



# Development of the Pharmaceutical Industry: Current Trends and the Role of China

Na Li and Natalia A. Volgina

## Abstract

The pharmaceutical industry is one of the fastest growing knowledge-intensive sectors of the global economy, which has undergone significant changes in recent years. The purpose of this work is threefold: first, to evaluate some trends in the development of the pharmaceutical industry; second, to trace the dynamics of mergers and acquisitions in the pharmaceutical market; third, to identify the features of the development of pharmaceutical R&D outsourcing into China. Based on the research, the authors come to the following conclusions. The leading countries in the global pharmaceutical market (in terms of the share of healthcare costs in GDP and in terms of pharmaceutical output) are the USA, Switzerland, Germany, France, Japan, and, in recent years, China. To strengthen their positions and gain control over other companies in the industry, pharmaceutical multinationals (MNCs) from the leading countries increasingly use the M&A tool, the development of which has become an important trend in the pharmaceutical market. To increase financial stability and reduce R&D costs, pharmaceutical MNCs are also expanding the use of R&D outsourcing. In recent years, China has become the main market for the outsourcing operations of the largest pharmaceutical MNCs, which actively cooperate with Chinese contract research organizations. The economic policy of the Chinese government has become one of the most important factors influencing the accelerated development of China's pharmaceutical industry.

## Keywords

Pharmaceutical industry · Pharmaceutical value chain · Pharmaceutical R&D · Mergers and Acquisitions (M&A) · China · Contract Research Organizations (CROs)

## JEL Codes

F15 · F23 · F63

## 1 Introduction

In the background of the economic crisis in 2020, caused by the COVID-19 pandemic, the pace of development of the global pharmaceutical industry did not fall but, on the contrary, showed high growth rates. Companies from countries such as the USA, Japan, Switzerland, Germany, France, and others are leaders in the global pharmaceutical market. China's pharmaceutical industry is also developing rapidly. The impact of the COVID-19 pandemic is expected to lead to further fragmentation of production in the pharmaceutical sector to reduce costs, ensure the growth of the pharmaceutical M&A market, and expand pharmaceutical R&D outsourcing processes globally and in China. The purpose of this research is threefold: first, to evaluate some trends in the development of the pharmaceutical industry; second, to trace the dynamics and directions of mergers and acquisitions (M&A) in the pharmaceutical market; third, to identify the features of the development of pharmaceutical R&D outsourcing in China.

## 2 Methodology

The methodology of the research on pharmaceutical industry development is based on a comparative analysis, which will allow comparing the dynamics of the leading pharmaceutical countries in the market. Such research methods as analysis and synthesis make it possible to identify the peculiarities of production fragmentation processes in the pharmaceutical industry in the global market, as well as to make estimates of future trends.

The main references for this research were official data from the World Bank (World Bank [DataBank], 2022),

N. Li · N. A. Volgina (✉)  
Peoples' Friendship University of Russia (RUDN University), Moscow, Russia

Statista portal (Statista, 2021, 2022), official data from Torreya (Torreya, 2021), official data from European Pharma (Balfour, 2021) and Fierce Pharma (Fierce Pharma, 2012; Liu, 2021), official data from several Chinese contract organizations, in particular, WuXi AppTec (WuXi AppTec, 2022) and Pharmaron (Pharmaron, 2019), and analytical studies by several authors.

### 3 Results

#### 3.1 Dynamics of Pharmaceutical Industry Development

To identify the macroeconomic trends in the development of the global pharmaceutical industry, we trace the share of healthcare costs in the GDP of different countries (Table 1).

Over the past decade, the share of global health care costs has remained relatively stable, rising from 9.5% to 9.8% (+0.3%) over the 2010–2019 period. Simultaneously, Japan's share increased from 9.1% to 10.7% (+1.6%); Switzerland's share increased from 9.9% to 11.3% (+1.4%); Germany's share increased from 11.1% to 11.7% (+0.6%); the share of the USA increased from 16.3% to 16.8% (+0.5%). The share of China was lower than that of the major countries but increased from 4.2% to 5.4% (+1.2%). The share of the EU remained stable at 9.9% (0%). The share of France decreased a little from 11.2% to 11.1% (−0.1%).

