

Competition among Russian Grocery Stores: Facts and Hypotheses to Explore *

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Abstract

Nowadays Russian retail industry is going through its own "Walmart revolution" when chains are gaining a dominant position on the market crowding out small local shops. While retail markets of the US and Europe have reached stable stage of the development with only minor changes in the market structure, the Russian retail industry is rapidly changing at present, thus, presenting an interesting subject for research. The current study provides an overview of the retail industry in developed countries and proposes a theoretical framework. Based on this, we describe an evolution of the Russian retail industry and indicate its main economic features and peculiarities. After we provide a description of obtained data. We conclude by highlighting relevant ideas for future research that can be studied in the Russian retail context.

Keywords: retail industries, grocery sector, market studies

JEL classification: L0, L81

*We are grateful for skillful research assistance by Semen Zabrodin, Darina Veriaskina, Otabek Mamatkulov, Tatyana Yakushina, Valeria Sherbakova, Anna Anistratenko.

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1 Introduction

Following the world trends, in 2000-2021 Russian grocery chain-stores were steadily enforcing their positions, crowding out small local shops. The Russian version of "Walmart revolutions" is continuing, being insufficiently analysed in the academic literature. The present working paper (scientific report) serves as a roadmap for planned studies of our research group; it presents sources of data and ideas to discuss with professionals before additional investments in data.

We suppose that 2000-2021 dynamics of competition in Russian grocery was influenced by three overlapping trends: (i) rising incomes, interrupted by 2009 and 2014 crises; (ii) rapid automobilization of urban life, eventually hampered by traffic jams; (iii) digitalization of retail, accelerated by Covid-19. As to observations, we note that market concentration was rising steadily in 2000-2021: such chains as X5, Magnit, Lenta, etc., gained more and more markets, gradually expanding to new regions. As to various formats: soft-discounters, supermarkets, hypermarkets, hard-discounters, some of them experienced rise and fall, e.g., supermarkets. We suppose that these observations, namely, market shares and their evolution can be understood through three ideas: (i) the *local market power* in each city area; (ii) several formats of shops/practices, tailored to heterogeneous consumer groups (*price discrimination*); (iii) indirect or direct *vertical integration of the industry*, fostered by chain-stores. Essentially, the latter factor enables to eliminate "double marginalization" and related vertical inefficiency, giving hope that profit is enhancing together with the public welfare. On the other hand, integration can potentially generate tacit collusion among oligopolists, that bore horizontal inefficiency.

Our object of interest is not a minor one: in 2020 the turnover of the Russian grocery retail industry amounted to 16.4 trillion rubles¹, which accounts for 15.3%

¹X5 Annual Report 2020 https://www.x5.ru/ru/PublishingImages/Pages/Investors/ResultsCentre/X5_Annual_Report_2020_RUS.pdf

in total GDP and stayed approximately at this level for the last 10 years ². Each month an average family spends about 30% of its total disposable income on food and non-alcoholic beverages ³. Thus, grocery is important for the economy and for a well-being.

From the urban viewpoint, grocery is important as it may affect the shape of the city. First, retailers choose new markets, locations for new stores. Second, food stores themselves influence the city traffic, housing and attract other retailers, like big-box stores, drug-stores, etc. The presence of retailers in any area also affects housing prices (Zhang et al., 2019). Thus, the retail industry has a substantial influence on life in modern cities.

In the light of these channels of influence, changes concerning the retail industry affect a large number of economic agents (consumers, grocery chains, local producers, wholesalers, etc.) and have a tangible material effect on the economy as a whole. That is why, the grocery sector usually attracts a lot of attention from regulatory bodies, advisory agencies; research in this area is in demand and promises some policy implications.

Historically, the "revolutions" among national grocery retail industries started in the US. American industry concentration experienced four major phases (Ellickson, 2016). The first phase starts with the entry of provincial chains, who slightly undercut prices of independent shops, exploiting some economies of scale. Initially, they saved costs mainly at the level of the whole chain through network externalities like information processing, better *centralised forecasting and accounting systems*. The next phase (exploiting high automobilization and high sprawl of American cities) involved the emergence of the *supermarket format* that brought the economy of scale to the stores themselves. Supermarkets exploited large store size, location in the outskirts of the town, self-service, and the emphasis

²<https://fedstat.ru/indicator/57319>

³<https://www.vedomosti.ru/economics/news/2020/12/14/850883-analitiki-otsenili-dolyu-rashodov-rossiyan-na-edu>

on advertising. Further, the era of *computerization* brought significant improvements: scanning registers allowed chain-stores to noticeably save on labour costs and to efficiently collect data. The last phase is marked by the entry of Walmart who penetrated the discount segment, exploiting its well-developed *supply and distribution system* and became the largest national (and international) chain, the great, famous shock to the retail industry (the latter advantage of chains seems to be the main one in nowadays Russia).

The development of the grocery industry in Europe generally has gone through similar stages as the US, albeit much later and with national peculiarities, described later on. In particular, the division of Europe into Eastern (post-socialist) and Western zones largely determined the way how and when the concentration of the industry evolved.

As for Russian private retail, it emerged after the collapse of the USSR in the early 1990s, alike other post-socialist countries. The Russian economy was collapsing too, real incomes dropped dramatically. At these times open-air marketplaces with low prices (involving massive tax evasion) became the most popular retail format, accompanied by Soviet shops, privatised in the form of many independent enterprises. Later on, in the 2000s, increasing incomes spurred the development of the industry. New bigger stores for the high-end segment were typically built or opened in acquired buildings by chain stores. They gradually gained a dominant position in the industry through acquiring or franchising small shops and, most importantly, building their own distribution centers, taking over the supply channels. Nowadays the process of Russian chains expansion is still ongoing; the Far East and the North Caucasus remain independent but might be eventually conquered. The grocery market is repeatedly shaken by bankruptcies, merges, and acquisitions. For instance, in 2017 X5 Retail Group acquired all 32 supermarkets owned by O'Key chain, which was planning to focus on develop-

ing hypermarkets and discounters ⁴. Later X5 acquired smaller chains Polushka, Vkusnyi dom, Matritsa, part of Holiday, Telezhka, Tverskoi kupets, etc ⁵. In 2019 soft-discounter Dixy and liquor shops Krasnoe & Beloe, Bristol merged as a DKBR Mega Retail Group Limited. Further, a big Dutch retailer in Russia, Spar, announced the closure of all supermarkets in January 2020. Then, in 2021 the second-largest chain Magnit has acquired Dixy which was part of the fifth-largest DKBR chain. This big acquisition reduces the gap between Magnit and the largest player – X5 Retail Group. Also, in 2021 the third-largest chain Lenta launched its new small brand/format Lenta-Mini, started purchasing the Russian part of German Billa ⁶, and acquired the Semya chain from Perm ⁷.

Such deals that major changes in market concentration are often under the attention of anti-monopoly authorities, they are regulated by the "Law on Commerce" that restricts the retailers' market share by 25% in every municipality. To summarize, nowadays we observe the retail competition in full swing and the Russian government involved in shaping the structure of the industry.

As for the modern analytical literature, the grocery competition in the US and Europe are fairly well-studied in (Seim, 2006; Ellickson, 2013; Aguirregabiria and Vicentini, 2016; Handbury, 2019), because grocery chains in these countries have developed earlier. Unlike the post-socialist and developing countries, the contemporary grocery industries in the European Union, the UK, and the US are at a stable stage of development (except for unfolding E-commerce). Russian retail industry, conversely, is going through important changes at present. That is why the Russian retail industry has a big potential for research and there are several important regulatory counterfactuals lack quantitative estimation. The aim of this paper is to indicate the main economic characteristics of the retail industry

⁴<https://www.vedomosti.ru/business/articles/2017/12/15/745434-x5-okey>

⁵<https://www.x5.ru/ru/Pages/About/History.aspx>

⁶<https://lenta.ru/news/2021/08/03/zavershsdel/>

⁷<https://www.rbc.ru/business/17/06/2021/60cb60479a7947804e3f5892>

in Russia and, based on this, to highlight possible directions for future research that would contribute to the empirical literature on grocery retail.

We begin discussion from an overview of grocery retail in the US and Europe in chapter 2. Based on this, we turn to the Russian retail industry. In chapter 3 we propose a theoretical framework for our future research. In chapter 4 we make a historical overview of the industry and describe the current features of the market. In chapter 5 we provide a description of obtained data that will be used in our future empirical research. In chapter 6 we summarise the knowledge about the current state of the industry together with modern literature and propose some directions that have considerable research perspectives in line with current literature and could be studied within the Russian context. Chapter 7 concludes.

2 Grocery retail industry in the US and Europe

This section provides an overview of the literature related to the history of grocery retail in the US and Europe and outlines recent developments in this sector, which were urged forward by the current Covid-19 crisis.

The evolution of grocery retail in the US

The evolution of the grocery retail sector in the United States was comprehensively reviewed by Ellickson (2016). The author distinguishes between four main periods in the development of the supermarket industry. The first period started in 1913 when the Great Atlantic & Pacific Tea Company founded the first grocery store chain (see also Tedlow, 1990). This format introduced standardization and scale, switched to the cash and carry model and integrated into both distribution and manufacturing, yielding significant cost savings and allowing to set lower prices. As a result, in the next two decades chain stores came to dominate the market.

The next milestone marked the birth of the supermarket in 1930 (see Charvat, 1961; Tedlow, 1990). The first supermarkets were large and located on the outskirts, relied on heavy advertising and operated on low margins and low expenses, making up the difference in volume. Supermarket growth was slow at first and accelerated after the World War II in 1950–1970s. The share of supermarket sales rapidly reached 75% in 1977 (Manchester, 1992), comparable to the current figures. During this period, firms moved closer to the suburbs and started adding services, appealing also to less price-sensitive consumers and converging to the store format as we know it today.

The next period in 1980-1995 was characterized as the “information age” (Ellickson, 2016). The invention of the UPC code and the scanning register led to an explosion of the number of products carried in each store and gave retailers access to new data, making it possible to engage in market research and data based marketing.

The latest milestone was marked by the entry of Walmart into grocery retail in 1988. Since then, the landscape of grocery retail in the US was shaped by the increasing share of supercenters and forcing out of traditional supermarkets. The expansion of Walmart also had an effect on prices: its everyday low pricing policy forced the incumbent firms to cut down on prices by 1-3% (Basker and Noel, 2009; Hausman and Leibtag, 2007).

Thus, within one century, food retailing in the US evolved from a market consisting of many small local specialized shops to a natural oligopoly. Modern formats such as supermarkets and supercenters quickly came to dominate the market. Due to its growing concentration, grocery retail has been under the microscope of the regulation authorities (see Pozzi and Schivardi, 2016, for an overview of the impact of those regulations).

The evolution of grocery retail in Europe

The development of grocery retail in Europe was in some aspects similar to that in the US, but also differed across countries since Europe consists of small and oftentimes very heterogeneous markets. The geopolitical division of Europe into the areas of socialist and Western influence had also a great impact on the evolution of grocery retail in the 20th century.

Grocery retail in Western Europe. The supermarket industry in the countries of the Western Bloc largely followed the steps outlined by Ellickson (2006), though slightly more delayed probably due to the devastating effects of the two wars on the European economies. The first chain stores emerged as early as in the 19th century (Delhaize in Belgium, Albert Heijn in the Netherlands, Félix Potin in France) and continued to expand throughout the first half of the 20th century. After World War II in 1950s the American supermarket model was brought to Europe (e.g. Tesco, Carrefour, Spar). The first hypermarkets followed in 1960s (SuperBazar, Carrefour, Auchan). Large firms started cross-border expansion to geographically proximate markets in 1970s, but it was not until 1990s when internationalization of the grocery retail industry really boomed, following the emergence of the new markets of the post-socialist countries.

In the past decades, developed European countries shared a common trend towards the consolidation of the grocery retail market. The market share of the top retailers increased, while the total number of stores decreased. Interestingly, European markets are much more concentrated than in the US, as a consequence, European consumers have to pay higher prices on average (Dobson and Waterson, 1999; Dobson, 2005; Nicholson and Young, 2012). Having said that, there is still substantial heterogeneity across different countries. For instance, grocery retail industry in the UK until recently has been one of the most concentrated in Europe with high average prices (Dobson and Waterson, 1999). As a result, it has received a lot of attention from the regulating authorities (Dobson, 2005). Grocery

retail in Germany is also very concentrated, however, average prices are low due to fierce competition among the local discounters. In contrast, in the UK the discounters did not play such a big role, and firms have put more emphasis on providing service and distinguishing themselves in terms of overall image (Dobson et al., 2001; Dobson, 2005). The Italian market is particularly outstanding because of its low concentration (Dobson and Waterson, 1999; Nicholson and Young, 2012). Scandinavian grocery retail is the most concentrated of all, with the share of top-3 grocers ranging between 81.6% and 96.2%, possibly explained by the climate conditions and the preference of the consumers for one-stop shopping (Deloitte, 2020; International Council of Shopping Centers, 2020).

Worth mentioning is the attempted entry of Walmart into two European markets. In 1997, Walmart entered Germany, but was forced to leave in 2006. As the main reasons behind Walmart's failure to succeed in Germany Fernie et al. (2006) list the high degree of price competition with the local discounters, limited store hours, price regulations (prohibiting retailers from selling below costs), stringent zoning requirements, strong labor unions, consumer loyalty to the local retailers and differences in organizational culture. The entry of Walmart into the UK market in 1999 by buying the local chain Asda was more successful since discounters were not that widespread there and the government was concerned about high food prices for British consumers. By 2004, Walmart achieved a 17% share of the grocery retail market. However, being a giant in the US and some developing countries, Walmart has not had a profound impact upon the market structure of grocery retailing in Europe. Defensive strategies by incumbent retailers and the uncooperativeness of large wholesalers have prohibited Walmart's expansion. Walmart's history in Europe emphasizes that, despite having much in common, grocery retail in Western Europe and the US are in some aspects fundamentally different.

