
SPATIAL FEATURES OF SECTORAL DEVELOPMENT

Location of the Largest Pharmaceutical Companies in Russia: Contribution to Regional Divergence or Convergence?

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Received March 9, 2021; revised April 20, 2022; accepted April 28, 2022

Abstract—The objective of the article is to identify factors for the location of pharmaceutical enterprises in Russian regions, including from the viewpoint of assessing the possible contribution of the pharmaceutical industry to the reduction of territorial disproportions in the level of economic development. The pharmaceutical production location factors is analyzed based on a generalization of foreign studies on the topic and a database compiled by the authors on the manufacturing enterprises of more than 50 largest pharmaceutical companies in Russia (taking into account the construction time and large-scale modernization of enterprises belonging to Russian or foreign owners). It is concluded that Russia experiences the same factors of pharmaceutical enterprises' location as abroad: the importance of historically established centers of production is characteristic, including in the eastern regions of the country (due to the reduced role of the transport factor for the industry); preference is often given to expanding capacities of already existing enterprises, instead of construction of new ones; new factories appear on the basis of established pharmaceutical research centers and/or with focus on markets of the largest urban agglomerations and/or in special economic zones and industrial parks. When building new enterprises, investors can seek both to participate in pharmaceutical clusters and save on production costs, including wages, by building factories in areas not saturated in industries. Foreign investment mainly reach only to the western regions of the country due to their capacious sales market and proximity to the countries of origin of companies, which are predominantly European. As a result of numerous factors, the impact of development of pharmaceutical production on territorial disproportions is ambiguous.

Keywords: pharmaceutical industry, major pharmaceutical companies, foreign investment, localization factors, clusters, research centers, special economic zones, sales markets

DOI: 10.1134/S2079970522020174

FORMULATION OF THE PROBLEM

In recent years, federal authorities have paid increasing attention to the development of the pharmaceutical industry¹ in Russia. Of course, the COVID-19 pandemic that began in 2020 largely contributed to this. However, interest in the industry is due no less to the introduction of anti-Russian sanctions, first in 2014, then in 2022, which contributed to the state's launch of corresponding import substitution programs and measures to support production in Russian regions.² The pharmaceutical industry is

associated with the production of vital goods; therefore, the presence in the country of its own medicine production is inevitably considered one of the most important elements of its economic security. As a result, the pharmaceutical industry significantly outperformed other manufacturing in terms of development dynamics not only in 2020, but also in pre-COVID 2019 (production indices amounted to 127.4% in 2019 and 123.2% in 2020). In 2021, the growth rates in the industry remained high (although not maximum): 111.5% versus 105.0% for manufacturing in general. Pharmaceutical production in Russian

¹The pharmaceutical industry in this article pertains to the production of medicines; i.e., we do not consider parapharmaceutical production. Unless otherwise stated, statistical data are given under the OKVED heading “Production of Medicines and Materials Used for Medicinal Purposes.” The source of the data is the Federal State Statistics Service (Rosstat).

²For example, in 2022, among measures to support business in sanction conditions, an independent measure was provision of backbone enterprises of the pharmaceutical and medical industries, as well as distributors of such products and pharmacy chains, with bank-backed guarantees at a preferential commission rate (for enterprises, 1%; banks are compensated up to 2% by the state).

regions very rarely becomes an object of geographical research, in our opinion, also because of its retained low share in the manufacturing: even in 2020, it was only 1.97% (in volume of shipped goods of own production). There are exceptions among regions, although small in number: in Kursk and Kurgan oblasts, about 14–15%; in Vladimir oblast, more than 9%; in Moscow, Yaroslavl, Ryazan, and Kirov oblasts, 6–7% each; in other federal subjects, less than 5%. More than a quarter of regions have no pharmaceutical industry at all.

Nevertheless, due to the importance of the pharmaceutical industry and dynamism of its development, the issues of patterns and location factors deserve attention. As part of the study, we focus on the pharmaceutical production location factors, since their understanding is important for developing state spatial development policy.

On the one hand, it can be assumed that, due to the science-intensive nature of the pharmaceutical industry, its location will gravitate toward already established scientific centers, which are most often in economically developed regions, an additional advantage of which is a capacious sales market. In this case, further development of the pharmaceutical industry in the country will contribute to the growth of territorial disproportions in economic development level. On the other hand, for pharmaceutical production as small-scale, the role of transport costs should be reduced, which means the possibility of pharmaceutical enterprises' location in regions remote from the main sales markets, which, as a rule, lag behind in the level and dynamics of their economic development. This can be used to solve the problem of reducing territorial disproportions, since, as has already been shown, in some regions, in particular, small ones, large pharmaceutical enterprises can make a significant contribution to industrial production.

