.043)	(0.036)	(0.055)
Moderate.or.severe.food.insecurity.in.the.population	-0.303**	-0.252	-0.209	-0.018
(std. er.)	(0.136)	(0.172)	(0.254)	(0.382)
Insufficient.activity	-0.101	-0.099	-0.104	-0.108
(std. er.)	(0.061)	(0.077)	(0.066)	(0.099)
Individuals.using.the.Internet	-0.158**	-0.017	-0.181*	-0.074
(std. er.)	(0.064)	(0.081)	(0.086)	(0.129)
Constant	76.860***	47.586*	92.605**	86.846
(std. er.)	(18.032)	(22.858)	(39.814)	(59.867)
Observations	24	24	24	24
R ²	0.776	0.605	0.739	0.351
Adjusted R ²	0.603	0.300	0.538	-0.147
Residual Std. Error (df = 13)	1.423	1.804	1.536	2.310
F Statistic (df = 10; 13)	4.497***	1.987		
Note:	* p<0.1; ** p<0.05; *** p<0.01			

Source: own processing

The only model, where the McDonalds Restaurant Density is a significant variable, is the OLS model with the BMI25 (prevalence of overweight) as the dependent variable. However, the correlation is negative, which should be interpreted as the rise of the density of McDonald's restaurants corresponds to the reduction in the prevalence of overweight. There are three more negatively correlated significant variables in the same model, which are the number of mobile cellular subscriptions, the prevalence of moderate or severe food insecurity in the population, and the number of individuals using the internet.

There are 2 positively correlated significant variables, which are the percentage of urban population and GINI index, which are also significant at BMI30 model (prevalence of obesity).

In the Instrumental Variables model, there are no significant variables for the BMI30 model, while the only significant variables in the BMI25 model are the number of mobile cellular subscriptions and the number of individuals using the Internet, both negatively correlated. Nevertheless, the results should be treated carefully, due to the low number of observations. To sum up, based on the above data, I cannot confirm that the presence of fast-food chains is associated with the rise of the BMI.

4.2 Restaurant and mobile food service activities models

Description of the model

The first panel data regression models include BMI25 (overweight) and BMI30 (obesity) as dependent variables, the density of the enterprises in the restaurant and mobile food service activities, as the main explanatory variable, and 7 covariates which are GDP per capita PPP (expressed logarithmically in constant 2017 international dollars), the portion of the population living in urban areas, GINI index, openness to trade, foreign direct investment, number of people using internet and number of mobile cellular subscriptions.

The regression equations are the following:

Overweight:

$$\text{BMI25} = \beta_0 + \beta_1 * \log(\text{rmfsa.dens}) + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

Obesity:

$$\text{BMI30} = \beta_0 + \beta_1 * \log(\text{rmfsa.dens}) + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

The sample size consists of 272 observations.

The Instrumental Variable regression with the Index of Economic Freedom as an instrument has the following equations:

Overweight:

$$\text{BMI25} = \beta_0 + \beta_1 \cdot \log(\text{rmfsa.dens}) + \beta_2 \cdot \log(\text{GDP}) + \beta_3 \cdot \text{UrbanPopulation} + \beta_4 \cdot \text{GINIIndex} + \beta_5 \cdot \text{Trade} + \beta_6 \cdot \text{FDI} + \beta_6 \cdot \text{Internet} + \beta_7 \cdot \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

$$\log(\text{rmfsa.dens}) = \beta_0 + \beta_1 \cdot \text{IEF} + \beta_2 \cdot \log(\text{GDP}) + \beta_3 \cdot \text{UrbanPopulation} + \beta_4 \cdot \text{GINIIndex} + \beta_5 \cdot \text{Trade} + \beta_6 \cdot \text{FDI} + \beta_6 \cdot \text{Internet} + \beta_7 \cdot \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

Obesity:

$$\text{BMI30} = \beta_0 + \beta_1 \cdot \log(\text{rmfsa.dens}) + \beta_2 \cdot \log(\text{GDP}) + \beta_3 \cdot \text{UrbanPopulation} + \beta_4 \cdot \text{GINIIndex} + \beta_5 \cdot \text{Trade} + \beta_6 \cdot \text{FDI} + \beta_6 \cdot \text{Internet} + \beta_7 \cdot \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

$$\log(\text{rmfsa.dens}) = \beta_0 + \beta_1 \cdot \text{IEF} + \beta_2 \cdot \log(\text{GDP}) + \beta_3 \cdot \text{UrbanPopulation} + \beta_4 \cdot \text{GINIIndex} + \beta_5 \cdot \text{Trade} + \beta_6 \cdot \text{FDI} + \beta_6 \cdot \text{Internet} + \beta_7 \cdot \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

The sample size consists of 263 observations.