Grocery retail in post-socialist Europe. The development of grocery retail in the countries of the former Socialist Bloc followed a different path. Dries et al. (2004) distinguish between three periods in the history of modern grocery retail in these countries. During the pre-transition period before 1990s, like most sectors of the economy, grocery retail was largely state-owned and controlled by the socialist governments, while market share of privately owned stores ranged from negligible to small (Kulke, 1997; Michalak, 2001). The early transition period in the early 1990s brought on privatisation without fundamental change in the distribution and format of the retail stores. The breakdown of the state system into small private retail chains occurred mainly with domestic capital since foreign investors had legal and economic obstacles to entering the market. Finally, the “globalization period” starting in mid-late 1990s was characterized by the rapid rise of the supermarkets, the proliferation of formats, extensive foreign investments and growing concentration of the grocery retail sector. Thus, the concentration of the market followed a “U-shaped” pattern over time: the highly concentrated state-owned system was first decentralized during the early transition period, and then the market showed the trend towards re-concentration.

Garb and Dybicz (2006) outline several characteristics of the transition in post-socialist countries that stand in contrast to the evolution of the retail sector in the developed countries. First, it happened rapidly over a single decade. Second, decentralization occurred in towns and cities that were traditionally compact and well-served by public transport. Supermarkets started in upper-income niches in large cities and then spread into middle-class and then poorer consumer markets (Reardon and Swinnen, 2004). Third, the retail usually led urban decentralization, proceeding rather than following residential and job sprawl. Fourth, since consumers in the emerging markets had much lower income in comparison to Western Europe, many companies were willing to accept losses in the beginning in order to occupy a larger share of the market. Finally, while the supermarket sector in the

developed countries was established by the force of domestic capital (Reardon and Swinnen, 2004), retail in post-socialist Europe is overwhelmingly foreign-owned.

Today, the landscape of the grocery retail sector in Central and Eastern Europe largely resembles the markets of the US and Western Europe. Retail stores predominantly take modern formats such as supermarkets, discounters and hypermarkets (Machek, 2012). The concentration of the market has increased in the past decades, approaching Western European figures (Špička et al., 2016). However, there is still some heterogeneity in the speed of catching up with the global trends. Dries et al. (2004) divide post-socialist markets into three categories according to the start of the “globalization period”. First-wave countries (Czech Republic, Hungary, Poland) started the globalization period around 1996. Second wave started in the late 1990s in Balkan countries such as Croatia, Romania, and Bulgaria. In third-wave countries, including Russia and Ukraine, retail globalisation did not really start until 2002. The authors claim that the penetration of supermarkets is correlated with the globalisation of the retail sector of a country, as well as with per capita income and the extent of institutional and economic reforms and market liberalisation. This claim is supported by the evidence provided by Traill (2006), who add income distribution, urbanisation, female labour force participation and openness to inward foreign investment to the potential factors of the rise of supermarkets.

The effect of the Covid-19 crisis on grocery retail

Up until recently, grocery retail has been unaffected by the so-called “retail apocalypse”, the massive closing of brick-and-mortar retail stores due to the shift to online trade, which is observed in other retail sectors. The share of online grocery sales on Western markets remained low and constituted 3.4% of the total grocery sales in 2019 in the US (Mercatus, 2020), with comparable figures in European countries (Caine and Koetter, 2018). Consumers might have been reluctant

to buy groceries online since they might have a preference towards picking perishable products themselves and, in addition, online grocery shopping is typically associated with higher costs for delivery services. The unfamiliarity of most consumers with e-grocery and the habit of going to a traditional store could also have contributed to the relatively slow growth of online trade in this sector.

This habit was broken for many people by the recent Covid-19 pandemic and the associated government measures. The lockdowns instigated a worldwide economic crisis, surging unemployment rates and losses in almost all sectors of the economy. However, grocery retail was spared from the crisis and, in fact, has even benefited from it: for instance, total grocery sales in the US exploded in March, 2020 and remained at a high level thereafter (see Figure 1). Apart from panic buying associated with the anticipated stockouts and closure of stores, forced closure of restaurants was another factor contributing to the surge in grocery sales. Before the pandemic, US consumers actually spent more in restaurants and bars than in grocery stores; these spendings dropped dramatically in March, 2020 and are only approaching the pre-pandemic levels in the middle of 2021 as laid out in Figure 1.

The increase in total grocery sales was accompanied by a disproportional increase in online grocery shopping: the share of e-grocery market in the US tripled over one year and constituted 10.2% of the total sales in 2020, compared to the previous predictions of 4.3% (Mercatus, 2020). Similar patterns were observed in European countries (Günday et al., 2020). The adoption of online grocery shopping has almost doubled in the US according to the survey of Mercatus (2020): 43% of the respondents recently shopped online in 2020, compared to 24% in 2019. This change of consumer attitudes is consistent with safety concerns and the preference to avoid crowded places. Both US and European consumers were reported to reduce their frequency of shopping (Mercatus, 2020; Beek et al., 2021). Government restrictions also contributed to the observed change in consumer behavior: in some countries, lockdown regulations restricted mobility within a certain radius

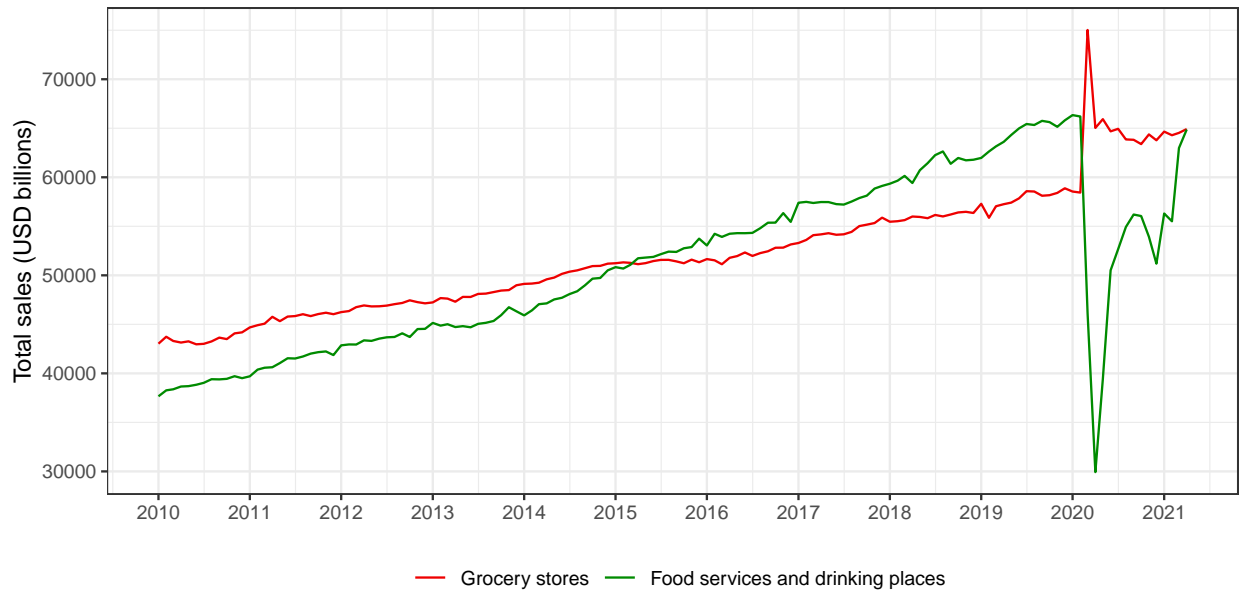


Figure 1: Total sales in the grocery retail sector vs. eating and drinking establishments in the US, adjusted for seasonal differences. Data source: US Census Bureau, accessed at <https://www.census.gov/retail/index.html> on 10-06-2021.

or controlled the frequency and duration of going outside one's home.

Retailers adapted to the shock in consumer preferences and invested in the development of online shopping options. Lafontaine and Sivadasan (2020) mention the following examples of the recent retail firm strategies:

- omnichannel strategy, or physical retailers offering online shopping combined with either delivery to customer homes or curbside pickup (for instance, Walmart InHome Delivery);
- independent delivery firms teaming up with physical retailers, such as Instacart in the US or SberMarket in Russia;
- Buy Online Pickup in Store (BOPIS) or "Click and Collect" implemented by traditional grocery retailers. This strategy is gaining momentum (67% of shoppers in the US were reported to have used it recently and 90% of the retailers plan to implement it by 2021) and partly resolves the concerns

associated with perishable products and higher costs: consumers have the option to take a look at the product before taking it home and do not have to pay for delivery.

Since the new consumer preferences might persist and, according to the estimates of Bonnet and Etcheverry (2021), e-commerce increases consumer surplus and, under some conditions, firms' profits, we can expect online grocery retail to continue to grow.

Finally, the crisis could potentially affect the market structure of grocery retail. Interestingly, after having a long period of steady growth and gaining market share in grocery, Walmart is currently losing its share to traditional local supermarkets like Kroger and Albertsons (Boyle, 2020). Traditional grocers benefited from attracting less price-sensitive consumers who had to substitute for restaurant dining. It was also possible for the local stores to increase prices by offering less discounts during the period of increased demand, while Walmart's everyday low price policy did not allow to reap these benefits. With restaurants opening again, this trend is likely to reverse, however, it is not clear when and whether Walmart is going to reach its pre-pandemic market share since the new shopping habits might turn out to be long-lasting.

3 Theoretical framework, methodology

To organize our facts and ideas, we exploit three kinds of (disputable and non-coordinated) theoretical concepts: (i) a certain representation of our industry/demand, (ii) a model/concept of spatial oligopolistic competition and (iii) some approach to calculating profit per variety, per firm, etc.

3.1 Bounds of the "food industry" and its demand

To discuss the tendencies of competition, we should delineate the bounds of the "industry" analysed.

Geographically, we prefer a narrow range, limiting our analysis only to *largest Russian cities*, say, over a million population. Smaller settlements are less interesting for us because we focus on the "urban consumer", who can choose among various possibilities: hypermarkets, supermarkets, pdiscounters, online trade, catering.

As to the *horizontal* boundaries of our "industry", we prefer to analyse a broad range of products and services – everything that people eat and drink in a big city. It means *all foods and beverages*. Though we mostly discuss the *grocery stores* and *online food supply*, yet, we should include also *catering* – canteens, cafe, restaurants to complete the picture of food competition (though at the current stage we lack sufficient data on catering and E-commerce).

In the *vertical* dimension of our industry, we also seek for broadness, we should take into account *the whole supply chain from agriculture/import to the consumer's table*. We aspire to know what makes the chain stores and other actors successful or not in competition. To find out their comparative advantages, we should discuss the four stages of food provision, personalized by several actors, presented in our flow-diagram (Figure 2). These actors are: (1) farmers, fishermen, and other initial producers; (2) food-processing factories for milk, meat, etc.; (3) wholesalers, distribution centers, dark-stores of E-commerce; (4) final retailers, i.e., shops, couriers, canteens – who handle the product to customers.

This diagram intends to show that there is a noticeable variation in possible supply flows, which generates some competition at each stage of the food supply. Indeed, a farmer can choose between several local buyers/distribution centers or, possibly, choose to serve the buyers simultaneously. In turn, these centers can

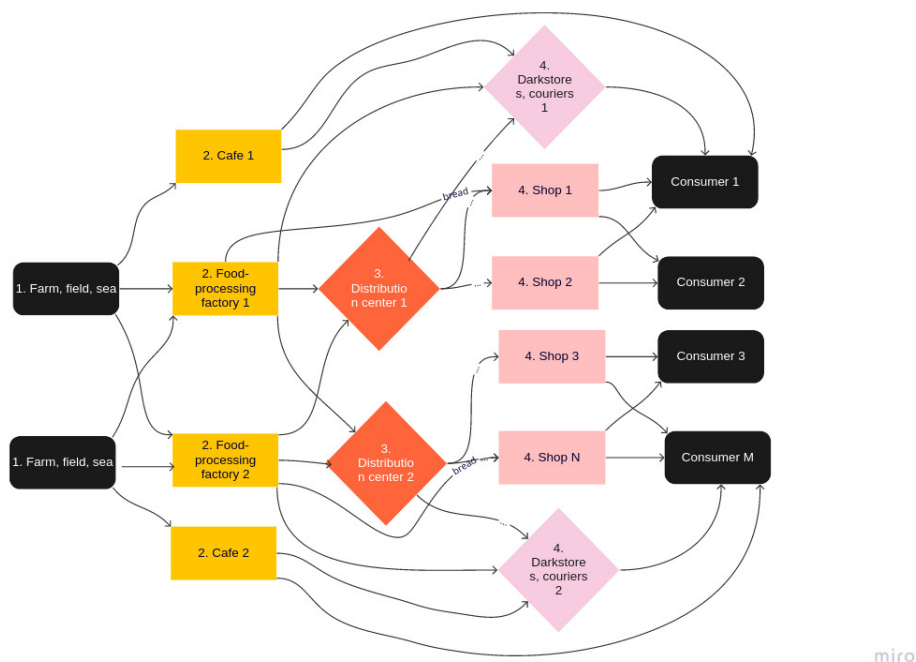


Figure 2: Food supply chain

choose among their upstream partners and among the downstream shops that they serve. There is also a segment of the network that bypasses shops, namely, the food supply through catering: cafes, canteens, restaurants. Another bypassing segment involves E-commerce, delivery through couriers. In particular, Delivery-club and Yandex-eda supply ready dishes from restaurants, Utkonos, and others supply "slow" grocery, while Samokat and Yandex-lavka supply "fast" grocery in 15 minutes.