A combination of these two oppositely directed trends (for different types of industries), as well as the effect of other factors in the location of pharmaceutical enterprises, is not excluded. The objective of this article is to test these hypotheses and to identify factors for the location of pharmaceutical enterprises in Russian regions. For this, we analyze the features of location of production facilities of the largest pharmaceutical companies in Russia that had been developed at the end of 2020. In determining the composition of factors affecting the location of pharmaceutical enterprises, we rely on foreign studies on the geography of the industry within individual countries.

REVIEW OF PREVIOUS STUDIES

Due to the importance of the pharmaceutical industry, a considerable number of publications by economists are devoted to it. The object of research is more often the Russian pharmaceutical market than

the pharmaceutical industry. The latter is interesting to the authors from the aspect of domestic producers on the market; state support for the industry is often analyzed, but almost no attention is paid to analyzing the location of enterprises in Russian regions.

According to the pharmaceutical research company *GSM Group*, in 2020, in the structure of drug consumption in Russia, the share of domestic drugs was 33.5% in terms of rubles (in value terms) and 63.1% in terms of packages. Another 10.1% in rubles and 5.5% in packages are represented by imported drugs, the production of which is localized in Russia.³ Thus, in total, in Russia in 2020, 43.6% of drugs consumed in the country were produced in rubles and 68.6% in packages (this ratio reflects differences in the cost of domestic and imported drugs).

The experience of geographic research of the industry available in Russia is mainly related to the geography of the global pharmaceutical industry; in the 2010s at the Faculty of Geography, Moscow State University, two such candidate theses were defended (Krotkov, 2013; Podgornev, 2015). These, as well as in related studies on the global economy (Mamed'yarov, 2018; Ovcharov, 2005), analyzed differences between countries in the development of the pharmaceutical industry; the main object of research, due to the high degree of globalization of the industry, are transnational corporations (TNC). In (Podgornev, 2015), areas and centers of the pharmaceutical industry are identified; however, it was not the task of the author to explain the distribution patterns of industry enterprises within individual countries. Russia is not given any significant attention in these works due to its low role in the global pharmaceutical industry. Similar works exist abroad: on the geography of the global pharmaceutical industry (Daemmrich, 2009), on regional strategies of TNC, but also more often in a country context (an interesting example is the work on India, which occupies a special place in the global pharmaceutical industry (Yeoh, 2011)).

In Russia, some exceptions to the general rule are studies on pharmaceutical clusters (Aleksandrova et al., 2019; Bogachev and Rodionova, 2014); however, it seems due more to the prevailing interest in clusters and cluster policy in general in the country than to the pharmaceutical industry as such. There is also an important study from the viewpoint of our research on the development of the pharmaceutical industry in Russia until the early 2000s (Rodionova and Ovcharov, 2001), which gives an idea of the geography of the industry that had developed by that time. However, as is well known, active implementation of investment projects in various industries began in Russia precisely in the 2000s, and over the past 20 years, the geography of the pharmaceutical industry, of course, has undergone significant changes.

³ https://dsm.ru/docs/analytics/2020_Report_rus.pdf.

Abroad, there are few studies devoted to the location of pharmaceutical enterprises within individual countries (rather than global economic studies), but there are still examples of studies on the patterns and factors of the industry location in different types of countries in terms of the development of the pharmaceutical industry: in the traditional leaders among economically developed countries—USA, Germany, and several other European countries (Bignami et al., 2020; Boasson et al., 2005; Demirel and Mazzucato, 2010; Furman, 2003; Janne, 2002); in Ireland, which is characterized by rapid development of innovation (Van Egeraat and Curran, 2013); and in China, which has attracted a significant amount of foreign investment in recent decades and has significantly increased its role in the global economy (Li et al., 2017).

Summarizing these studies, we can say that there are no strict requirements for the location factors of pharmaceutical plants. Pharmaceutical production is small-tonnage; therefore, they need not be bound to raw materials sources or consumers, nor does it require large amounts of fuel or energy (although stable power supply is important). Nevertheless, companies strive to reduce costs: for product delivery to consumers, energy costs for ensuring the required temperature and humidity conditions for production, etc. In addition, for pharmaceutical companies, the availability of clean water is often critical. Pharmaceutical production itself is neither capital- nor labor-intensive (the number of employees in factories is small, and an increased level of qualification of workers is not always needed).