Table 3: Summary statistics

Summary Statistics					
Statistic	N	Mean	St. Dev.	Min	Max
BMI25	420	56.479	3.360	47.700	66.800
BMI30	420	20.725	3.049	14.000	32.100
rmfsa.density	281	178.105	94.496	8.073	466.521
fbsa.density	365	305.699	178.099	13.111	831.505
ief	404	68.303	6.775	48.800	82.600
logGDP	420	10.440	0.486	9.146	11.656
Urban.population	420	71.506	13.220	43.965	97.919
GINI.index	388	31.849	4.059	23.700	42.900
Mobile.cellular.subscriptions	420	115.681	19.807	42.343	172.122
Openness.to.Trade	420	113.326	62.272	45.419	408.362
Foreign.direct.investment	418	13.679	42.884	-58.323	449.083
Individuals.using.the.Internet	420	66.900	19.147	15.460	98.240

Source: own processing

Table 4: Regression Results

Regression Results				
	<i>Dependent variable:</i>			
	BMI25	BMI30	BMI25	BMI30
	<i>OLS</i>		<i>Instrumental variable</i>	
			IEF	
	(1)	(2)	(3)	(4)
Rmfsa.Density	-0.0004	-0.002**	-0.001	0.017*
(std. er.)	(0.001)	(0.001)	(0.005)	(0.010)
logGDP	0.758***	1.153***	0.706	-0.708
(std. er.)	(0.247)	(0.268)	(0.522)	(1.085)
Urban.population	0.218***	0.197***	0.211***	0.150***
(std. er.)	(0.024)	(0.026)	(0.027)	(0.055)
GINI.index	-0.015	-0.008	-0.020*	-0.025
(std. er.)	(0.011)	(0.012)	(0.012)	(0.025)
Mobile.cellular.subscriptions	-0.002	-0.004**	-0.001	-0.009*
(std. er.)	(0.002)	(0.002)	(0.002)	(0.005)
Openness.to.Trade	0.003**	0.002	0.003**	-0.001
(std. er.)	(0.001)	(0.001)	(0.001)	(0.003)
Foreign.direct.investment	0.002***	0.001*	0.002***	0.001
(std. er.)	(0.001)	(0.001)	(0.001)	(0.001)
Individuals.using.the.Internet	0.017***	0.006	0.017***	0.013
(std. er.)	(0.004)	(0.004)	(0.004)	(0.009)
Observations	272	272	263	263
R ²	0.368	0.315	0.341	0.009
Adjusted R ²	0.225	0.160	0.190	-0.218
F Statistic (df = 8; 221)	16.076***	12.694***	112.940***	26.361***
<i>Note:</i>	* p<0.1; ** p<0.05; *** p<0.01			

Source: own processing

In this regression, there is a contradiction in the correlation of the density of enterprises in the restaurant and mobile food service activities, as the OLS regression shows a positive significant correlation, while the IV model represents a negatively correlated significant

outcome. However, it should be noted that the last model (4) has a negative adjusted R^2 and therefore shows the overall unreliability of this model.

LogGDP variable has the biggest magnitude in the OLS models for both overweight and obesity, while the number of urban population has the second largest coefficient and is significant in all models. Other significant variables are Openness to trade, foreign direct investment, and the number of individuals using the internet. Gini Index and the number of mobile cellular subscriptions are significant only in one of the models.

4.3 Food and beverage service activities models

Description of the model

The second panel data model uses the same data, however, instead of the density of enterprises in the restaurant and mobile food service activities, the density of enterprises in food and beverage service activities is used.