We argue that these bypasses and variations in choice put limits on markups charged by any market player. On the other hand, when big actors concentrate any horizontal stage (wholesale or retail) in their hands, they become able to capture, negotiate or force the vertical integration also. Respectively, this diagram serves as a road-map for discussion of the distribution of markups on the whole supply chain, and the mergers/acquisitions. Comparison of markups should reveal the nature of competition in the industry.

Demand. To understand the decisions of all actors in the industry depicted in our diagram, we should describe the final stage of this supply network: demand. It is a very complicated object. Indeed, we should analyse the population of buyers heterogeneous in several respects: locations in the city, incomes, consumer behavior (habits of buying in a certain way), consumer preferences for certain goods. Among these, only the distribution of consumer locations is directly observable. An additional difficulty is that the consumers' *discrete choice* of shops is combined with their *continuous choice* of quantity/quality of goods.

The resulting gross demand of all consumer groups is presented in our models (including the model in the next subsection) as any seller's multidimensional function (encompassing the range of products) of the multidimensional argument, which is the range of factors, influencing the demand. These factors include this retailer's prices and assortment, plus pricing/variety strategies of other sellers. It is reasonable to expect, that the demand elasticity to my price is negative, while the competitors' high prices work positively for me. Naturally, it is the elasticity that matters.

In principle, the demand that we analyse should include several food categories. Empirically available are 12 food categories that we observe in OFD data, and some data from other sources. We shall try to identify 3 quality segments: high, middle, low quality or to make quality a continuous variable. In modeling demand, we should distinguish physical volumes of consumption (kilograms) from monetary ones (roubles). In constructing the functional forms of demand, we shall stick to computable ones, and consider multiple consumer groups, who differ in their locations, incomes, etc. After encompassing all these features, the gross demand at each shop appears as a sum (or integral) of the consumer groups' specific demands, weighed on probabilities to choose this shop, and on probabilities of these groups.

3.2 Basic model of a 5-dimensional city

Here we outline our *basic model*, which will probably overcome many transformations when being adjusted to our data during our research project. It is not a purely theoretical model, but a model that should be *structurally estimated* on data. This job will include estimation on the specific detailed map of the real city and various non-geographic consumer characteristics – these considerations motivate the construction elements presented now.

City. Respectively, our city $A \subset R_+^5$ is a 5-dimensional domain for heterogeneous consumers. Dimensions 1,2 reflect geography: the city is a two-dimensional space, supplied with roads. Dimension 3 (the "vertical" one) reflects income or preference for quality, the other two are described later on. The consumer population is a continuum distributed on the domain A with a given density α , like gas in cosmos. Density $\alpha(a) < 1$ is the probability that a consumer $a \in A$ has this specification/address a . The walking consumers can be also taken into account.

Unlike consumers, N shops are discrete, they are located in given points on the roads.

Product space. We divide all purchases of a consumer into two groups of products: "necessities" like bread and meat, bought in amount $x \geq 0$ and "add-ons" $y \geq 0$. Both products have a common quality level $q \in [0, 1]$. "Add-ons" mean entertainment products like soft drinks, alcohol, sweets, etc. that compete in consumption with music, films, but not with bread, meat, and milk ("add-ons" often have a high price margin, whereas "necessities" serve as the attractors to each shop, both categories create profit together).

Consumers. The continuous consumer population of the city is heterogeneous in several respects. Each consumer is characterized by a 5-dimensional "address-vector" $a \in R_+^5$ that includes: her 2-dimensional geo-location $\{a_1, a_2\}$, supplemented with her preferred quality level a_3 (possibly, correlated with income).

Two other characteristics are her preference for add-ons a_4 , and her disutility of the shopping time/distance a_5 .

Given $S > 0$ sellers s in the city, any consumer with address $a \in A$ maximizes her utility by distributing her attendance of shops ($\delta_s \in \{1, 0\}$) and her consumption $(x, y) \in R^{2S}$ among S sellers, namely, solving the problem

$$\begin{aligned} \max_{(x,y) \geq 0} U(x, y; a, p) &= \sum_{s \leq S} \delta_s [u(x_s q_s^{a_3}) + v(y_s q_s^{a_4})] + \epsilon_{as} \text{ s.t.} \\ \sum_{s \leq S} \delta_s [(p_{sx} + a_5 \cdot |l_s - a_{1,2}|) \cdot x_s - (p_{sy} + a_5 \cdot |l_s - a_{1,2}|) \cdot y_s] &\leq E(a_3), \\ \sum_s x_s &= 1, \quad \{\delta_s \equiv \delta_s(x, y) = 1 \Leftrightarrow [x_s > 0 \vee y_s > 0]\}. \end{aligned}$$

Here, we are optimizing the attendance variable δ_i only indirectly, making it dependent on consumption as $\{\delta_s(x, y) = 1 \Leftrightarrow [x_s > 0 \vee y_s > 0]\}$. Parameter p_{sx} is the price for necessities and p_{sy} is the price for add-ons, $E(a_3)$ is the total expenditure for food, dependent on the consumer's type. Further, (l_{s1}, l_{s2}, q_s) is the 3-dimensional shop's location in the city/quality space, $|l_s - (a_1, a_2, a_3)|$ is the distance from each consumer to each seller (measured either by Euclidean distance, or linearly on the rectangular network of streets). The ideosyncratic consumer a 's preference for each specific seller i is the stochastic term ϵ_{as} . The no-hunger constraint $\sum_s x_s = 1$ expresses the idea that some food should be eaten by any consumer anyway. Neo-classical elementary utilities u, v depend on quantity and quality of consumption.

Economically, this formulation means that each consumer of type a derives some *additive utility* U from consuming everything she buys in several shops, chosen with probabilities $x_s \leq 1$ (additivity of U can be questioned, but convenient for estimations). The same among all consumers functional form of monetary valuations u, v for goods also can be questioned, but enable estimations. The more concave functions u, v are, the more consumer loves the variety of shops (in par-

ticular they can be linear). This love struggles with distance, therefore, the range of attendance will be limited. The expenditures of a consumer include prices and the monetary "cost of distance" from the shop, included with the personalized coefficient a_5 . This cost of distance depends upon the quantity bought during a time period (a year), because quantity correlates with the number of purchases in the shop. The result of this optimization generates the demand of each consumer a for both goods x, y in all N available shops (many of them can happen not attended: $\delta = 0$).

The utility maximization with a Lagrange multiplier π_a , as usual generates FOCs

$$\begin{aligned} u'(x_s q_s^{a_3}) q_s^{a_3} &= (p_{sx} + a_5 \cdot |l_s - a_{1,2}|) \cdot \pi_a, \\ v'(y_s q_s^{a_4}) q_s^{a_4} &= (p_{sy} + a_5 \cdot |l_s - a_{1,2}|) \cdot \pi_a, \end{aligned}$$

that yield the consumer's demand functions

$$\begin{aligned} x_s(p; a, \pi) &= u'^{-1} \left(\pi_a \frac{p_{sx} + a_5 \cdot |l_s - a_{1,2}|}{q_s^{a_3}} \right) / q_s^{a_3} \vee 0, \\ y_s(p; a, \pi) &= v'^{-1} \left(\pi_a \frac{p_{sy} + a_5 \cdot |l_s - a_{1,2}|}{q_s^{a_4}} \right) / q_s^{a_4} \vee 0, \end{aligned}$$

where $a \vee b$ means maximum between a, b .

Producers. Shops exist in 3-dimensional space. Geography is given, but the third dimension – quality – is chosen. For this baseline setup, we can assume that shops are *independent*, not being chain-stores. They compete in prices in a Nash-Bertrand way (understanding partial substitution of their services). We first study a Nash equilibrium in prices/qualities. On the second stage of our analysis, we shall compare the Nash outcomes with the hypothesis of coordinated pricing behavior of shops belonging to each chain-store. It will mean an Oligopoly equilibrium or a Tacit-collusion equilibrium. In the third stage, we should assume free entry of shops, to study a Location equilibrium.

In all versions of the model, the *competitive pressure*, i.e., the competition intensity $\pi(a_1, a_2, a_3) > 0$, is a geographically-local variable, a sort of price-index everywhere. An equilibrium includes the *distribution* of such pressures on city A . In this basic model, each seller s perceives the pressure of competition π_s at each location s' as given, when calculating her gross demand (X_s, Y_s) – the integral of all consumers' demands at her location. She maximizes (in prices and quality) her operational profit Π_s as

$$\begin{aligned} \max_{(p_{sx}, p_{sy}, q_s)} \Pi_s &= \int_{a \in A} [(p_{sx} - c_x(q_s))x_a(p; a, \pi) + (p_{sy} - c_y(q_s))y_a(p; a, \pi)] d\alpha(a), \\ \text{s.t. } \Pi_s &\geq f_s. \end{aligned}$$

When this operational profit covers the fixed cost $f_s > 0$, the firm remains in the market, otherwise, it exits. Here $c_x(q_s), c_y(q_s)$ are the unit costs (wholesale prices) for both goods. Costs are dependent on the quality segment chosen.

Solutions. The solution to the profit-maximization problem exists, because of continuity and boundedness of Π_s . Further, assuming usual neo-classical properties of the individual demand and some regularity of the consumers' distribution α (to guarantee a quasi-concave profit function), the seller's solution $P_s(\pi) \equiv (p_{sx}, p_{sy}, q_s) \in R^3$ should be unique.

In particular, probably, we shall estimate demand assuming a specific linear-quadratic utility $u(z) = gz - 0.5bz^2$. Such utility generates a linear inverse demand $p(z; \pi) = (g - bz)/\pi$, so that the direct demand as a function of the composite price $P \equiv (p + tx)$ becomes $z = (g - P\pi)/b$. We can denote the *price margin* as

$$m \equiv p - c.$$

When we assume the pressure of competition π being the *same* across locations,

we can express profit at location l as

$$\begin{aligned}\Pi_l &= \int_{a \in A} \left(\frac{(g - m_l - c_l - t \cdot |l - a|) \vee 0}{\pi b} \cdot \alpha(a) \right) da = \\ &= 2m \int_{\rho=0}^{r(m)} \left(\frac{(g - m_l - c_l - t\rho)}{\pi b} \cdot \alpha(l + \rho) \right) d\rho,\end{aligned}$$

which is a cubic function of the price margin m , a function with a single maximum. The gross demand is a volume of the rectangular pyramid with height $(g - p)$, its base being the rectangular triangle with catets $[0, g/b]$ and $[0, r(m)]$.

Theoretically, under price p and choke-price a , the Consumer Surplus is the volume of the named pyramid, with slopes b and t . The pyramid is determined by $(a - p)$ as its *height* and half of rectangle $[0, q] \times [0, \xi]$ with $q = a - bp$, $\xi = a - bt$ as its *basement*:

$$CS(p) = \frac{(a - p)^3}{3bt}.$$

Under the unit cost c , the seller's operational profit Π is the trapezia under this rectangle:

$$\Pi(p) = (p - c) \frac{(a - p)^2}{2bt} \vee 0,$$

and can be expressed through the price-margin $m \equiv p - c$ as

$$\Pi(m) = m \cdot \frac{(a - m - c)^2}{2bt} \vee 0$$

Profit Π is a cubic function, taking positive values between its argminima $\underline{p} = c$, $\bar{p} = a$, or, equivalently, $\underline{m} = 0$, $\bar{m} = a - c$.

As to other, non-linear demand functions, we suppose that the demand spatial dimension per se does not spoil the concavity of the profit function. Dangerous for profit concavity is only the abrupt hills (atoms) among the distribution α of consumers. We shall impose a restriction on distributions that atoms are absent (regularity) and prove the following Lemma.

Lemma. Under regular consumers' distribution α and uniform pressure of competition π , the producers' decision is a single-valued continuous function of price.

Further, continuity of the firms' responses to the situation will allow to state the existence of static equilibrium, defined as follows.

Equilibrium. The static price equilibrium is a bundle, including: (i) distribution of intensities of competition $\pi(a)$ for all $a \in A$, (ii) prices and qualities $P_s(\pi) = (p_s, q_s)$ satisfying the profit maximization conditions for all $s \in S$, (iii) utility maximizing consumption $q_{a,s}$ for each pair buyer-seller (a, s) within the city.

Lemma. Under regular consumers' distribution α , the price equilibrium exists. Proof goes by Brouwer's theorem.

This model deserves a lot of additional theoretical work to be prepared for empirical estimation on our data on grocery retail in a big city.

3.3 Costs, prices, and profits

To have a closer look at the competition, we should obtain data on the details of costs and price margins on each stage of any supply chain for each grocery category. We observe 12 categories in our data. According to our interviews with several chain-stores retailers, each retailer has special "category managers", responsible for assortment and pricing policy for this category, e.g., "meat", or "diary products", "beverages". Their decision-making involves calculating profits per-category and per-SKU (storage-keeping unit).

Here, the usual book-keeping difficulties arise with *splitting* the fixed costs (buildings, personnel, logistics) among various SKU and categories. Usually, they are split proportionally to sales of SKU and categories. The more economically profound method is to calculate not a single variable – cost per SKU, but a vector

variable – fixed and variable costs separately. Moreover, there are factors of the interdependence of SKU/categories. Intuitive managerial decisions often follow the profound logic, keeping some low-profit and even some negative-profit SKU when they are "attractors", generate traffic of clients to the shop. Our calculations and model constructions should take into account such considerations and dependencies.