Considering the overall level of health care costs as a share of GDP and the growth rate of these costs, we can conclude that the main leading countries in the pharmaceutical industry are the USA, Germany, Japan, and Switzerland. China's pharmaceutical industry is showing significant positive dynamics.

In the background of the economic recession of 2020–2022, connected with the costs of fighting the COVID-19 pandemic, the growth of the pharmaceutical industry did not fall but, on the contrary, showed an increment. According to Torreya (Torreya, 2021, p. 9), in 2019–2021, the output value of the global pharmaceutical

industry was \$5.79 trillion, \$6.65 trillion, and \$7.03 trillion. In this context, the output value of the pharmaceutical industry in the main countries around the world in November 2021 was (\$ million): the USA—2,793,782, China—840,261, Switzerland—539,394; Germany—413,935, and Japan—375,314 (Statista, 2022).

Over the years, the USA, Switzerland, Germany, Japan, and some others have been leading in terms of the size of pharmaceutical production in the world market. In recent years, China has moved into second place in terms of the cost of pharmaceutical production, behind only the USA.

#### 3.2 Mergers and Acquisitions in the Pharmaceutical Market

In the global economic recession, the reasons why the pharmaceutical industry can show steady growth are not only related to supporting people's immediate health needs but also to make huge profits. On the one hand, competition in the global pharmaceutical market is limited because there are high barriers to entry into the industry due to the need for huge long-term investments in R&D. For example, it takes an average of 10–13 years to get a new concept drug launched and investment around \$13.95 billion (DiMasi et al., 2016, p. 20). On the other hand, this often leads to the financial instability of the largest pharmaceutical MNCs. Additionally, a key factor hurting MNCs' financial profits is the global development of the generics market. In fact, according to some estimates, the cost of a generic two years after its appearance in the market is, on average, 40% lower than the original drug (Ayazovich, 2019, pp. 21–23). Consequently, many of the patented drugs owned by pharmaceutical MNCs are losing price competition to generics.

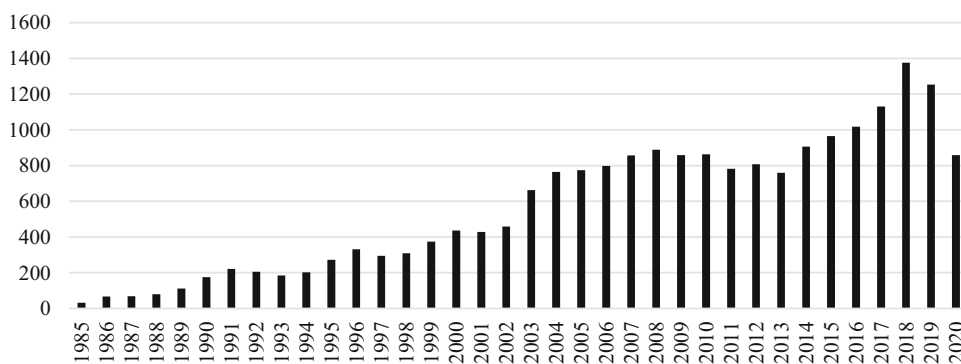
Therefore, to strengthen their market position, gain control over other companies in the industry, and maintain profit growth, most pharmaceutical MNCs use the instrument of M&A (as a form of foreign direct investment). In recent years, the pharmaceutical market has been characterized by a high intensity of M&A (Cherkasova, 2019, p. 95).

**Table 1** Share of health care costs in GDP of selected countries, 2010–2019 (%)

Years Countries	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
The average level of the world	9.5	9.4	9.4	9.4	9.5	9.7	9.9	9.8	9.7	9.8
USA	16.3	16.2	16.2	16.1	16.3	16.5	16.8	16.8	16.7	16.8
EU	9.9	9.8	9.9	10.0	10.0	9.9	9.9	9.9	9.9	9.9
Germany	11.1	10.8	10.9	11.0	11.0	11.2	11.2	11.3	11.5	11.7
Japan	9.1	10.5	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
Switzerland	9.9	10.0	10.2	10.5	10.6	11.0	11.3	11.5	11.4	11.3
France	11.2	11.2	11.3	11.4	11.5	11.4	11.5	11.3	11.2	11.1
China	4.2	4.3	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.4

Source: Compiled by the authors based on data from the World Bank (World Bank [DataBank], 2022)