Given the relatively free location of pharmaceutical enterprises, the choice of locations by investors is quite sensitive to state economic policy measures, and in different types of countries. In Ireland, e.g., development of pharmaceutical centers was driven by spatial planning policy, which created industrial sites and infrastructure needed for investors (Van Egeraat and Curran, 2013). In China, the placement of foreign direct investment in the pharmaceutical industry was determined by the absence of strict environmental requirements at the provincial level and, conversely, by the presence of preferential treatment for investors (special economic zones or their counterparts); the shift in state spatial policy from supporting eastern coastal regions to supporting deep provinces led to corresponding shifts in the location of pharmaceutical enterprises (Li et al., 2017). Case studies of the same two countries show that concentration of pharmaceutical enterprises is not necessary: investors are prepared to or already do locate their production in population centers where the pharmaceutical industry had not been previously developed: either in cities where there are good industrial sites with infrastructure (Ireland), or in regions unsaturated in enterprises, where costs are lower and there are more free workers (China (Li et al., 2017)).

In addition, studies in economically developed countries where the pharmaceutical industry originated show that the location of the industry is highly concentrated; pharmaceutical clusters are a typical form of territorial organization of production (Demirel and Mazzucato, 2010; Kaiser, 2003; Podgornev, 2015). Moreover, a case study of US publicly traded pharmaceutical companies demonstrated that inclusion of such companies in clusters is one of the factors that increase their value (Boasson et al., 2005).

The most important feature of pharmaceutical industry is its high research intensity. Therefore, the modern scientific literature analyzes not so much the geography of pharmaceutical production as the geography of R&D and innovation therein. The science intensity of the pharmaceutical industry entails a number of features of the industry:

- the already mentioned key role in the global production of TNC, since only very large companies have sufficient resources for many years of expensive R&D, as well as for the increased costs of promoting products inherent in the pharmaceutical industry;

- the continuing importance of traditional centers of production that appeared at the stage of emergence of the pharmaceutical industry itself in economically developed countries. The pharmaceutical industry appeared either in the work places of pharmaceutical scientists or on the basis of the chemical industry (Daemrich, 2009; Podgornev, 2015). In modern conditions, economically developed countries are distinguished by the best conditions for the development of high-tech and innovative activity. Such countries are characterized by the presence of companies producing original drugs, while in less developed countries, generic products are more represented.

From the viewpoint of geography, it is important that all the abovesaid on the location of pharmaceutical enterprises pertains directly to pharmaceutical production, while the location of research units of large pharmaceutical companies or small innovative firms has a completely different logic; certain properties of the territory are important for them. Thus, scientific studies show that innovative pharmaceutical companies are characterized by the fact that their specialization depends on the scientific base available in the region (Furman, 2003); the level of development of R&D in the region (both in universities and industry as a whole) positively affects the value of companies (Boasson et al., 2005). In other words, it is possible to establish drug production in a region without the presence of not only any special location factors, but also a research base, while the latter is extremely important for new products.

However, even in terms of the relationship between the level of development of scientific research in a region and location of innovative activity in the pharmaceutical industry, the situation is not so unambiguous. Recent paper (Bignami et al., 2020) analyzes dif-

ferences in the importance of geographic proximity for the organization of R&D cooperation in the pharmaceutical industry, depending on types of knowledge. It is shown that geographic proximity is much more important for cooperation in basic research than for clinical science. The former is associated with the transfer of implicit knowledge (which requires direct communication of people), while knowledge in clinical science takes place within a highly regulated process that is carefully documented (and such systematized knowledge is easier to transfer with remote collaboration). In addition, the geographical proximity of research centers engaged in basic science and companies allows the latter, if necessary, to involve highly qualified scientists in their work. There is also a tendency to locate clinical trials far from the research centers of pharmaceutical companies, in countries where it is possible to reduce the costs of such trials.

Special attention is paid to how the coming of TNC to a region affects the local development of technologies and innovations. It is shown that this contribution depends on the characteristics of the region, even within economically developed countries. For leading economic centers, external investment complementing domestic investment can create additional opportunities to modernized and expand the local knowledge base. For less developed centers, foreign TNC can be both positive (strengthening regional centers of excellence) and negative, as local firms may not be able to compete with large TNC (Janne, 2002).