As to the *supply prices*, working between farmers and food-processing factories, between factories and wholesale suppliers, and further downwards along the supply chains – they are usually secret. The official price can be public, but all discounts (which usually take place) and specific conditions are the subject of negotiations and kept in secret from other participants of the market. Our approach is to reveal the average information from deep interviews with the retailers (already 2such interviews took place), and then extrapolate the differentiation of the wholesale prices for other instances, according to the relative size of the two parties negotiating; how they split joint profit.

4 Evolution of grocery retail industry in Russia

This section briefly reviews the history of Russian grocery retail, highlights its main phases and its current state, focusing on our research question: understanding competition of chains for several consumer groups through various shops formats. We start with delineating these formats and hypothetical consumer groups targeted by them, briefly mentioning our theoretical framework. Then, we turn to the history of competition, highlight some specifics of the Russian economy in big cities, describe top-10 retail chains and their history including the details of formats. This section ends with the brief review of the government regulation of the industry.

In general, the stages of industry development in Russia are similar to ones

observed in other countries, especially in Eastern Europe, though having some national peculiarities. Before 2000 the political instability prevented secure big investments in retail. After consolidation of power and gradual rise of incomes, Russian grocery entered the stage of rapid expansion of chain-stores, that lasted up to 2009 crisis. Later on, increasing competition among chains in big cities eventually came to almost-saturated stage, around 2019. After this the Covid-19 pandemic pushed forward the online trade, which essentially changed the competition.

4.1 Formats and pricing

This sub-section describes typical formats of Russian retailers' stores, differing in several dimensions: variety and size of the store (tightly connected), price level, location in the city, quality of service. Though there are some intermediate types, the majority of stores will be grouped into three formats differing by scale: (1) soft discounters, (2) supermarkets, (3) hypermarkets, and specific formats: (4) hard discounters, (5) convenience stores, (6) premium stores and (7) e-grocery. Describing these, we briefly discuss their pricing strategies and afterwards come to the influence of Covid-19 on the state of the market. For each format there will be examples of existing chains, but all specifics about the chains will be given in the subsection 4.3.

(Radaev, 2006a) has classified Russian grocery retail formats in 2006 starting from the biggest ones. In Table 1 we have provided an updated version of the classification of the most popular formats in accordance with data from annual reports of public retail companies such as X5, Magnit, Lenta, O'Key.

Supermarkets was the first type of store of a retail chain that appeared in the 90s in Russia, following the Western patterns. The difference from existing “over-the-counter shops” was larger store size, extended variety, a larger number of de-

Table 1: Characteristics of the most popular trade formats in Russia (food sector)

Format	Area, m^2	Number of SKU	Total turnover, billion RUB	Price level	Average check, RUB
Supermarket	500-2500	6000-17000	3444	Mid/Mid+	500-700
Hypermarket	3000-7500	12000-30000	1804	Mid-/Mid	900-1500
Soft-discounter	300-500	4000-6500	4756	Low/Mid	300-400
Hard-discounter	150-700	800-1800	492	Low/Mid-	500-600
Premium grocery	60-800	2000-18000	–	Mid+/High	600-2500
Online hypermarket	-	25000-50000	147.6	Mid-/Mid	4000-5000
Online express	-	2000-5000		Mid/Mid+	1500-2000

Data source: company reports, accessed at <http://www.lentainvestor.com/ru/files/file/download/id/1817>, <https://lenta.com/globalassets/docs/investors/2021/30-04-2021.pdf>, http://report2020ru.magnit.com/magnit/annual/2020/gb/Russian/pdf/magnit-ar20_RUS.pdf, http://s://www.magnit.com/upload/iblock/368/Magnit_Press%20Release_FY2020_15Mar2021_rus.pdf, <https://www.magnit.com/ru/about-company/store-formats/>, <https://www.tinkoff.ru/invest/news/515754/>, <https://ria.ru/20210927/magaziny-1751950877.html>, https://www.x5.ru/ru/Documents/X5_Retail_Investors_Q12021.pdf, https://www.x5.ru/ru/PublishingImages/Pages/Investors/ResultsCentre/X5_Annual_Report_2020_RUS.pdf, https://www.x5.ru/ru/PublishingImages/Pages/Media/News/Q4_2020_Trading_Update_RUS.PDF, https://www.okeygroup.lu/upload/iblock/1e2/O_KEY_Investor-Presentation-FY-2020_final.pdf on 25-10-2021.

partments including non-grocery, and freedom that allows customers to search and choose products by themselves. They are located in the crossroads, metro stations, trading centers, or other high-traffic places, in central areas of cities. The extended variety, a large number of departments including non-grocery, and enough free space allow customers to search and choose products conveniently, making shopping a type of entertainment. Supermarkets are characterized by high-quality service and quite high margins, so they are focused mainly on the middle price segment. Perekrestok (i.e., cross-road, X5 Retail Group) is a striking example of a classical supermarket chain that offers a wide choice of food products, some non-food FMCG, and a wide range of ready-to-eat food, which is an additional attraction feature.

Hypermarkets came in Russia later than supermarkets. They usually have much bigger space, a significantly broader variety of goods, more non-grocery

assortment, suburban or out-of-town locations. They suggest lower prices, and decreased service levels. Hypermarket might be a big-box store (Lenta) as well as a part of a mall (Auchan). Almost necessarily, it has free parking of sufficient size, easily accessible by automobile. It is targeted to fulfill all customers' needs for family purchases in one weekly automobile trip. The German chain Metro, which originally applied a "cash and carry" model and had small businesses (small stores and HoReCa business) as its target audience, is now competing with hypermarkets for individual consumers in a lower price segment. Lenta also has a "cash and carry" program for business.

Convenience stores are not common in Russia unlike the US and Western European countries. They are targeted to urgent purchases, working 24 hours or 7:00-23:00, being typical in gas stations. They have a narrow variety and small area, sell first of all soft drinks, snacks, and cigarettes. In the 1990s kiosks and over-the-counter shops played this role, while shops at the gas stations began to appear only in the 2010s. They typically have high prices that probably reflect their local market power in location or time segment. Say, a driver urgently needing cigarettes or soft drinks would pay more than usual.

Soft discounters sometimes are also called proximity stores due to their location strategy – in residential areas as well as the convenience stores in other countries, but they are typically characterised by reasonably low prices. In the old districts, these stores inherit the trading facilities from Soviet and early post-Soviet shops, somewhat changing the service and strategy. In the newly constructed city districts similar format also targets the audience in walking areas, those unwilling to go far for shopping. Examples of such store chains are Pyaterochka, Magnit, Dixy, Bristol, Monetka.

Soft discounters have a smaller variety and area than supermarkets, low price level is achieved by providing a lower quality of products and relatively inferior services. The prices might be even lower than in the hypermarkets so they are

either aimed at customers who usually shop at hypermarkets and make small purchases nearby their home or at people who do not combine different types of shopping and always make shopping within walking distance from home. The latter group could include low-income customers who don't own a car. During a slow period of chain expansion (from 2014 to 2020), the soft discounter format expanded its popularity at the expense of supermarkets and hypermarkets. Total area of hypermarkets was increasing but the share of hypermarkets area (among supermarkets, soft discounters and hypermarkets) was gradually reducing from 30.1% (4.9 mln m^2) in 2014 to 19.8% (5.6 mln m^2) in 2020, while share of supermarkets changed from 18.2% (2.95 mln m^2) to 11.4% (3.25 mln m^2). Meanwhile, soft discounters have increased its share from 51.7% (8.4 mln m^2) to 68.8% (19.6 mln m^2)⁸.

Hard discounters are the stores with a limited range of products and low quality, targeted at buyers with low and lower middle income, typically located nearby their living area or where land/housing is cheaper. Their trading area may be similar to soft discounters or supermarkets. The Svetofor retail chain that has existed on the market since 2009 has entered the top-10 largest Russian chains in a short time, and the number of its customers is dramatically growing. Both, World Financial Crisis 2007-2009 and the Russian Financial Crisis 2014-2016 helped this success because certain groups of consumers became poorer. Other chains picked up this idea later. During the Corona crisis, X5 Retail Group launched the hard discounter chain named Chizhik, while Magnit opened several new discounters named Moya Tsena (RETAIL.RU, 2020b).

Premium grocery stores by area and variety might be similar to a supermarket or a soft discounter. However, the fixed costs (fashionable area) and variable costs (quality products) are higher (Radaev, 2006b). These stores are focused on the high-end price segment providing quality products and services, although

⁸http://report2020ru.magnit.com/magnit/annual/2020/gb/Russian/pdf/magnit-ar20_RUS.pdf

there is a fairly wide product range that is also available to middle-income clients. Such stores are located in central districts or near expensive real estate. VkusVill, Azbuka Vkusa, Globus Gourmet are examples of this type of store.

E-grocery is the online food retail market. There are online hypermarkets (Sber-Market, Utkonos) with within-the-day delivery or pickup and the same price level and variety as in hypermarkets. Also, there are online-express services (Yandex-Lavka, Samokat) with smaller variety, higher prices, and faster delivery (from 15 to 60 minutes) that could be considered as online convenience stores. These services previously played a minor role. This market developed intensively since 2020, during the pandemic, still, keeping penetration in Russian food retail only about 0.9% of sales (versus 6.1% in the US and 8.1% in the UK) ⁹.

Following the successful examples of online-only services, the largest offline retailers also have launched or expanded their online hypermarkets. By the third quarter of 2020, X5 Retail Group is the market leader in the e-grocery with 12% market share. The second and third places are occupied by Utkonos and Sber-Market (marketplaces for different retailers), while Magnit is still developing its online services as pilot projects or in partnership with Yandex.Eda and Delivery Club (marketplaces for cafes and restaurants). Ozon and Wildberries that initially ignored e-grocery, now have become fourth and fifth respectively (RETAIL.RU, 2020a).

We have discussed existing retailers' store formats and their differences. Now we will focus on the chains' pricing strategies and how it affects consumers' behaviour. All formats except hard discounter applying "promotional pricing". In the paper (Lal and Rao, 2018) the authors consider the pricing format as a mechanism for differentiation, where "promotional pricing" is paired with higher service while "everyday low price" is the characteristics of hard discounter stores with in-

⁹https://www.x5.ru/ru/PublishingImages/Pages/Investors/ResultsCentre/X5_Annual_Report_2020_RUS.pdf

ferior service. According to the Survey NielsenIQ (2018), the share of sales for promotions of the top 20 FMCG categories in the first half of 2018 increased by 5 percentage points to the same period last year and amounted to 64%. At the same time, the number of items sold with a discount has been increasing from 10 items on average per category in 2016 to 14 items in 2018. Moreover, the average discount depth was also growing: from 20% in 2016 to 23% in 2018. Promo pricing was one of the most effective marketing tools, but customers got used to a large number of goods with discounts. Thus, such a strategy becomes less effective every year. In 2019 only 46% of promotions generated additional sales, decreased from 53% a year earlier (NielsenIQ, 2020).

The peculiarity of the Russian market is that the prices could differ not only from city to city but from one shop of the chain to another within one city. The difference in the prices for the same item in stores of the Magnit might be up to 10% even though the distance between the stores is about a few hundred meters. The situation is the same for stores of different chains located nearby: the price of a certain pack of milk may vary by 15% (RETAIL.RU, 2015), that increases multi-stop shopping. Such behaviour is not forbidden, furthermore, there is a startup that is implementing dynamic pricing for major players such as Magnit and Dixy (Skolkovo, 2020). Though there are chains that keep the same price level in all stores in the city.

The Covid-19 crisis has significantly affected consumer behaviour. Movement restrictions affected the ability to visit many stores looking for the best price. The frequency of visits was noticeably reduced, but the average basket in all formats has grown. Buyers began to focus more on prices: the share of private brands and discounters is growing. At the same time, consumers are looking for the best prices both offline and online, which was not observed in 2019, thus 62% of shoppers use both sales channels (RETAIL.RU, 2020c). As a result, the share of online trading is growing. Hypermarkets are losing to a combination of e-

grocery and discounters. At the same time, prices at discounters are lower than in hypermarkets and sometimes it's easier to get there.

To sum up, the formats of stores in Russia are in many ways close to formats in the EU and USA. The difference is that soft discounters substitute convenience stores, which may be due to the larger inequality and relatively larger share of low-income population. After the crises in the 2010s hard discounters with the “everyday low price” strategy have become more attractive to consumers, unlike the hypermarkets. Retailers also tend to diversify their formats according to the consumers' preferences. Different prices on the same item in different chains and sometimes within the same chain might lead to multi-stop shopping while Covid-19 pandemic has pushed the development of e-grocery and encouraged the consumer to search the best prices both offline and online.

4.2 The origins and early stages of competition

Before moving on to the current stage of Russian retail development, in this subsection we consider its dynamics in general and also briefly describe its state in the 'pre-chain era'.

There have been some attempts in the literature to periodize the evolution of Russian retailing. For example, the early stages of development were described in detail in the studies by Radaev (2003, 2006b). The evolution of Russian retailing, including later stages, is described in the special project called “Russian Economy 1999-2019” by Vedomosti and Expert RA (Ischenko, 2019). In the current paper we summarise the results of earlier works with a particular focus on grocery retailing. We also highlight the specifics of government regulation of the retail sector in Russia.

Dynamics of retail industry in Russia is presented in Table 2. Retail turnover grew steadily throughout the whole period of modern history of Russia for both

grocery and non-food retailing. At the same time, in terms of the volume index, both grocery and non-grocery retailing in 1995 and 2000 lagged behind the 1990 level, taken as a baseline.