Therefore, the equations for the panel data OLS regression are the following.

Overweight:

$$\text{BMI25} = \beta_0 + \beta_1 \cdot \log(\text{fbsa.dens}) + \beta_2 \cdot \log(\text{GDP}) + \beta_3 \cdot \text{UrbanPopulation} + \beta_4 \cdot \text{GINIIndex} + \beta_5 \cdot \text{Trade} + \beta_6 \cdot \text{FDI} + \beta_6 \cdot \text{Internet} + \beta_7 \cdot \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

Obesity:

$$\text{BMI30} = \beta_0 + \beta_1 \cdot \log(\text{fbsa.dens}) + \beta_2 \cdot \log(\text{GDP}) + \beta_3 \cdot \text{UrbanPopulation} + \beta_4 \cdot \text{GINIIndex} + \beta_5 \cdot \text{Trade} + \beta_6 \cdot \text{FDI} + \beta_6 \cdot \text{Internet} + \beta_7 \cdot \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

This model has a total sample size of 355 observations.

While the equations for the IV with the same instrument as in the previous model are as below.

Overweight:

$$\text{BMI25} = \beta_0 + \beta_1 \cdot \log(\text{fbsa.dens}) + \beta_2 \cdot \log(\text{GDP}) + \beta_3 \cdot \text{UrbanPopulation} + \beta_4 \cdot \text{GINIIndex} + \beta_5 \cdot \text{Trade} + \beta_6 \cdot \text{FDI} + \beta_6 \cdot \text{Internet} + \beta_7 \cdot \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

$$\text{Log}(fbsa.dens) = \beta_0 + \beta_1 * \text{IEF} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

Obesity:

$$\text{BMI30} = \beta_0 + \beta_1 * \log(fbsa.dens) + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

$$\text{Log}(fbsa.dens) = \beta_0 + \beta_1 * \text{IEF} + \beta_2 * \log(\text{GDP}) + \beta_3 * \text{UrbanPopulation} + \beta_4 * \text{GINIIndex} + \beta_5 * \text{Trade} + \beta_6 * \text{FDI} + \beta_6 * \text{Internet} + \beta_7 * \text{Mobile.cellular.subscriptions} + \varepsilon_i$$

The sample size for the IV model has 319 observations, due to the lack of data on the Index of Economic Freedom for some of the selected countries.

Table 5: Regression results

Regression Results				
	<i>Dependent variable:</i>			
	BMI25	BMI30	BMI25	BMI30
	<i>OLS</i>		<i>Instrumental variable</i>	
			IEF	
	(1)	(2)	(3)	(4)
Fbsa.Density	-0.0001	-0.001	-0.0003	0.005***
(std. er.)	(0.0004)	(0.0004)	(0.001)	(0.002)
logGDP	0.693***	0.687***	0.799***	0.219
(std. er.)	(0.233)	(0.260)	(0.275)	(0.398)
Urban.population	0.235***	0.189***	0.226***	0.200***
(std. er.)	(0.018)	(0.020)	(0.020)	(0.029)
GINI.index	-0.025**	-0.025**	-0.033***	-0.034**
(std. er.)	(0.011)	(0.012)	(0.012)	(0.017)
Mobile.cellular.subscriptions	-0.002	-0.006***	-0.001	-0.006**
(std. er.)	(0.002)	(0.002)	(0.002)	(0.003)
Openness.to.Trade	0.003**	0.004***	0.003***	0.003

(std. er.)	(0.001)	(0.001)	(0.001)	(0.002)
Foreign.direct.investment	0.001**	0.001	0.002**	0.002**
(std. er.)	(0.001)	(0.001)	(0.001)	(0.001)
Individuals.using.the.Internet	0.015***	0.002	0.016***	0.006
(std. er.)	(0.003)	(0.004)	(0.004)	(0.005)
Observations	355	355	319	319
R ²	0.441	0.346	0.409	0.113
Adjusted R ²	0.342	0.231	0.296	-0.056
F Statistic (df = 8; 301)	29.638***	19.890***	185.824***	83.124***
Note:	*p<0.1; **p<0.05; ***p<0.01			

Source: own processing

In the last regression, there is a significant positive correlation of the density of enterprises in food and beverage service activities, however, again the adjusted R² value is negative, which represents not the effectiveness of the selected model. The largest coefficients are again the logGDP and Urban population as in the previous model. GINI index has a significant negative correlation compared to the previous model, where the result was not significant.