Thus, foreign experience suggests that in Russia, the location of enterprises can be explained by various factors and carried out in different regions: both in the largest urban agglomerations (due to their high scientific potential and capacious market), and in economically underdeveloped ones, where costs of production are lower. The possible significance of pharmaceutical clusters is also ambiguous (new enterprises can be located in such clusters, but they can also be located outside them, focusing on other advantages of the territories). It is quite logical to assume the preservation of the importance of the traditional, established in the Soviet period, pharmaceutical centers. It is also important to pay attention to the role of special economic zones and their counterparts in development of the industry.

MATERIALS AND METHODS

The basis of our research is our database of enterprises of the largest pharmaceutical companies in Russia. It was necessary to thus limit the study in order to obtain more accurate and detailed information on enterprises: on their websites, companies clearly indicate which units are production (rather than marketing) and where they are located, when the plants were built (purchased, modernized); clarifications are often given for the reasons for choosing a production site (in the territory of a special economic zone, near or on the

basis of a specialized research institute, etc.) or the adjacency of new projects with existing enterprises of companies is visible.

The well-known ratings of the largest Russian companies (for example, Expert, RBC) include single manufacturing pharmaceutical companies (not those selling medicines), and then only in the recent hundreds. Therefore, specialized ratings of pharmaceutical companies are needed. We know of two such ratings that have appeared in recent years. One is the rating of the 50 largest pharmaceutical companies in Russia, published in the electronic journal *Healthcare in Russia* in December 2018,⁴ compiled according to company revenue in 2017. The second is *Forbes'* ranking of the top 20 pharmaceutical companies, published in September 2020,⁵ based on five criteria: 2019 revenue, year-over-year revenue change, net profit, the number of medicines registered for the company, and the number of clinical trial approvals issued to the company; at the same time, the rating included companies controlled by individuals (more than 50%) and not included in global conglomerates. The lists of companies included in these ratings largely coincide, but not completely: there are 56 companies in the only two ratings considered.

We took into account whether the companies have Russian or foreign owners, since they can be distinguished by the presence of different territorial development strategies. Most of the 56 companies have Russian owners (although formally companies can be registered offshore); there are three state-owned companies, but there are also foreign investors: German *STADA*, *Martin Bauer*, *B. Braun Melsungen*; Italian *Menarini* (its German division *Berlin-Chemie*); Swiss *AVVA*; French *Servier*; Hungarian *Gedeon Richter*; Slovenian *KRKA*; American *Abbott*; and Indian *Sun Pharmaceutical*. Along with foreign companies included in the list of the largest, also well know are projects by Swiss *Novartis*, French *Sanofi*, British *AstraZeneca*, Israeli *Teva*, and Japanese *Takeda*. The draft Strategy for the Development of the Pharmaceutical Industry in Russia up to 2030, published in mid-2018, presented a list of projects for the construction of pharmaceutical enterprises implemented in the country for 2001–2015 (there are 36 of them); we also take them into account as the most significant (but basically the projects were implemented just by the largest pharmaceutical companies in Russia; the strategy itself was not approved at the time of writing this article).

The country affiliation of foreign pharmaceutical companies that set up in Russia generally corresponds to the overall situation with legitimate (nonoffshore)

⁴ <https://zdorovayarossia.ru/ratings/top-50-krupneyshikh-farmatsevticheskikh-kompaniy-rossii4903>.

⁵ <https://www.forbes.ru/biznes-photogallery/408079-20-luchshih-farmkompaniy-rossii-pervyy-reyting-forbes?photo=20>.

foreign direct investment in Russia: European companies, especially German ones, predominate, while the United States, one of the leaders in the global pharmaceutical industry, is poorly represented in Russia. The difference between the pharmaceutical industry and a number of other industries (e.g., the automotive industry) is that only about half of these companies are among the 50 largest global pharmaceutical TNC: *Big Pharma*,⁶ i.e., the Russian market began to be taken over in many respects, conditionally, by medium-sized companies.