Table 2: Russian retail turnover dynamics

Year	Turnover, bn. roubles		Volume index, %	
	Grocery	Non-grocery	Grocery	Non-grocery
1990	0.11	0.14		
1995	238.8	273.2	77.7	92.4
2000	1093.2	1259.1	83.5	97.1
2005	3217.6	3823.9	123.8	174.8
2010	8002.2	8509.9	180.6	277.8
2015	13412.3	14114.5	187.0	328.1
2018	15055.4	16523.9	188.0	329.3

Data source: Federal State Statistics Service, accessed at <https://rosstat.gov.ru/folder/210/document/13233> on 13-07-2021.

Note. Retail trade turnover is given in historical prices. The values for 1990 and 1995 (before the denomination) are in trillions of roubles.

We attribute the dynamics of retail evolution in Russia to the social and economic development trends of the country. These trends determined the structure and dynamics of the demand. Retailers, in turn, adjusted to it. However, the Russian government strives to apply regulatory intervention to the retail industry to navigate the direction of market development (see subsection 4.4).

Russian retail was born in the early 1990s, when privatisation and liberalisation of domestic and foreign trade activities set the stage for the emergence of a market economy in the country. Domestic firms and consumers were able to trade at market prices. The opening of borders allowed the Russian market, which had previously been in a state of scarcity, to be flooded with large quantities of imported goods, albeit not always of high quality.

During the 1990s, retail trade was allowed in almost all locations and formats.

Various forms of 'street' trade were quite common in that period. Meanwhile, more modern and developed forms of trade were also emerging. The first Russian supermarkets (Perekrestok in 1994 in St. Petersburg, Sedmoy Kontinent in 1996 in Moscow) and hypermarkets (Lenta in 1993 in St. Petersburg) were opened during this period. Some of them later became the basis for the development of chain retailers (see subsection 4.3). Also in this period, the first foreign retailers came in Russia. In 1990, the Austrian chain Julius Meinl opened a shop in Moscow (eventually, this chain stayed on the Russian market until 1996). In 1997, Russia's first foreign hypermarket, Ramstore, opened a store in Moscow, they did not get leading positions in the Russian market though (Bakun, 2007). The fact that foreign companies could not gain a foothold in the Russian retail sector in the 1990s is usually explained by the low level of protection from Russian criminal structures (Bakun, 2007; Slobodyan, 2016). Overall, in this period shops of the modern formats could only target a small share of the Russian retail market, since only wealthy people could afford to shop in a supermarket.

Beyond that, the Russian retail market of the 1990s was very different from the present. In the paper Robinson (1998) the author identifies main retail formats in Russia during this period, among which are "quasi department stores", "food shops", "kiosks", "street traders and markets". The first two are shop formats vaguely similar to their European counterparts (Robinson, 1998). The latter two represent forms of out-of-store retailing that largely defined the landscape of the retail sector in the 1990s. Radaev (2006b) provides an even more comprehensive list of retail formats in Russia, both historical and contemporary.

Trading in marketplaces (also called open markets, open-air markets, or street markets) is considered to be the key retail format in Russia in the 1990s. Radaev (2006b, p. 19) defines marketplaces as "group placement of out-of-store format retail outlets", while Robinson (1998, p. 279) provides the following description:

From the observations made, it is difficult to clearly delineate between

markets and street traders or for that matter kiosks. Formal markets do exist to some extent and small markets exist around bus stations and at suburban road junctions with the attendant kiosks and individual street traders. The merchandise that is sold on market stalls consists on the one hand of the usual fresh food offerings of fruit and vegetables and on the other a mixture of anything and everything, food and non-food, alcohol and cigarettes, packaged, canned and bottled foodstuffs and often a combination of all of these.

The period of the 1990s, in general economic terms, was characterised by the decline in living standards and real incomes of the population. Therefore, the format of trade in marketplaces was in keeping with the spirit of the times, satisfying the demand for cheaper products. Moreover, marketplaces did not compete directly with the emerging supermarkets and hypermarkets, as they targeted different market segments: marketplaces targeted the poorer groups, while modern formats targeted the more wealthy part of population.

As real income has risen in the 2000s, the situation has changed. Higher incomes have shifted consumer demand towards higher-priced shops with better quality of service. Modern retail formats such as hypermarkets and discounters began to attract the low-price segment of the population as well. In addition, marketplaces faced an increased regulatory burden from the government in the 2000s, as discussed in subsection 4.4. As a result, marketplaces have ceased to play an important role in retail trade over time (see Table 3) while chain formats of retailing have become dominating players in the Russian market, as discussed in subsections 4.3, 4.1.

Table 3: Retail turnover by type of organisation

Year	Turnover, bn. roubles		Share, %	
	Out of marketplaces	Marketplaces	Out of marketplaces	Marketplaces
1990	0.23	0.02	91.7	8.3
1995	376.0	136.0	73.4	26.6
2000	1735.2	617.1	73.8	26.2
2005	5545.8	1495.7	78.8	21.2
2010	14457.2	2054.9	87.6	12.4
2015	25358.2	2168.6	92.1	7.9
2018	29799.4	1779.9	94.4	5.6

Data source: Federal State Statistics Service, accessed at <https://rosstat.gov.ru/folder/210/document/13233> on 13-07-2021.

Note. Retail trade turnover is given in historical prices. The values for 1990 and 1995 (before the denomination) are in trillions of roubles.

4.3 Chains expansion

This sub-section begins from the overview of the largest players in 2021 listed by turnover (from largest to smallest, see Table 4). Then we briefly discuss worth mentioning local chains and well-known foreign chains that made attempts to enter the Russian market and discuss the reasons for the spatial distribution of chains.

Table 4: Market share of the top-10 retailers by revenue in 2020

Company name	Revenue increase in 2020, %	Market share in 2020, %
X5	14.0	13.2
Magnit	13.0	8.6
DKBR	18.0	6.8
Lenta	7.0	2.7
Auchan	-11.0	1.3
Metro	8.0	1.2
O'Key	6.0	1.1
Sветофор	39.0	1.0
Monetka	11.0	0.8
VkusVill	38.0	0.8

Data source: INFOLine, accessed at <https://infoline.spb.ru/news/index.php?news=203186> and <https://infoline.spb.ru/news/?news=207558> on 21-07-2021; author's calculations.

The first chains have been founded in the late 90s. At this time current market leaders were born: Magnit was opened in Krasnodar in 1995, Pyaterochka was established in St. Petersburg in 1999, Perekrestok was opened in Moscow in 1994 (Ischenko, 2019). In 2006 Perekrestok and Pyaterochka have merged into the X5 Retail Group. Since then Magnit and X5 Retail Group has started the process of spreading from the West to the East and capturing new markets. Magnit's spatial expansion activity peaked in 2015, when the company entered the markets of Siberia (Baranov and Safronov, 2019). Currently, the chains are presented in the markets of most federal districts except the Far Eastern (Geointellect, 2021). In the middle of 2021 X5 Retail Group operates 16960 soft discounters (Pyaterochka), 940 supermarkets (Perekrestok), 49 hypermarkets (Karusel), and several new hard discounters were opened in 2020 (Chizhik) (X5 Retail Group, 2021), while Magnit owns 15098 soft discounters and 471 supermarkets (Magnit, 2021).

From 1993 to 2009 the process of chain expansion has continued. Some of the current largest retailers have entered the market at that period (INFOLine, 2021). Dixy launched its first supermarket in Moscow in 1999, Krasnoe&Beloe opened its first liquor store in Chelyabinsk in 2006, Bristol was established in Nizhniy Novgorod in 1998. After the merger of these three chains in 2019, the newborn company named DKBR Mega Retail Group Limited has become the third-largest by revenue retailer in the country with a presence in most of the regions except the Far East and the North Caucasus. In 2021 it was also announced that Magnit is acquiring Dixy (2655 soft discounters) to strengthen its position in Moscow and St.Petersburg (Bobrova, 2021). The deal does not apply to Krasnoe&Beloe (about 8700 liquor stores) (Krasnoe&Beloe, 2021) and Bristol (about 2500 soft discounters) (Bristol, 2021).

The fourth-largest chain of hypermarkets Lenta was founded in 1993 in St. Petersburg and opened its first store in 1999. In 2006 it began to enter markets of other regions: the Siberian, the Ural and the Southern federal districts (Lenta,

2021b). Now Lenta has 254 hypermarkets and 140 supermarkets in the biggest cities of all federal districts of the country except the Far East and the North Caucasian district (Lenta, 2021a). Lenta is known to be the first company that dared to launch hypermarkets chain in Russia. In 2021 the company decided to expand by creating a chain of stores named Lenta Mini that would compete with Magnit and Pyaterochka. Part of the hypermarkets' area will be given to e-grocery, thereby hybrid store-warehouses (also called as darkstores) will be created (Koroleva, 2021). Also in 2021 Lenta acquired Semya that was forth-largest chain in Perm and Billa Russia that was opened in 2004 by one of the biggest retailers in Europe (Pyatin, 2021).

French chain Auchan opened its first hypermarket in Moscow in 2002. Currently Auchan is the fifth largest chain by revenue with 62 hypermarkets, 33 superstores and 146 supermarkets all over the populous cities of the country except the Far East and North Caucasus (Auchan, 2021). Lenta and Auchan had similar expansion strategies. They were initially oriented towards largest cities and regional capitals and had the only one type of store – hypermarkets. After diversifying their formats they gradually began to extend their chain in towns with smaller populations which are located in areas nearby large agglomerations (Baranov and Safronov, 2019). In 2021 Auchan decided to change the concept of its hypermarkets in Russia. Chain management decided to reduce retail space, and the remaining space will be rented out to small shops with clothing and ready-to-eat food (Kuzmina and Burlakova, 2021).

Around the same time German chain MetroC&C launched its first hypermarket in 2000 in Moscow. In 2021 it holds 93 hypermarkets in cities of all federal districts except the Far Eastern (Metro, 2021) and MetroC&C is the sixth-largest retailer. Focused mainly on the large cities with a developed urban environment Metro takes the first place in a wholesale store for small entrepreneurs format. In 2012 Metro Russia launched a franchise for a chain of convenience stores named

Fasol. The benefit of Metro is that the franchisee is a regular customer for Metro's products (Odintsova, 2016). Currently, there are about 459 stores in cities nearby Metro's hypermarkets (Fasol, 2021).

In 2000s new chains have been arising not only in the East but all over the country. Inspired by the Walmart success entrepreneurs from Krasnoyarsk have founded Svetofor in 2009 (Stepanova, 2021). The chain of discount department stores has become the only Siberian chain that was able not only to set foot in saturated Eastern markets but also the only one who managed to enter all federal districts of Russia, now owns more than 2000 stores (Svetofor, 2021) and became the seventh-largest retailer by revenue.

The eighth position in the list of largest retailers by revenue is taken by O'Key which has opened its first hypermarket in 2002 in St. Petersburg. Now the company owns 88 discounters in central Russia and 78 hypermarkets all over the country except the Far East and the North Caucasus (O'Key, 2021a). In 2009 Monetka has launched its first store in Yekaterinburg. Today it is the ninth biggest by revenue chain with 1711 soft discounters in the Ural and the Siberia (Monetka, 2021). Finally, the tenth position belongs to VkusVill – the chain that is specializing in fresh and healthy products which was founded in 2009. It is the first example of a Russian gourmet chain in the upper mid-price segment which was able to become that popular in the Central, the Northwestern, the Southern and the Volga federal districts (approximately 1200 stores) (TASS, 2021b).

All of the top 10 largest chains have presence in several federal districts. However there are Eastern local chains worth mentioning. Despite the fact that they have not yet entered the Western markets, they are quite large players, since they own a large share of the Eastern market. Some of them even made it to the top-10 retailers, including Svetofor which was mentioned earlier. Siberian chain Holiday was founded in 2000 in Novosibirsk and used to be one of the largest local chains until the bankruptcy in 2019. At the same time local chains such as Sumberi, and

Krasniy Yar were founded in Siberia, and Slata was founded in the Far East. In 2021 these three chains have merged into one holding company called the Eastern Union alliance which has plans to increase its presence in the east of the country (Levinskaya, 2021). Another worth mentioning local Siberian chain from Tomsk is Yarche which was created in 2015 as a vertically integrated extension of the biggest snacks' manufacturer KDV Group. And finally, Maria Ra is the last example of a successful local chain that was able to enter markets of most of the living areas of Siberia and was included in the top-10 list of biggest FMCG chains in 2018 (INFOLine, 2020).

Metro and Auchan are rare example of foreign chains succeeded and became one of the most significant players in the market. In 2008-2009 Walmart and Carrefour made their own attempts to enter the Russian market, but by 2010 both players had left it due to the lack of sufficient prospects for growth and opportunities for acquisitions (Interfax, 2010). One of the biggest Finland holding company S-Group extended its supermarket chain PRISMA and opened its first store in St. Petersburg in 2008. Currently, the company has 68 stores in Finland, 8 in Estonia, and 16 in St. Petersburg that are known for high-quality products and services (PRISMA, 2021).

Dutch retailer SPAR entered the Russian market in 2000 and was the first foreign food retailer to set a foot in Russia. In 2008 SPAR Russia B.V was established to encourage the growth of the company. Any regional retailer or wholesale company that sells food can apply for a license that gives the right to use the brand and to get recommendations from the parent company (Ganzhur, 2020). Unlike a franchise, the license does not imply strict adherence to technology. In 2019 one of the major license holders Intertorg faced major financial difficulties that led to a decrease in the number of stores. By the end of 2020, there have been 395 operating SPAR branded stores in Russia (SPAR, 2021).