**Fig. 1** The number of M&A deals in the biotechnology and pharmaceutical sector around the world, 1985–2020. *Source:* Compiled by the authors based on Statista data (Statista, 2021)



We shall consider the dynamics of M&A in the pharmaceutical market over the period 1985–2020 (Fig. 1). M&A in the pharmaceutical market continued to grow from 1985 to 2007, that is, before the financial crisis. The period of 2008–2013 was characterized by a declining trend as part of the industry’s post-crisis recovery process. Since 2014, the M&A market has returned to growth. However, in 2019, declines began to emerge again. In 2020, the market fell sharply in response to the COVID-19 pandemic.

As seen in Fig. 1, the number of M&A deals increased from 32 in 1985 to 1376 in 2018. In 2019–2020 their number decreased to 1253 in 2019 and 895 in 2020 (Cherkasova, 2019). In 2020, there is a corporate example of a major M&A transaction, which influenced the growth in the value of the M&A market. As of December 1, 2020, the total value of M&A in the pharmaceutical (including biopharmaceutical) market equaled \$228 billion (which was 13% lower than in 2019, equaling \$262 billion), the second-lowest in the past five years (Balfour, 2021). In December 2020, AstraZeneca paid \$39 billion to acquire the US biopharmaceutical company Alexion Pharmaceuticals (Liu, 2021).

Therefore, in 2020, although the number of M&A deals was the lowest in nearly five years, the value of M&As increased and became the highest in the last five years.

### 3.3 Outsourcing Pharmaceutical R&D into China

Another important trend in the pharmaceutical market was the development of outsourcing processes, including R&D outsourcing. Even though outsourcing R&D is associated with sensitive problems of preserving intellectual property rights, it helped strengthen the market positions of large pharmaceutical MNCs, increasing their financial stability. It allowed them to reduce R&D costs and the time of R&D and accelerate the returns on financial investments (Bruche, 2009, pp. 267–288).

The multistage and multidimensional nature of the pharmaceutical value chain creates favorable opportunities for transferring certain parts of the R&D process to other countries, first of all, to emerging market countries (Xu & Liu, 2018, pp. 1–4). The most important direction of pharmaceutical R&D outsourcing processes is China (Grimes & Miozzo, 2015, pp. 1–8). The integration of China into the R&D link of the global pharmaceutical value chain has been the focus of many researchers (Grimes & Miozzo, 2015, pp. 1–8). There is a consensus among them that the economic policy of the Chinese government has been one of the most important factors influencing the development of China’s pharmaceutical industry. The control of drug regulatory agencies has played a determining role.

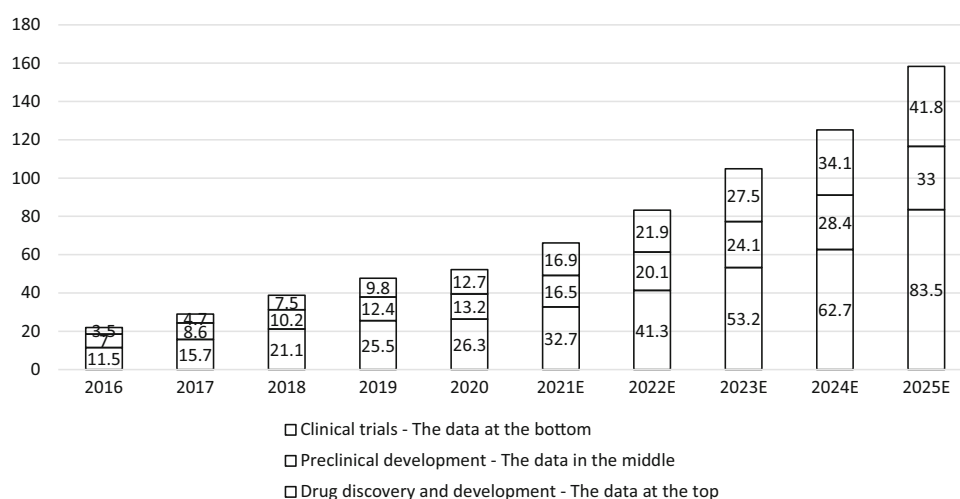
In 2015, China officially released the “Made in China 2025” document. The chapter “Biomedicine and High-Performance Medical Devices” is the tenth major area of China’s strategic plan for the decade (Green Book “Made in China 2025” about technological innovation in key areas, 2016, p. 169). In 2022, China officially promulgated the “14th Five-Year Pharmaceutical Industry Development Plan” to continue promoting the development of the pharmaceutical industry deeply. The key objectives are as follows (“14th Five-Year” Development plan for China’s pharmaceutical industry, 2021, p. 10):

1. To promote pharmaceutical innovations;
2. To support the R&D development of pharmaceutical organizations at all stages;
3. To strengthen the protection of intellectual property.