When analyzing enterprises, we do not consider their specialization in the production of pharmaceutical substances or drugs, since such information is not always available. It is also noteworthy that Rosstat statistics on the relation of these two components is most likely distorted. The fact is that in recent years there has been an obvious trend towards a reduction in the share of production of pharmaceutical substances in total production in the industry: from 25.4% in 2017 to 9.1% in 2020. However, according to production indices, the volume of production of pharmaceutical substances over the same period (from 2017 to 2020) increased by 3.5 times, and medicines, by only 1.5 times, which demonstrates the significant impact of pricing in the industry. In addition, the production of pharmaceutical substances is characterized by a very strong territorial concentration: at the end of 2020, 74.2% of pharmaceutical substances were produced in only two regions (Moscow and Moscow oblast); 94.0%, in four regions (Moscow, Moscow oblast, St. Petersburg, and Irkutsk oblast).

When analyzing enterprises, we cannot separate the production of original drugs and generics: information about this is usually not available. At the same time, as mentioned above, the locations of R&D subdivisions and manufacturing enterprises in the pharmaceutical industry may not coincide (moreover, there is a lack of information on the geography of R&D subdivisions for foreign countries (Krotkov, 2013)); the production of generics also requires a certain research base. Manufacturers of both original and generic drugs can be successful (in *Big Pharma* there are also companies specializing in generics, for example, the Israeli *Teva*). Therefore, from the viewpoint of the objectives of our article—to analyze the factors of location of pharmaceutical enterprises—the differences between the production of original drugs and generics seem insignificant.

Along with division of companies into domestic and foreign, we pay special attention to the time of construction of enterprises. In our opinion, in terms of content, it makes sense to single out several stages of creating production:

—the Soviet period: many enterprises have survived from the Soviet era, and with the beginning of the market period, they mainly became private and were modernized over the years (we individually note cases when such large-scale modernization programs are known);

—1990s: the years of economic crisis, when few investment projects were implemented in the country;

—the 2000s and the first half of the 2010s: from the beginning of economic growth to the introduction of sanctions, one of the consequences of which was an increased focus on import substitution;

—2015 to the present: here we pay particular attention to projects in 2020 with the completely understandable increase in importance of the pharmaceutical industry during the COVID-19 pandemic.

RESULTS AND DISCUSSION

Figure 1 shows the enterprises of the largest pharmaceutical companies existing at the end of 2020, as well as the investment projects listed in the Strategy-2030. First, we note that among the largest pharmaceutical companies, many have only one production site (in particular, most foreign companies) or two or three closely located ones (in Moscow and Moscow oblast or different cities of federal subject). There are only a few companies with relatively wide geographical production activity that have factories in different Russian macroregions. In the largest number of federal subjects, there are nine production sites at state-owned NPO Microgen JSC (formed in 2003 by a merger of several state-owned enterprises): these are plants in Moscow, Nizhny Novgorod, Perm, Ufa, Omsk, Tomsk, Irkutsk, Stavropol, and Makhachkala. Second place in the number of regions is Pharmstandard JSC with enterprises in Kursk, Ufa, Tomsk, Vladimir, and Moscow oblasts, as well as a plant for medical equipment and instruments in Tyumen.

An analysis of the geography of the considered pharmaceutical enterprises in Russia allows, in our opinion, to say that, in general, the same factors for the location of pharmaceutical production are manifested as abroad.

(1) The industry is characterized by the preserved importance of historically established production centers. A significant number of companies, as part of their development, did not build new plants, but expanded and modernized existing production sites. As well, the new plants are often located in the established centers of the pharmaceutical industry, next to existing enterprises. It is important that the Soviet period was distinguished by a rather wide geography of factories. In particular, many of them were in hinterland regions of the country, including as a result of evacuation during World War II; enterprises were located in cities now unattractive to manufacturing

⁶ Top 50 pharmaceutical companies in the world for 2020. <https://www.pharmexec.com/view/pharm-execs-top-50-companies-2020>.