To sum up, based on the conducted analysis, I again cannot confirm that the density of the enterprises in the food and beverage industry is positively correlated with the rise of overweight and obesity among the population on a country level.

4.4 Other research on the topic

During this study, previous researches on the same topic were analyzed.

The first study that needs to be cited for comparison is *The effect of fast food restaurants on obesity and weight gain* study conducted in 2009 by researchers Janet Currie, Stefano Della Vigna, Enrico Moretti, and Vikram Pathania. This study can be considered a key one in the topic of obesity and fast food. Researchers have collected a huge database to conduct a comprehensive study and obtain reliable results. The mentioned research is based on micro-data, rather than national level macro data that is used in my research: the exact location of

restaurants and their proximity to schools and residence places have been used and analysed in the research.

Another positive characteristic of this model is that this model includes not only McDonald's but also other fast-food establishments (the 10 largest fast food chains), for example, Pizza Hut, KFC, Subway, and others.

Another study to point out for comparison is *Are Restaurants Really Supersizing America?* from 2007, from researchers Michael Anderson and David A. Matsa. In this study, as in the study presented in this paper, no correlation was found between the number of restaurants and obesity. However, researchers in the first study mentioned in the text above have explained a potential reason why no statistically significant correlation was found. In the research *Are Restaurants Really Supersizing America?* Anderson and Matsa use the data on the presence of Interstate highways in rural areas as an instrument. While Richard Dunn in his study *Obesity and the Availability of Fast-Food: an instrumental variable approach* from 2008 also does not find a significant correlation for rural areas, when using a similar instrumental variable approach.

This can also explain the results of my study, since I investigated the presence and number of restaurants in general on a national level, without specifying their location or other parameters. Therefore my study includes restaurants both in urban and rural areas.

The following two studies are those on which the analysis of this paper is based. First study: „*Globesization': Ecological evidence on the relationship between fast food outlets and obesity among 26 advanced economies*” from researchers Roberto De Vogli and Anne Kouvonen. They used data on the number of Subway restaurants, while my study analyzes McDonald's and other catering facilities. The main difference between their study and mine is that their study analyzes 26 advanced economies. The datasets and the countries they have chosen are linked not by regional criteria, but by the criteria of their economic development. Therefore, the analysis includes countries such as the USA, Japan, Canada, Norway, and so on. However, these countries differ in their cultural backgrounds and attitudes towards nutrition. Moreover, in Japan, obese people are required to pay an additional tax called “Fat tax”. In this study, a statistically significant correlation was found in contrast to my study, but the main parameter that differs greatly in the study is the dataset of countries.

The latest study, in which my model is in many ways similar, is “*The influence of market deregulation on fast-food consumption and Body Mass Index: a cross-national time series*”

analysis by Roberto De Vogli, Anne Kouvonen and David Gimeno.” This study is a bulletin of the World Health Organisation. The researchers took the Instrumental variables approach as well, and they also use mostly the same set of covariates as in my analysis. The difference is that in this study, the researchers take 25 high-income OECD countries, as in the earlier analysis example. Also, a high priority of this study is that researchers use data on fast food transactions per capita, rather than the number of restaurants. This information has been taken from the Global Market Information Database, which I had no access to. These data help to investigate the relationship between the volume of food sold in fast food restaurants and obesity better than just the number of restaurants,

It can be stated that the research presented in this dissertation is limited by the fact that macro data was used as micro data could not be found due to limited time, personal and financial resources. However, I would strongly suggest future researches to gather micro data as in research *The effect of fast food restaurants on obesity and weight gain study conducted by researchers Janet Currie, Stefano Della Vigna, Enrico Moretti and Vikram Pathania*, and conduct the analysis on city, even district level. Although, another potential issue that I see in models which study the proximity of the restaurants to the residences is that in recent years delivery services such as Uber Eats have become very popular, so people could order a meal from a fast food outlet delivered to their door even if they do not live nearby. To tackle this problem I would suggest using the fast food transactions per capita as the explanatory variable, as Roberto De Vogli, Anne Kouvonen and David Gimeno have done in their research, which from my point of view should better demonstrate how much fast food do people consume, rather than the number of restaurants.