These goals illustrate the importance the People’s Republic of China attaches to the development of the pharmaceutical industry, including the encouragement of outsourcing from developed pharmaceutical countries.

In recent years, under the influence of several factors (some of which were mentioned above), China has become the main market for outsourcing operations of major

**Fig. 2** Size and forecast of the pharmaceutical R&D outsourcing market in China 2014–2020 (billion CNY). *Source* Compiled by the authors based on data from the TouBao Research Institute report (Sun, 2021, p. 14)



pharmaceutical MNCs. As the final link in bottom-up outsourcing (Volgina, 2021, pp. 150–162), the trend of development of the pharmaceutical R&D outsourcing industry in China is its steady growth (Sun, 2021, p. 14) (Fig. 2).

As follows from Fig. 2, the Chinese market for contract research organizations (CROs) is steadily expanding: the Chinese CROs market was 22 billion CNY in 2016 and 52.2 billion CNY in 2020 at a compound annual growth rate of 24.1%. By 2025, the size of China's CROs market is expected to grow to 158.3 billion CNY, with a compound annual growth rate of 24.9%.

The high growth rate of the Chinese CROs market is based on strong Chinese government support, improved quality of research services due to strict regulatory rules, and its lower price compared to competitors. This attracts many pharmaceutical MNCs to China.

As early as 2002, the large American pharmaceutical company Eli Lilly signed a contract with the Chinese pharmaceutical company ShangPharma to outsource its research in the area of diabetes. Nowadays, the companies of Big Pharma are expanding the outsourcing of some of their pharmaceutical R&D to several Chinese pharmaceutical research organizations. For example, the UK pharmaceutical company AstraZeneca had signed R&D outsourcing agreements with Chinese CRO WuXi AppTec for research arthritis drugs and with Pharmaron to speed the R&D of new drugs, as well as the German pharmaceutical company Merck (Fierce Pharma, 2012).

According to a report by China's CRO WuXi AppTec and Pharmaron in 2021, 20 foreign pharmaceutical MNCs (Big Pharma companies) selected them as contract research companies and outsourced certain research activities to them (Pharmaron, 2019, p. 8), (WuXi AppTec, 2022, p. 1). This means that Big Pharma companies outsourcing their pharmaceutical R&D processes to China is no longer the only case.

## 4 Conclusion

The global pharmaceutical industry is growing steadily in the background of the global economic crisis caused by the COVID-19 pandemic. This is mostly due to the processes of offshoring, which is the M&A, and the outsourcing processes that large pharmaceutical MNCs are conducting. China plays a significant role in these processes.

M&A in the pharmaceutical market and outsourcing of pharmaceutical R&D to China will continue in the following years. This is because large pharmaceutical MNCs are pursuing a strategy of restructuring their pharmaceutical value chain to improve the efficiency of its single links, from product delivery to the end consumer to pharmaceutical R&D. In recent years, the R&D productivity of large pharmaceutical companies has dropped sharply, in spite of huge investments; relatively few innovative drugs have been developed. To reduce the cost of drug R&D and look for new forms of innovation, large pharmaceutical companies increasingly use M&A and outsourcing instruments to integrate China into a more global value China.

**Acknowledgments** This publication has been supported by the RUDN University Scientific Projects Grant System, project № 060121-0-000.

## References

- “14th Five-Year” Development plan for China's pharmaceutical industry. (2021). Accessed September 13, 2022, from [https://www.miit.gov.cn/cms\\_files/filemanager/1226211233/attach/202112/15b1431a91494ccb873f8e83b1f45077.pdf](https://www.miit.gov.cn/cms_files/filemanager/1226211233/attach/202112/15b1431a91494ccb873f8e83b1f45077.pdf).
- Ayazovich, M. Z. (2019). *Innovative development of the global pharmaceutical industry* (Synopsis of dissertation of candidate of economics). Moscow, Russia: National Research Institute of World Economy and International Relations named after E.M. Primakov of the Russian Academy of Sciences.