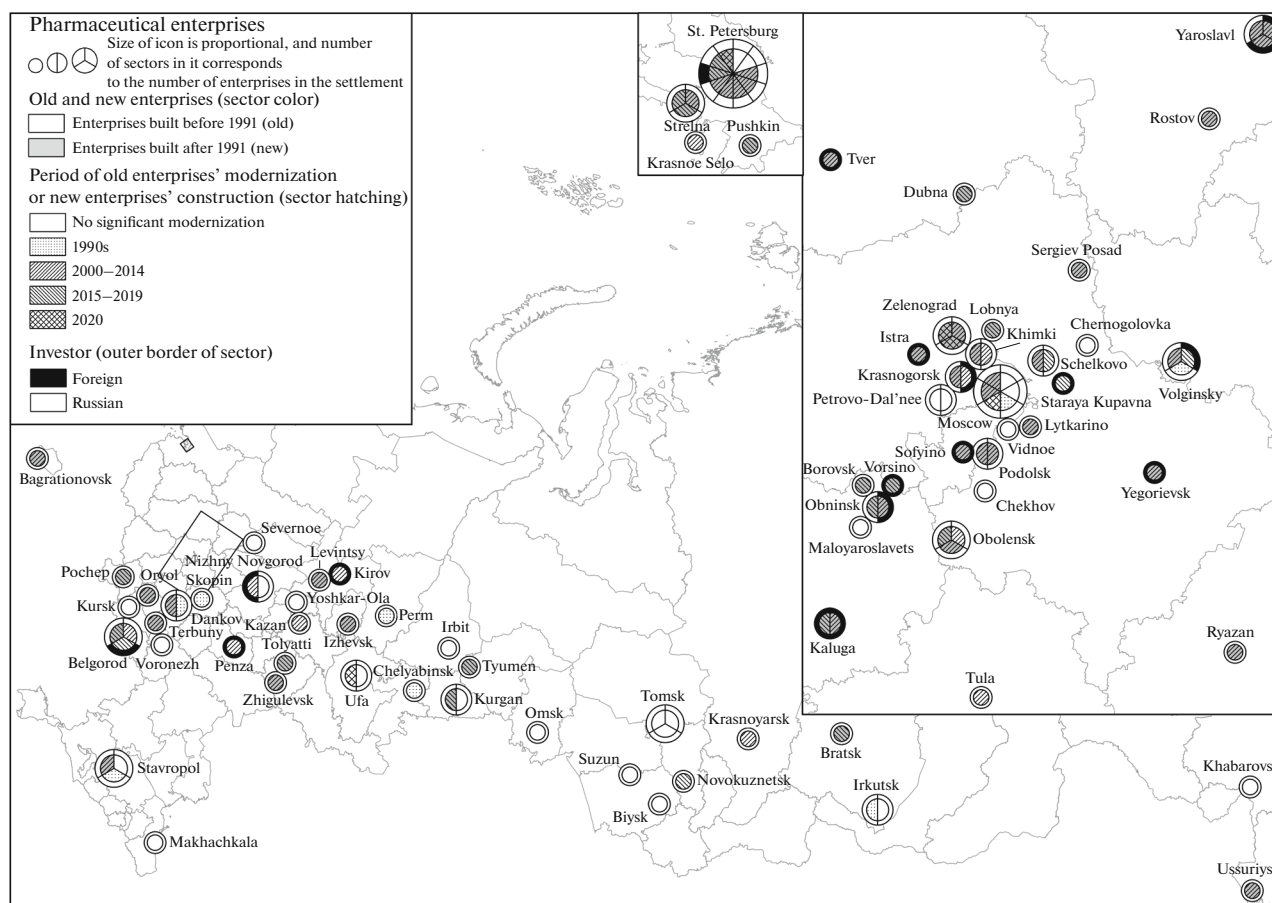


Fig. 1. Manufacturing enterprises of the largest pharmaceutical companies in Russia.

companies in general, such as Khabarovsk and Makhachkala.

The preservation and development of historically established centers of pharmaceutical production in the eastern regions of the country (e.g., Irkutsk and Tomsk oblasts), far from the main sales market of European Russia, but supplying products to this market, confirms the reduced importance of the transport factor for pharmaceutical production.

(2) The presence of research centers is important. As mentioned above, even the production of generics requires R&D, and Russian companies also produce original drugs. Therefore, a number of new factories have emerged on the basis of the established pharmaceutical research centers, primarily in Moscow and Moscow oblast. Obolensk, Serpukhovskiy district, where the State Research Center for Applied Microbiology and Biotechnology is located, hosts enterprises of two companies: Alium and Geropharm; Rafarma has a workshop for the production of small-tonnage batches in Chernogolovka on the basis of the Institute of Problems of Chemical Physics of the Russian Academy of Sciences; Farmstandard has a production facility in Krasnogorskiy district on the basis of the Mech-

nikov Research Institute of Vaccines and Sera (established at the end of the Soviet period in 1988).