So far we have reviewed significant federal and local retail chains as well as

foreign players in Russia. Statistics below (see Figures 3 and 4) represent dynamics of chains' expansion in time and space. Share increase of retail chains in the total retail trade turnover from 2011 to 2020 is the greatest in the Northwest and the Ural, but in the Northwest the share was initially the highest (Figure 3). In 2020 the share of retail chains in the Far East and the North Caucasus is still under 20% and has as weak growth as in the Southern federal district.

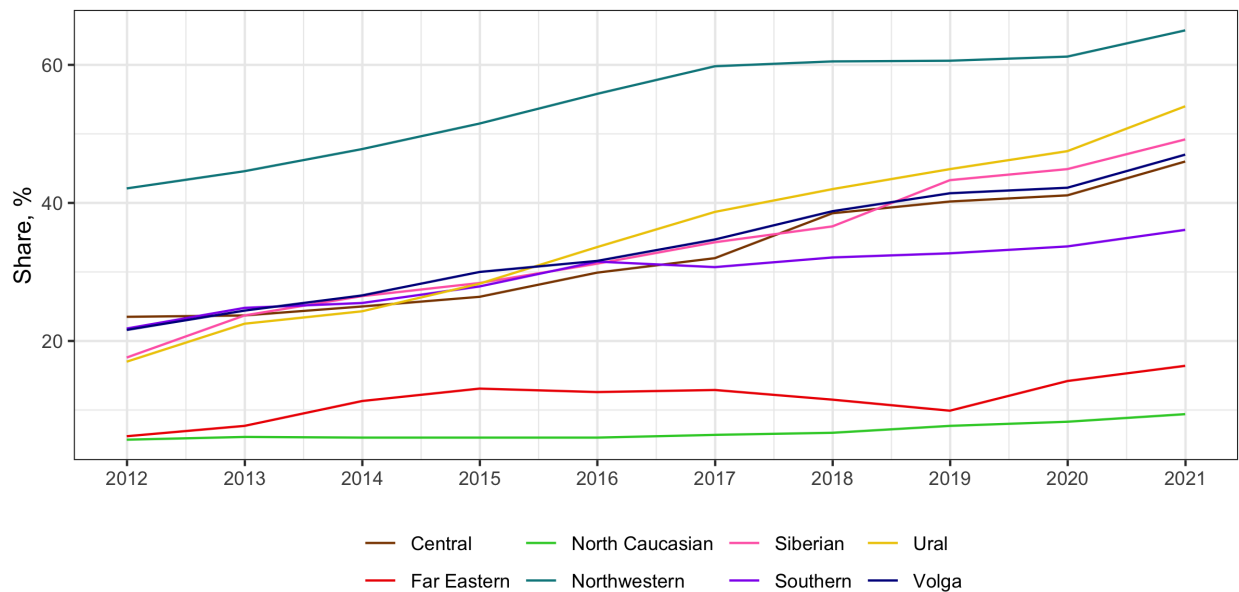


Figure 3: Share (%) of retail chains in the total retail trade turnover in food products by federal district in 2011-2020. Data source: Federal State Statistics Service, accessed at <https://rosstat.gov.ru/folder/23457> on 11-06-2021.

One of the reasons for the low presence of chains in the Far East, the North Caucasus and the northern regions of the country (see Figure 4) is the markets remoteness and isolation that affects logistics. The number of distribution centres also depends on the number of stores. For example, X5 and Magnit each have about 40 distribution centres all over the country, O'Key has only 2 in St. Petersburg and 1 in Moscow (O'Key, 2021b). In order for a chain to grow rapidly and reduce costs in the Far East there should be a distribution centre (Abasheva, 2015). The largest chains use franchisees to explore new markets (X5, Magnit,

Dixy, Krasnoe&Beloe, Bristol, Metro's convenience stores Fasel), but most of them open stores independently.

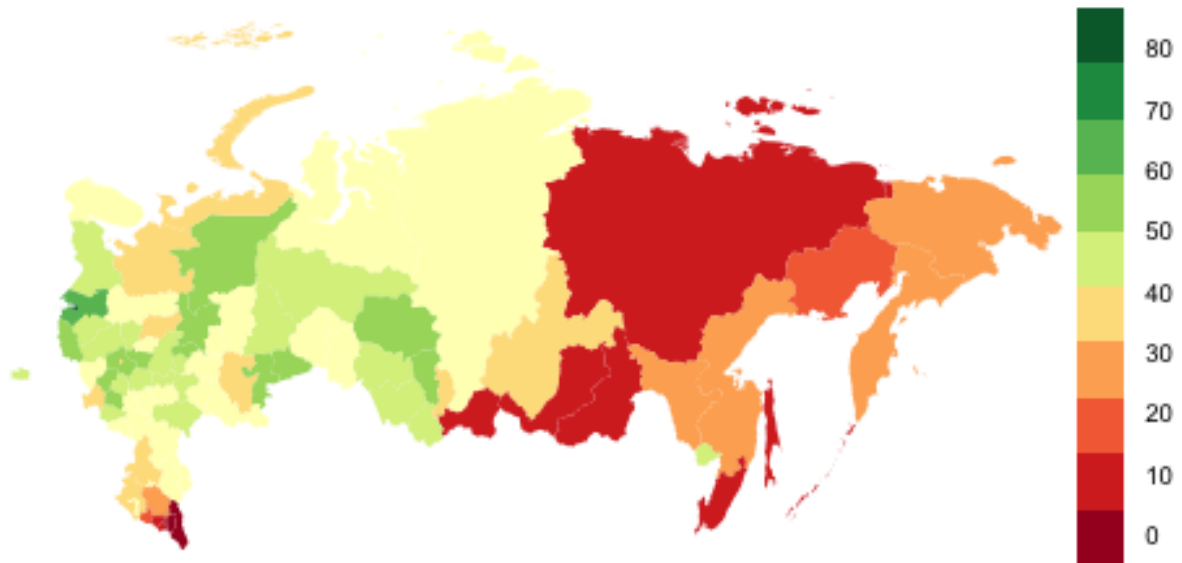


Figure 4: Share (%) of retail chains in the total retail trade turnover in food products in 2020. Data source: Federal State Statistics Service, accessed at <https://rosstat.gov.ru/folder/23457> on 11-06-2021.

Despite the fact that the purchasing power of the population in the north and east of the country is higher than in the South (see Figure 5), another reason might be that market capacity that is insufficient for the large chains to enter. Low population density (see Figure 6) and the lack of proper infrastructure might make the Far East and the north of the country unattractive for the national chains. The local tastes of the population also appear to be not an issue in this situation. Each Russian region could have certain products that are especially loved by local residents, such as bakery products, fruits, vegetables, fresh products. For example, the share of local goods in the X5's stores is about 30% (RETAIL.RU, 2020d), so it seems that national chains are able to serve regional preferences. Nevertheless, multi-ethnicity and weak institutes might also be the reason for local stores pros-

perity and the absence of national chains in the North Caucasus and the northern regions of the country.

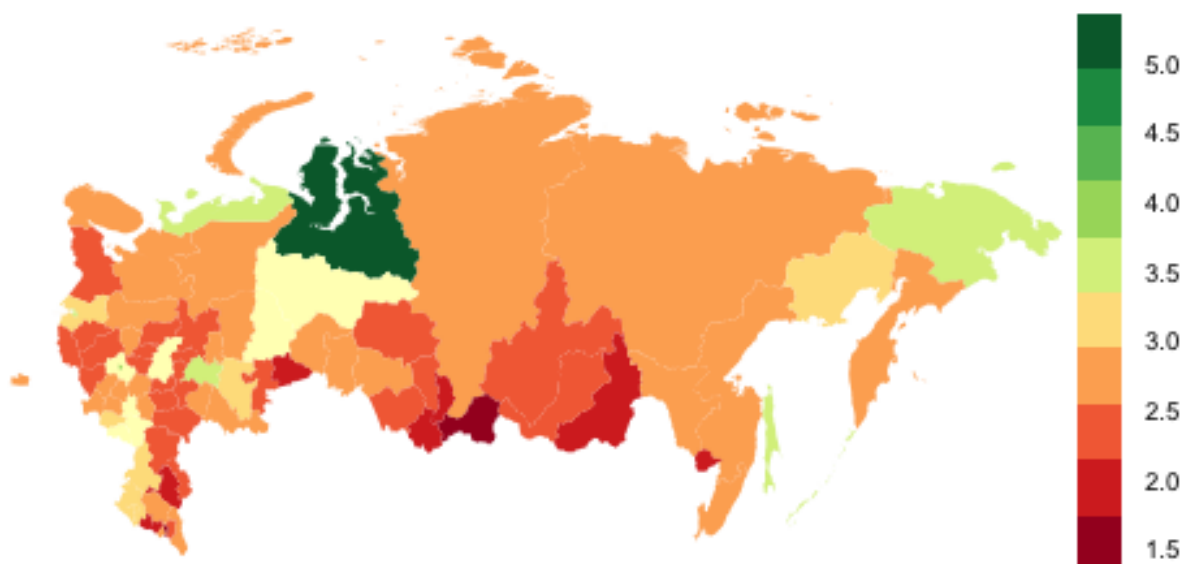


Figure 5: Per capita income (RUB) divided by consumer basket (RUB) in 2019. Data source: Federal State Statistics Service, accessed at <https://www.fedstat.ru/> on 21-06-2021.

Starting from the middle of 90s local retail chains arose all over the country. Most of the biggest retailers were founded in the west and later expanded to other parts of the country crowding out local chains. It followed with the entry of the foreign retailers, some of which has become important market players (Metro CC, Auchan) and some had bad experience of entering the market (Wallmart, Carrefour). In 2020 average food chains' share in the country has outreached 44% and the share of the market of top-10 retailers exceeded 37%. The most remote and isolated parts (Far East and the North Caucasian federal districts) in 2020 were still unattractive for national chains and remain the lowest share of food retail chains.



Figure 6: Population density (logarithm number of people per square kilometre) in 2019. Data source: Federal State Statistics Service, accessed at <https://www.fedstat.ru/> on 21-06-2021.

4.4 Regulation of the retail sector in Russia

This sub-section provides analysis of the laws and other regulations adopted in Russia to regulate retailing, including the behaviour of retail chains. A summary of the market regulations is partially covered by Aizinova (2019) including reasons and consequences of various laws analysed in Avdasheva and Shastitko (2011); Radaev (2013); Avdasheva et al. (2015); Radaev (2018).

The seminal legal act that regulates retailing in Russia is Presidential Decree "On freedom of trade" (adopted on January 29, 1992). In accordance with the decree, all individuals and firms in Russia were granted the right to conduct trade, intermediary and procurement activities without special permits, with the exception of trade in items the sale of which is prohibited or restricted by law (weapons, drugs, medicines, etc.). In conjunction with earlier regulations on privatisation and price liberalisation, this has led to an explosion in trading activities in the various formats described above.

Thereafter, in the 1990s and early 2000s, the Russian government did not pursue any targeted policy to regulate the retail trade sector. Although certain regulatory measures existed at the local level that were associated with planned and occasional inspections of retail outlets' compliance with fire and sanitary safety standards, tax legislation, etc. (Radaev, 2018).

Over time the government has stepped up its efforts in this area and retail regulation has begun to become more explicit. Thus, in December 2006, Federal Law N 271-FZ "On retail markets and changes to the Russian Federation Labour Code" was adopted. This law, nevertheless, cannot be described as regulating retail in its pure form. Radaev (2018, p. 2) characterises it as follows:

The law prescribed reducing the share of foreign citizens in the open-air markets to 40 % of sellers and aimed to reach the zero level in one year. The retail trade of alcohol and medicine was prohibited for immigrants. The law was passed using populist slogans to defend the interests of small domestic producers amid a dominance of migrant traders in the open-air markets. However, the major focus of these legislative undertakings was a restrictive migration policy rather than the regulation of trade *per se*.

Currently marketplaces in Russia are widely recognised to be subject to over-regulation, which hinders the development of small and medium-sized businesses, so in 2021 the Russian ministry of industry and trade introduced a draft law "On the regulation of wholesale and retail food markets" into the government that would reduce the requirements for the operation of wholesale and retail marketplaces (TASS, 2021a).

It should be noted that the retail sector, like other industries, is subject to the regulatory impact of competition policy. Significant changes in this area took place in Russia in the 2000s when the Federal Antimonopoly Service (FAS, analogue of

Federal Trade Commission) was established (2004) and the Federal Law *N 135-FZ "On protection of competition"* was adopted (the law was adopted on July 26, 2006). This period in Russia is characterised by a significant increase in the number of court cases involving antitrust law violations, as well as an increase in the amount of fees collected (Avdasheva and Shastitko, 2011). In doing so, the FAS in Russia went beyond the standard list of competencies performed by similar agencies in the US and Europe. As Avdasheva and Shastitko (2011, p. 497) write:

The government has assigned the anti-monopoly authorities the task of tackling current problems of economic policy. This is manifested also in the sector-specific nature of cases of violation of the anti-monopoly legislation initiated during recent years.

Due to the expansion of chain companies in the 2000s, they have become the main target for regulation in the retail sector. In particular, Federal Law *N 381-FZ "On the fundamentals of state regulation of commerce in the Russian Federation"* or so-called "Law on commerce" (adopted on December 28, 2009) can be considered as the main legal act related to the subject area in question. The adoption of this law has been repeatedly criticised by various researchers (Avdasheva and Shastitko, 2011; Avdasheva et al., 2015; Radaev, 2018), since the law was adopted without any expert evaluation and there were no objective economic reasons for its adoption.