- Balfour, H. (2021, January 8). *Value of pharma's M&A deals remain high, despite COVID-19*. *European Pharma review*. Accessed July 8, 2022, from <https://www.europeanpharmaceuticalreview.com/news/138786/covid-19/>.
- Bruce, G. (2009). The emergence of China and India as new competitors in MNCs' innovation networks. *Competition & Change*, 13(3), 267–288. <https://doi.org/10.1179/102452909X451378>
- Cherkasova, A. A. (2019). Analysis of the pharmaceutical market of M&A transactions. *Bulletin of Magistracy*, 11-4(98), 94–97.
- DiMasi, J. A., Grabowski, H. G., & Hansenc, R. W. (2016). Innovation in the pharmaceutical industry: New estimates of R&D costs. *Journal of Health Economics*, 47, 20–33. <https://doi.org/10.1016/j.jhealeco.2016.01.012>
- Fierce Pharma. (2012). *Top 10 Big Pharma investments in China*. Accessed July 8, 2022, from <https://www.fiercebiotech.com/special-report/top-10-big-pharma-investments-china>.
- Green Book “Made in China 2025” about technological innovation in key areas. (2016). Accessed September 13, 2022, from <http://www.cm2025.org/uploadfile/2016/0321/20160321015412313.pdf>.
- Grimes, S., & Miozzo, M. (2015). Big Pharma's internationalization of R&D to China. *European Planning Studies*, 23(9), 1–8. <https://doi.org/10.1080/09654313.2015.1029442>
- Liu, A. (2021, January 19). *The top 10 largest biopharma M&A deals in 2020*. *Fierce Pharma*. Accessed July 8, 2022, from <https://www.fiercepharma.com/special-report/top-10-largest-biopharma-m-a-deals-2020>.
- Pharmaron. (2019). *Pharmaron Report, 2019*. Accessed July 8, 2022, from [http://pdf.dfcfw.com/pdf/H2\\_AN201903011301405084\\_1.pdf](http://pdf.dfcfw.com/pdf/H2_AN201903011301405084_1.pdf).
- Statista. (2021). *Number of merger and acquisition deals in biotechnology and pharmaceuticals sector worldwide from 1985 to 2020*. Accessed July 8, 2022, from <https://www.statista.com/statistics/965888>.
- Statista. (2022). *Total value of pharmaceutical sector worldwide 2021, by major country*. Accessed July 8, 2022, from <https://www.statista.com/statistics/1246608>.
- Sun, X. (2021, July). *Research report – 2021 China CRO industry*. *Chinese TouBao Research Institute*. Accessed July 8, 2022, from [https://pdf.dfcfw.com/pdf/H3\\_AP202109271518813471\\_1.pdf](https://pdf.dfcfw.com/pdf/H3_AP202109271518813471_1.pdf).
- Torrey. (2021, November). *The pharma 1000. Top global pharmaceutical company report*. Accessed July 8, 2022, from <https://torreya.com/publications/pharma-1000-report-update-torreya-2021-11-18.pdf>.
- Volgina, N. A. (2021). Pharmaceutical value chain: Opportunities for outsourcing. *RUDN Journal of Economics*, 29(1), 150–162. <https://doi.org/10.22363/2313-2329-2021-29-1-150-163>
- World Bank [DataBank]. (2022). *Health nutrition and population statistics*. Accessed July 8, 2022, from <https://databank.worldbank.org/source/health-nutrition-and-population-statistics#>
- WuXi AppTec. (2022). *Report: Productivity continues to grow strongly and key business expected to accelerate in 2022*. Accessed July 8, 2022, from [https://pdf.dfcfw.com/pdf/H3\\_AP202203281555572761\\_1.pdf](https://pdf.dfcfw.com/pdf/H3_AP202203281555572761_1.pdf).
- Xu, V., & Liu, Y. C. (2018). China's CRO pharmaceutical industry development status and trend analysis. *Border Theory*, “China Market”, 19, 1–4.