In addition, from the viewpoint of the contribution of the pharmaceutical industry to the reduction of territorial disproportions, it is important to note that a number of pharmaceutical research centers have developed in by far not the most economically developed regions (or areas within federal subjects) and frequently having relatively unfavorable economic and geographical positions. In Kirov oblast, the factory of the Nanolek company appeared in the village of Levintsy, which hosted the Research Institute of Microbiology of the USSR Ministry of Defense during the Soviet period.

An example of a research center located in a region attractive to investors, but not the most economically developed, is the village of Volginsky in Vladimir oblast, where the factories of Farmstandard, Verofarm, and Generium were built and where the All-Russian Research Institute of Veterinary Virology and Microbiology and the Pokrovskiy Biopreparations Plant were originally located.

Even from the given names of research centers, it is clear that they can play a different role in the develop-

ment of pharmaceutical production. In some cases, we are talking directly about the introduction of scientific advances into production; others rely only on the existing human resource potential, traditions (Volginsky is an example of such).

It is also possible that pharmaceutical enterprises will appear on the basis of the chemical industry (as has happened abroad). Thus, in Bryansk oblast, pharmaceutical production was organized in the city of Pochep using the property complex of a plant for the destruction of chemical weapons.

(3) When locating new production facilities, the capacity factor of sales markets—the proximity of the largest urban agglomerations, primarily Moscow and St. Petersburg—is also obviously taken into account. It is not just that the two capitals are simultaneously research centers either. A number of enterprises have emerged in different federal subjects of the Central Federal District, which is quite typical of other manufacturing.

It is important to note that the factor of sales market capacity is of increased importance for foreign companies that focus mainly on their research bases (abroad), and for them the presence of Russian research centers is not of obvious importance, but the presence of a large number of consumers is important: in the Center, the Volga Region, and the Northwest. Territorial proximity to Europe is also important: foreign companies operating in Russia are predominantly European (see above). The same patterns are typical of foreign direct investment attracted to the country as a whole: foreign entrepreneurs cite access to the capacious Russian market as the key motive for investing in Russia.

Another well-known pattern is manifested: focusing on the largest sales markets, foreign companies locate production in areas with a low level of economic development, where there is an opportunity to economize on production costs.

(4) The importance of having a preferential regime for doing business for the location of pharmaceutical enterprises was also confirmed. In many cases, the presence of such preferential treatment complements other favorable factors. In Moscow there is both a research base, a sales market, and preferential terms for a technology-innovative special economic zone (SEZ): Technopolis Moscow and the Skolkovo Innovation Center. Similarly, in St. Petersburg, companies have also taken advantage of the technology-innovative SEZ created there. However, there are also cases of location of pharmaceutical enterprises in SEZs or industrial parks in regions that cannot be attributed to traditional pharmaceutical centers, e.g., the Rafarma plant in the Terbuny regional SEZ in Lipetsk oblast, Ozone in the Tolyatti SEZ, which suggests that the introduction of a preferential treatment for investors can be, as well as abroad, an independent factor in the location of pharmaceutical enterprises.

Clearly, there is often a combination of several favorable factors for the location of pharmaceutical production. Another such example is Kaluga oblast: it is close to a capacious sales market, and the presence of the science city of Obninsk, and the active investment policy of the regional authorities, which have created a number of industrial parks. In this region, according to the general opinion, a pharmaceutical cluster has developed (considered in detail in (Bogachev and Rodionova, 2014)).

(5) In general, the situation with pharmaceutical clusters in Russia is ambiguous. Due to the interest in clusters and cluster policy that has arisen in the country, there are officially announced clusters, which often do not coincide with the real ones (Aleksandrova et al., 2019). Specialists of the Russian Cluster Observatory, HSE University,⁷ cite ten such formally declared pharmaceutical clusters, while speaking about the high level of development of only one: in Obninsk, the average level of development of three more clusters and the low level of development of seven clusters (which most likely prevents us from talking about their actual existence).

The selection of clusters is an independent research problem; however, we note that in addition to Moscow and St. Petersburg, two or three of the largest companies are present in cities like Tomsk, Kurgan, Belgorod, Stavropol, Nizhny Novgorod, Ufa, and the already mentioned villages of Volginsky and Obolensk.

As well, there is the example of the R-farm company, which first built a plant in Yaroslavl, then in Rostov in the same Yaroslavl oblast, then in neighboring Kostroma oblast. This logic can be explained by the fact that the company does not want to waste time working with enterprises very remote from each other; they are striving to reduce production costs (Kostroma oblast, as is well known, is “poorer” than Yaroslavl oblast and wages there are also lower).