One of the main goals of the law was to restore the balance between retailers and suppliers, to protect suppliers, in particular small ones, from discrimination by retailers when entering into contracts. The expansion of chain retailers in the first decade of the 2000s changed the distribution of market power between suppliers and retailers in favour of the latter. Using their increased bargaining power, large chain retailers were supposed to increase their pressure on suppliers when concluding contracts, including price discounts, penalties, promotion fees, payment

deferral terms, etc. The law has introduced some prohibitions to limit the listed opportunities for chain retailers. In 2016 the law has been amended to strengthen regulation of the relationship between chain retailers and suppliers. In particular, the aggregate payment made by a supplier to a retail chain for purchasing goods from it and for providing promotion services was capped at 5 per cent of the price. The maximum delay for retail chains to pay for food received from suppliers, depending on its expiration date, has also been reduced. However, the relationship between retailers and suppliers did not actually change after the adoption of the law due to the adaptation of market agents to the new conditions (Avdasheva and Shastitko, 2011; Radaev, 2018).

In addition, the law was intended to limit the market power of retailers in the consumer market. In terms of consumer market regulation, section 14 of the law can be considered as crucial, limiting the allowable market share of a chain retailer to 25 percent within the boundaries of a municipal district or region. The main motivation behind this was that chain retailers, having large market power in certain geographical markets, could abuse this power to disadvantage consumers. That was a reasonable assumption, but not fully corresponded to the real situation in Russia. For example, as Radaev (2018) notes, at the time the law was adopted, the level of concentration of the Russian retail sector was significantly lower compared to European countries, and chain companies occupied only about one-fifth of the total retail turnover in Russia. Nevertheless, we can assume that the law was adopted in order to play a forward-looking role, given the hypothetical risks that might arise in the future. Despite this, Avdasheva and Shastitko (2011) point out that section 14 of the law had rather a negative impact on the market as it reduced incentives for competitive behaviour in the retail sector.

To summarise, in this sub-section we have reviewed the current aspects of regulation of the retail sector in Russia. On the one hand, the Russian retail sector is subject to general government policy and, in particular, government competition

policy. On the other hand, the retail sector is subject to sector-specific regulation as a result of the Law on Commerce, which distinguishes the Russian retail sector from similar markets in developed countries and strengthens the national specifics of the sector's development.

5 Data

We have a plan to collect and match food retail data in Russia from different sources, such as consumer panel surveys, the Russian Longitudinal Monitoring Survey, Federal State Statistics Service, some average ticker data from different Russian chains and geodata on the sales, store location, socio-demographic characteristics of the population.

Below there is the data for one of the empirical parts of the research project that is provided by "Geointellect", a geoanalytics platform which is the largest in Russia in terms of geodata amount as well as the number of services, tools, and cities ¹⁰. An agreement has been reached with the company on research on the terms of paid access to geocoded data for St. Petersburg and the Leningrad region (Leningrad Oblast)¹¹. Given the capabilities of the geoanalytics platform, three main blocks of data were collected: (i) sales data, (ii) store location data, and (iii) data on the socio-demographic characteristics of consumers.

5.1 Sales data

The first block of data, containing sales data, is obtained by the geoanalytics platform from the operators of fiscal data (hereafter in the paper – OFD) ¹². A total of

¹⁰<https://geointellect.com>

¹¹This section presents a description of the data for St. Petersburg, since in this study we are primarily interested in large cities.

¹²The operator of fiscal data is a legal entity established specifically to receive, process, store and transmit fiscal data to the Federal Tax Service of Russia. Their activity is regulated by the Federal Law of 22.05.2003 N 54-FZ "On the application of control and cash registers for cash payments and (or) settlements using electronic means of payment".

19 OFDs operate in Russia as of March 2021. The data provided to the geoanalytics platform by three of the OFDs covers 60 % of the market and is available for December 2019 for each postcode area¹³.

The OFD data contains two key indicators of retail store sales in Saint Petersburg. The first one is the average number of checks at stores in the postcode area per month (denoted further as *avg_traffic*). The second one is the average amount per check for stores in the postcode area in a given month (denoted further as *avg_check*). Data is available for 15 product categories for each of the three retail formats: (i) supermarkets, (ii) hypermarkets, and (iii) discounters and convenience stores)¹⁴. Note that the operator of fiscal data divides these formats by the criterion of the number of cash registers in a outlet. In this classification, convenience stores can have 1-2 cash registers, discounters – 3-6 cash registers, supermarkets – 7-13 cash registers, hypermarkets – 14 cash registers and more.

Table 5 presents basic descriptive statistics aggregated across all product categories by three store formats for all three variables, while Figures 7, 8, 9 provide more detailed comparative characteristics by different product categories by store format. The resulting descriptive statistics are in line with expectations and seem realistic, allowing to draw up profiles of the most common retail formats in Saint Petersburg on an empirical basis.

¹³Unfortunately, this data does not include a large block of data on chain retailers, because some big chain retailers work with their own OFD, which does not disclose this information.

¹⁴Individual data for each store cannot be provided for commercial confidentiality concerns. For the same reason, the data received by Geo-Intellect from the operator of the fiscal data were computed according to the following algorithm. First, the entire territory of St. Petersburg, as well as the Leningrad Oblast, was divided into cells using a hexagonal grid (the radius of each cell is about 100 metres). A buffer with a radius of 1000 metres was then placed around the centroid of each cell. If the buffer received 3 or more outlets with the given format and selling a particular product category, then the total number of checks, the average number of checks per shop and the average check based on the data of all outlets with the given format and selling a particular product category that were put in the buffer were calculated. If 0, 1 or 2 sales outlets of a given format selling a certain category of goods fell within the radius, then a zero value was taken for the corresponding cell. The data from these outlets was then aggregated at postcode area level. With this procedure it turned out that many of the cells next to each other had the same value, as they had the same shops in their buffer. Therefore, only relative indicators (average number of checks per shop and average check) are suitable for analysis at postcode area level.

Table 5: Descriptive statistics for sales data by store type (Saint Petersburg, December 2019)

Store format	Variable	count	mean	std	min	max
Discounters, convenience stores	avg_check	245	928.9	337.0	289.0	2557.0
	avg_traffic	245	1678.7	617.4	131.3	4626.7
Hypermarkets	avg_check	37	1351.1	936.5	182.9	2799.6
	avg_traffic	37	70212.5	45905.0	319.5	182482.0
Supermarkets	avg_check	125	610.5	257.8	277.9	1551.2
	avg_traffic	125	42925.2	17640.1	10272.0	102602.0

Note. The unit of observation is the postcode area. Thus, the number 245 in table means that there are 245 postcode areas where at least three discounters or convenience stores are located.

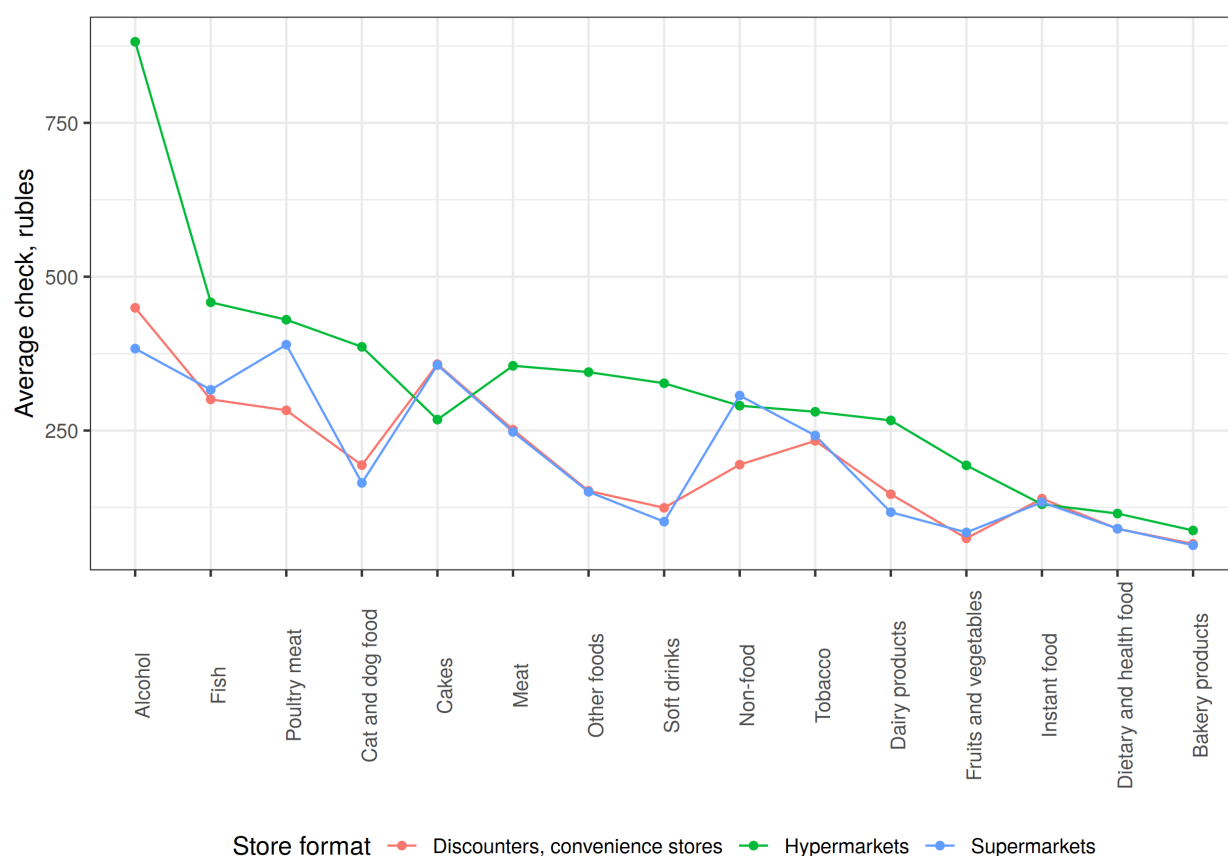


Figure 7: Average check value by product category and store type

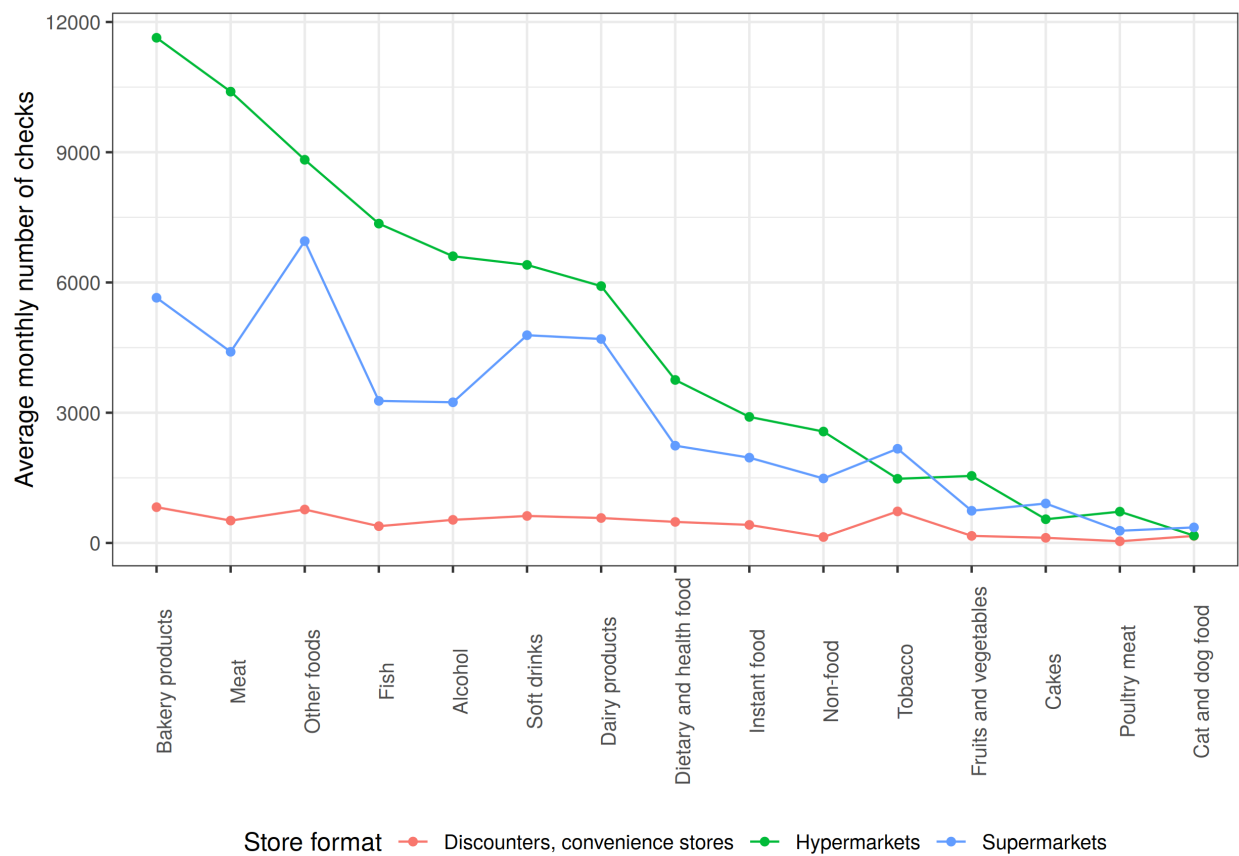


Figure 8: Average monthly number of checks by product category and store type



Figure 9: Avg. check value and avg. monthly number of checks scatter plot (by product category and store type)

Table 6: Dynamics of the number of stores in St. Petersburg

Date	Number of stores
2017-01-01	8953
2017-06-01	9693
2018-01-01	10098
2018-07-01	10244
2019-04-01	10313
2019-09-01	9061
2020-05-01	9162
2020-08-01	10407

5.2 Store location data

The second block of data includes primarily information on the location of retail stores in St. Petersburg. The location is coded in two ways: firstly through address (street name and house number) and secondly through geographical coordinates (latitude and longitude) ¹⁵. Information is available for 8 different dates between January 2017 and September 2020, allowing to determine the opening and closing periods of some stores (i. e. entry and exit of stores). In addition, for each store, its name and firm's ID are known, which makes it possible to identify the chain affiliation of the store ¹⁶. Also, for each store, we know the postal code area in which the it is located, which will allow us to match the store location data with the OFD data.