5. Conclusion

This work is devoted to the topic "How large food manufacturers affect the country and its population." Since the topic of the work is very wide, it was narrowed down to the area of studying the influence of large manufacturers in the field of fast food and catering establishments on the physical condition of the country's inhabitants. Physical condition in the context of this work was measured in the BMI index, which measures a person's body mass index.

The main assumption before writing this paper and conducting the analysis was that fast food and other large food manufacturers lead consumers to overweight, that is, to the risk of health problems. The task of the work was to answer the question of whether this hypothesis is true, that is, whether the presence and number of fast-food restaurants really affect the average body mass index in the country.

The initial hypothesis is that the number of fast-food outlets affects the body mass index. At the same time, before the analysis, it was assumed that there is a direct correlation between the number of outlets in restaurant establishments such as fast food and the BMI index (the more establishments, the higher the BMI index in the population). The index was considered in two variations: BMI 25 (the highest limit of the permissible value, which, according to the WHO interpretation, means overweight) and BMI 30 (according to the WHO interpretation, it is obesity).

Under the definition of fast food, the study on the number of McDonald's outlets was originally conceived, since McDonald's is the largest representative of the fast-food sector and has the largest number of outlets around the world.

However, the limitation to this analysis was that I had limited data. According to the search results, information about the McDonald's restaurant chain was available from 2016 onwards, and information on body mass index was available until 2016. That is, the only segment of the study could be exactly 2016, but this would not be enough for the study.

Therefore, the analysis has been expanded to NACE Division I.56 - Food and Beverage sector. The data for this sector has been added to provide a comprehensive analysis and relevant results.

More countries and a longer period of time (2008-2018) were taken for the analysis. But since the area of food and beverage includes many different substructures, the area of Restaurants and mobile food activities was taken separately as a subdivision of the NACE Division I.56. Each model was investigated based on OLS analysis and instrumental variables.

Instrumental variables were used in the analysis because it was suggested that the correlation is two-sided. That is, not only the number of fast-food restaurants directly affect the value of the BMI index in the country, but also vice versa, the number of fast-food restaurants increases with a high BMI in the country. The assumption arose on the basis that in a country with a higher BMI there will be an increased demand for fast food restaurants, which motivates large manufacturers to open more restaurant outlets in such countries. Thus, not only was the correlation carried out but also, I have tried to show the causality.

In addition to the dependence of the two mentioned indices, the ease of doing business index was also added, since it is logical to assume that the easier the conditions for opening a new business in the country, the more outlets and branches will be opened in different areas of business, including food and beverage.

The second variable under study is the index of economic freedom. This variable is similar to the previous variable, but this index also reflects the government's actions in doing business in the country.

As a result of the analysis, it was revealed that there is no significant statistical relationship between the selected variables and the BMI index in the country. This analysis is indicative only for the selected variables and for the given sequence of analysis. With different data or time periods, the analysis might show a higher correlation.

Also, in the context of the analysis, it is worth noting that other studies were previously analyzed that were conducted in order to identify the relationship between the development of the fast-food industry and the BMI index in countries, but they were carried out for a different list of countries and other variables.

As part of a recommendation for future research, it is also worth noting that it would be more accurate to carry out the analysis based not on national level macro data, but specific cities and districts.

In the introduction to this thesis two research questions have been stated:

1. What are the effects of large food manufacturers' activities on the economy of the country, in terms of its health factors (BMI index)?

As a result of the research, I can say that based on our data large producers, such as fast-food producers, do not have a significant statistical effect on the increase in the BMI index of the inhabitants of the countries.

2. Is the emergence of a large international food manufacturer beneficial for the physical condition of the inhabitants of a country?

Since a significant statistical relationship between the number of outlets in the fast-food industry and the BMI index was not found, it is impossible to say unequivocally what effect the first factor has on the second.

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