Thus, we see that in Russia, as well as abroad, companies can choose different strategies, locating their enterprises both in already established pharmaceutical production centers and in places completely new to the industry, based on the logic of their undersaturation in enterprises in principle.

In the conditions of 2020, five main areas of the pharmaceutical industry had increased importance: the development and production of vaccines against COVID-19; specialized drugs for the treatment of COVID-19; production of nonspecialized drugs for the treatment of complications of COVID-19; test systems; personal protective equipment and antiseptics. In the first two—the most innovative—areas, the following projects of the largest pharmaceutical companies are well known:

⁷<http://map.cluster.hse.ru>.

—the production of specialized drugs for treatment of COVID-19 began in Krasnogorsk (Biocad), Irkutsk and Bratsk (Farmasintez), and Kurgan (Sintez);

—production of a vaccine against COVID-19—in St. Petersburg (Farmsintez, Biocad and SPbNIIVS), Moscow (R-farm and Bannofarm), Yaroslavl (R-farm), Podolsk near Moscow (Petrovax Farm), in Vladimir oblast near Pokrov (Generium).

In addition, a number of projects that were planned before the start of the pandemic continued in 2020 (see Fig. 1).

The conditions of 2020, which required promptness in the development of the pharmaceutical industry (increasing the production of nonspecialized drugs to combat COVID-19 as soon as possible, as well as establishing the production of new drugs and vaccines), led to an increase in the role of a number of existing pharmaceutical enterprises and, to a minimal extent, to the emergence of new pharmaceutical factories. At the same time, the latter were created in SEZ (in Moscow and St. Petersburg); the logic of their appearance is largely the same as the expansion of existing industries: the SEZ is a prepared industrial site, which reduces the time spent on building new enterprises.

CONCLUSIONS

Analysis showed that, first, the logic of location of pharmaceutical enterprises in Russia largely corresponds to that of development of the industry in other countries, and second, the hypothesis about the diversity of individual enterprises' location factors was confirmed, which means that the pharmaceutical industry can contribute both to divergence and convergence of regions in their level of economic development.

The contribution of the pharmaceutical industry to the increase in territorial disproportions is primarily governed by the lack of desire of foreign investors to locate their enterprises in the eastern regions of the country, which are significantly less investment-attractive (compared to western regions), including due to the smaller capacity of the macroregional consumer market, as well as remoteness from European countries, which are the homeland of most foreign pharmaceutical companies coming to Russia (contribution to disproportions at the macroregional level).

For domestic companies, the location of enterprises in the main settlement zone is also more preferable. In addition, established research centers, the presence of which is significant for Russian companies, are located mainly in European Russia. As a result, a negative trend has emerged for the eastern regions: the total share of the Siberian and Far Eastern federal districts in the total Russian production of medicines and medical materials gradually decreased from 8.4% in 2017 to 7.4% in 2020.

In addition, due to the relative nonmaterial intensity and low-tonnage pharmaceutical production, it can still be located in regions remote from the main sales markets of the country, which is confirmed by the continued importance of the pharmaceutical centers that have developed in the interior of the country. A striking example of 2020 is Irkutsk oblast, where the production of pharmaceutical substances was launched from scratch and the region's share in their all-Russian production immediately reached 8.4%.

The contribution of pharmaceutical production to the reduction of territorial disproportions is manifested at the level of federal districts and regions. When creating large-scale industries for the industry that are not directly related to interaction with research centers, investors prefer to place them in regions (primarily the Central Federal District) and settlements with a relatively low level of wages, i.e., relatively economically underdeveloped.

Since in some cases companies are guided by the already established centers of scientific research and the pharmaceutical industry (trying to rely not only on the scientific base, but also on the existing personnel potential and traditions), and in others, on saving on production costs, the territorial concentration of pharmaceutical enterprises is not mandatory, just like in other countries. There are examples of both emerging pharmaceutical clusters and stand-alone factories.

The latter means that the authorities of a large number of regions and municipalities can potentially attract pharmaceutical enterprises. At the same time, as the analysis shows, it is important to take into account that investors are very sensitive to the presence in the region of such investment project support tools as special economic zones and industrial parks, where there is an infrastructure prepared for investors and tax incentives. Today, this contributes to the growth of interregional disparities rather than to their reduction, since SEZs and their counterparts are created in regions with a predominantly high or at least medium level of economic development, where regional authorities have the resources and experience in working with investors.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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