Table 6 shows the dynamics of the number of retail outlets in Saint Petersburg as of the available dates. Table 7 in turn details these dynamics for the ten largest chain retailers in Saint Petersburg.

¹⁵The study chose address as the main method of determining the location of a shop because of the inaccuracies found in the attribution of coordinates to particular. For example, there were found instances of coordinates changing from date to date while the address remained unchanged.

¹⁶In this way, each store can be uniquely identified using the street name, house number and firm's ID. The only problem may be when a single firm locates two stores in the same building, but such cases are assumed to be not very common.

Table 7: Top 10 retail chains by number of stores in St. Petersburg

Chain	2017-01-01	2017-06-01	2018-01-01	2018-07-01	2019-04-01	2019-09-01	2020-05-01	2020-08-01
Pyaterochka	316	342	380	399	431	464	496	492
Magnit	150	171	201	219	242	278	332	342
Dixy	287	293	295	296	293	290	294	310
Krasnoe & Beloe	0	0	0	0	172	204	244	258
VkusVill	0	0	0	2	20	51	114	112
Perekrestok	42	45	56	77	88	94	103	111
Velikolukskij mjasokombinat	138	130	128	124	127	125	115	105
Belorusskij dvorik	55	60	79	80	98	110	104	103
Semishagoff	62	65	72	81	86	88	93	96
Fix price	0	0	0	0	73	73	73	88

5.3 Data on consumers

The third block of data includes socio-demographic data, which will provide an estimate of spatially distributed demand and its dynamics. We have data on population, smartphone user density, prices of commercial real estate sales and rents, residential income, residential property rental prices, number of searches for car services, number of public transport stops. To ensure compatibility with OFD data, all variables required for the purposes of the study are aggregated by "Geointellect" at postcode area level.

More specifically, the following variables are available to us:

- *pop* – population in the postcode area, the number of individuals, annual data for 2017–2021.
- *flats* – the number of households in the postcode area, annual data for 2017–2021.
- *devices* – the average number of unique smartphones per hex grid cell in the postcode area for July 2017, October 2017, April 2019, October 2019.
- *price_sale* – average monthly sale price per square meter of commercial real estate, in rubles, for July 2018, October 2019, December 2019, February 2020, October 2020, December 2020.

- *price_rental* – average monthly rent per square meter of commercial real estate, in rubles, for July 2018, October 2019, December 2019, February 2020, October 2020, December 2020.
- *price_rental_res* – average monthly rent per square meter of residential real estate, in rubles, for June 2018 and March 2020. There are missing values in the data due to the fact that partially missing data on rents in some postcode areas for this period of time.
- *incomes* – average monthly income per family of two workers, in rubles, for June 2018 and March 2020. It is calculated on the basis of monthly rental data as the product of the average monthly rental price per square meter per square meter of the apartment, divided by the share of income that people are willing to spend on renting (based on Domofond data). There are missing values in the data due to the fact that partially missing data on rents in some postcode areas for this period of time.
- *income_model* – average monthly income per family of two workers, in rubles, calculated using the model built by the geodata provider in 2017 for St. Petersburg. The model was built on the basis of data on residential real estate rental ads, the cadastral value of 1 sq m of real estate, distances to the city center, the density of residential development and distances to subway stations.
- *auto* – the number of queries on automobile services for October 2020. Shows where on the map users of Yandex services search for organizations or services. Based on the data from the Yandex services geopositioning. Rubric is defined from the query. Queries with a search radius of less than 3 kilometers are taken into account. Values are not integers, because the initial data was in large enough hexes that were cut on postcode areas.

Table 8: Population and number of households in St. Petersburg postcode areas

period	variable	count	mean	std	min	max
2017	flats	240	9209.8	6816.4	0.0	37258.0
	pop	240	22864.0	17667.3	0.0	110518.0
2018	flats	240	9462.0	7105.6	21.0	41563.0
	pop	240	23504.7	18456.3	46.0	123289.0
2019	flats	240	9738.2	7453.0	28.0	46282.0
	pop	240	24210.9	19429.7	67.0	137287.0
2020	flats	240	10035.3	7872.0	28.0	50730.0
	pop	240	24966.8	20581.4	67.0	150480.0
2021	flats	240	10325.7	8319.3	28.0	54308.0
	pop	240	25708.3	21798.2	67.0	161094.0

Table 9: Smartphones users density in St. Petersburg postcode areas

period	count	mean	std	min	max
2017-07	247	88.6	172.0	0	1354
2017-10	247	56.2	97.5	0	807
2019-04	247	96.8	84.0	3	817
2019-10	247	197.7	161.0	6	1216

- *stops* – number of public transport stops for February and July 2018.

Descriptive statistics of the listed variables are presented in the Tables 8–14.

6 Directions for future research

6.1 Effect of chain expansion

Retail chains have significantly increased their market share over the last 15 years. It is still unclear what are competitive effects of chain expansion into the supermarket industry. There are ongoing debates on the effect of chains expansion for consumers and society in the US and Europe. In the US the process of rapid chain expansions is called the "Walmart Revolution". Although, in Russia, there is no unique player that has quickly taken the market as Walmart did, but the way how

Table 10: Sale and rental prices per square meter of commercial real estate in St. Petersburg postcode areas

period	variable	count	mean	std	min	max
2018-07	price_rental	228	946.4	492.8	180.0	4372.0
	price_sale	215	107131.3	57901.1	17576.3	360475.0
2019-10	price_rental	218	1027.3	505.3	167.7	3214.3
	price_sale	204	110229.8	62133.7	10363.2	406376.6
2019-12	price_rental	216	1087.8	550.0	203.6	3214.3
	price_sale	212	110090.5	63249.5	9826.3	367005.2
2020-02	price_rental	220	1079.6	521.7	188.8	3703.7
	price_sale	202	112832.8	62334.3	9947.4	362514.8
2020-10	price_rental	222	1066.0	443.4	250.0	2778.5
	price_sale	217	107514.9	60572.4	12500.0	327357.7
2020-12	price_rental	209	1039.6	496.9	239.8	3333.3
	price_sale	195	104995.6	61850.9	15277.8	342458.6

Table 11: Residential income and rental price in St. Petersburg postcode areas

period	variable	count	mean	std	min	max
2018-06	income	227	121942.0	29493.2	65248.2	245588.7
	price_rental_res	227	573.1	138.6	306.7	1154.3
2020-03	income	35	100097.6	18777.7	66193.9	138949.2
	price_rental_res	35	470.5	88.3	311.1	653.1

Table 12: Modelled income in St. Petersburg postcode areas

count	mean	std	min	max
237	100206.5	25868.3	7293.9	166975.0

Table 13: Queries on automobile services in St. Petersburg postcode areas

count	mean	std	min	max
235	231946.4	226083.7	35.9	1183286.0

Table 14: Public transport stops in St. Petersburg postcode areas

period	count	mean	std	min	max
2018-07	233	16.6	12.7	1	66
2020-02	233	17.6	13.1	1	69

chain expansion affected market structure is very similar to the situation in the US.

One of the questions of potential interest concerns how chain expansion has changed the market shape of the retail industry. Retail chains crowded out small local grocery stores and regional chains. Entry and rapid spread of large national retail chains made assortment more homogeneous among markets and reduced variety. At the same time, the economy of scale helps retail chains significantly save on logistics and other costs. Thus, retail chains can offer lower prices and better service and quality (Basker and Noel, 2009). Lower marginal costs also allow retail chains to enter remote markets which would not be served in the absence of retail chains. The question of the overall effect of chain expansion on consumers and total welfare remains open.

The chain expansion has also affected labour market. In the early study (Basker, 2005) it has been shown that the entry of Walmart has increased retail employment. Another way chains entry could affect labour markets is by increasing average efficiency in the retail sector, so fewer labor force is needed per sale. Thus, one could attempt to quantify the effect of chain expansion on the labour market considering these different forces.

The main difference from the US is that the chain expansion in Russia is still ongoing. Currently, retailers are quite well represented in a central part, so the main development takes place to the East (Far East). In this context question of how national retailers expand the network of stores has potential benefit for the understanding of the market structure of the supermarket industry. Specifically, how retail chains decide where and when to open a new distribution center. There is a large body of literature that shows that endogenous sunk costs play a central role in determining the equilibrium structure of the supermarket industry (Ellickson, 2006, 2007, 2013). The construction of a distribution center allows retailers to enter new geographical markets, changes their logistics system and, consequently, affects local market structure.

During the pandemic Russian retail industry has been going through a new stage of evolution – the rise of online retail. New online retailers have entered the market as well as incumbent retail chains have launched online formats in addition to brick-and-mortar stores. With the arrival of online grocery retailers, there is a new direction for research arising.

Since online stores often provide free delivery in a case of a large purchase, we would expect that they eat off the market share of large formats such as hypermarkets. Since online retailers do not own physical stores and are not restricted by the shelf and store size, one can expect the available variety to increase and the price to go down. The arrival of online retailers also changes opportunities for market discrimination. On the one hand, online trade eliminates geographical price differentiation when prices for the same products in stores of one chain differ. On the other hand, online retailers have more possibilities to track the history of purchases and make personalized offers based on this. To estimate the effect of online retailers on market outcomes one could think about counterfactual where one removes transportation costs from utility function see what happens with market outcomes and total welfare.

6.2 Income inequality and food deserts

Another emerging topic in the literature concerns access to qualitative and affordable food (Allcott et al., 2019; Handbury, 2019). In Russia, there is fairly significant income inequality that retailers usually account for when entering the market and deciding the format, price and variety. Trying to keep prices affordable discounters tend to provide goods of lower quality and save on the quality of service. Furthermore, following incentive compatibility constraint retailers manage prices and assortment such that price inelastic but sensitive to quality consumers choose high-end stores, whereas price elastic consumers prefer discounters. Since

retailers choose locations unevenly, this could lead to some market distortions, for example, low-income people living in wealthy residential areas may have difficulties to find cheap products in local stores and, conversely, wealthy people residing in a poor area have to buy groceries in discounters or travel to have access to preferable variety.

6.3 Law on Commerce

The "Law on Commerce" described in the previous chapter is a unique policy and an interesting case for research itself. One could expect that the law could change a firm's strategy once it exceeded the 25%-market share cap. Thus, the law might weaken incentives for the largest chain to undercut. Another option that a firm can use to maximize markup in a given store is to offer a more expensive assortment in those areas where it is not allowed to open a new store.

The law can also affect dynamic behaviour. Since it limits firms to open stores in the same administrative district, it might attenuate cannibalization and shielding motives. Thus, in the trade-off between differentiation and business-stealing the firms would rather follow the first strategy trying to locate as far away from a competitor as possible to get maximum possible markup.

Similarly, the regulatory measure changes firms' entry behaviour. In a standard entry model, we assume that entries are happening in those locations that provide the highest payoff. In the presence of policy, some of those locations can be unavailable, then firms will choose second-best options. Furthermore, in a standard model, it is assumed that retailers choose a location based on the value of the profit function. The market share cap might change behaviour in such a way that firms choose the location of entry according to the criterion of maximum markup.

The policy can also render firms location configurations inefficient in spatially differentiated markets. One could easily imagine a situation when the biggest

player that has the lowest marginal costs already exceeded the market share cap while other retailers restricted by the budget can not enter the market, then the market will be undersaturated. The same situation could happen in remote markets. When costs of serving the market are quite high so that only the most efficient player can enter, then the district will have only one store. Both cases are quite plausible in reality and have an adverse effect on competition and consumers' welfare. To demonstrate spatial inefficiency one could simulate firms locations in the absence of market share cap to shed light on the welfare losses of efficiency in the status quo market configurations.

Also, the law does not differentiate market definition for different store formats. Apparently, hypermarkets and convenience store have different coverage areas. When a hypermarket is located in the suburbs of a city, its market is not limited by the administrative district, it rather includes several parts of the city. Since the hypermarket most likely has a market share higher than 25%, it is not allowed to open new stores. However, having a hypermarket in a district it could be cheaper for the chain to open more stores in districts around since it can save on logistics costs. In counterfactual one can study what could alternative boundaries for different formats that will overcome this limitation.

7 Conclusion

This article provides an overview of grocery retail industry in Russia. Since the US and European grocery industries are covered extensively in the literature already, we start discussion with a brief overview of retail in the developed countries. We proceed with description of the Russian retail industry comparing US, European and Russian markets. The main difference of the Russian retail is that the development of the industry began much later when the country started the transition from the command economy to market economy in 1990s. It partly explains why

Russian retail industry is only going through its own chain revolution. The other aspect is that Russia is a large country with quite heterogeneous population density. The first wave of chain revolution covered the central and western part of Russia. Now the chains develop distribution system to expand to the east and south directions. As the process is still ongoing, Russian retail market presents an interesting subject for studying effects of chain expansion on both consumer and supply side. We highlight some unique market features, such as regulation concerning market share of retailers in an administrative district. This article aims to give an overview of current state of the industry that might give an inspiration for future research.

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