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CHEMICAL INDUSTRY IN EUROPE DURING CRISIS CAUSED BY RUSSIA: A CASE STUDY OF GRUPA AZOTY

Introduction

The research problem is focused on the chemical industry in Europe during the crisis caused by Russia, with the main focus on Grupa Azoty, alongside its competitor in the industry, presented as a case study. The discussed problem is connected to Russia's invasion of Ukraine, which resulted in tens of thousands of casualties on both sides and in damaging, particularly energy and food markets¹. Food markets worldwide are more likely to have limited supplies, unmet import demand, and increased global food prices due to war-related interruptions to Russian Federation and Ukraine exports. What is more, the decision of Russia to freeze gas exports to several EU members has had a powerful effect on the situation in the European market. Nations heavily reliant on the Russian Federation and Ukraine's supplies of fertilizers and food need to source from other nations to accelerate energy production in other countries². Grupa Azoty is a Polish chemical company with ties to the Russian market due to its reliance on natural gas supplies. In recent years it has taken steps to reduce its dependence with the diversification of its supply sources and investments in its gas extraction to become more self-reliant. However, in the past, this access to Russian gas has been a crucial factor in enabling the company to produce fertilizers at competitive pric-

¹ European Council, *Impact of Russia's invasion of Ukraine on the markets: EU response*, <https://www.consilium.europa.eu/en/policies/eu-response-ukraine-invasion/impact-of-russia-s-invasion-of-ukraine-on-the-markets-eu-response/> (accessed: 24.11.2022).

² Food and Agriculture Organization of the United Nations, *The Importance of Ukraine and the Russian Federation for Global Agricultural Markets and the Risks Associated with the War in Ukraine*, Information Note, 10 June 2022 Update, <https://www.fao.org/3/cb9013en/cb9013en.pdf> (accessed: 24.11.2022).

es. This case study makes a special note of how the share price changes over various internal and external factors and what exact changes have occurred due to the crisis in terms of financials to compare it with its Norwegian competitor Yara International ASA. The proximity of the war to the chemical market in Europe is crucial in this matter.

The main research objectives were:

- To define the ongoing crisis within the chemical industry in Europe – Objective 1 (O1).
- To analyze the impact of the crisis on Grupa Azoty – Objective 2 (O2).
- To compare Grupa Azoty with its competitors – Objective 3 (O2).

The following research questions were formulated to meet the research questions (RQ) and to provide an in-depth understanding of the topic:

- RQ1: What was the reason behind the crisis in 2022? – for O1.
- RQ2: How is the chemical industry faring in Europe with the crisis? – O1.
- RQ3: How did the crisis affect Grupa Azoty? – O2.
- RQ4: What is the position of Grupa Azoty among its competition during the crisis? – O3.

1. Theoretical background and literature review

In 2022, the consequences of sanctions were observed due to military conflicts in Europe. However, it was not the first time such a situation occurred. This pattern of Russian aggression and imposing sanctions as a penalty date back to 2014, when Russia banned produce imported from the European Union (EU) at the beginning of August. It was in response to the sanctions imposed on Russia due to military aggression against Ukraine. Before that, in 2011-2013, Italy and Poland were the most significant net apple exporters in the EU. Both of those countries have developed export-oriented production. Italy was the biggest, with 40% of its total production exported, followed by Poland, with 30% of its total apple production not intended for the domestic market. However, Poland was the biggest in exporting apples to Russia, with 73% of the total volume of apples coming from the EU being of that particular origin. In total, the imports of Polish apples amounted to 32% in Russia. Poland also played an essential part in exporting apples to Belarus and Kazakhstan, which were in a customs union with Russia³. Therefore, the ban's consequences were more severe in Poland than in other Eu-

³ P. Krciński, *The EU foreign trade of apples in the context of the Russian embargo*, „Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie Problemy Rolnictwa Światowego” 2015, t. 15, zeszyt 3.

ropean countries that were less dependent on export-oriented production for the Russian market.

The dependence of the Polish apple producers on exports to Russia and its customs union partners left the industry vulnerable. An important role was played by Belarus, which acted as an intermediate in the reexport of Polish apples to Russia. It can be seen in the increase in the import of apples in 2014, which amounted to 208.6 thousand tons, a 63.7 thousand tons increase compared to the previous year, an unusual occurrence considering the downward trend in the earlier years. Similar operations were noticed in Moldova, Serbia, and Kazakhstan. Another substitution for the Russian market could have been to export to Asia, specifically China. However, new markets could not replace Russia, as only 10% of the apples meant for the Russian market were successfully sold. Additionally, in 2018, the producers incurred more costs than revenues. Moreover, as Russian producers increase the areas of the orchards, the importance of imports decreases together with the demand for Polish apples⁴. The embargo had a considerable impact on the Polish apple segment, which could not recover from the loss of such a significant market as Russia.

Almost eight years later, in 2022, the conflict between Russia and Ukraine escalated once again, causing severe sanctions to be put in place against the aggressor. Chemical producers play a crucial role in the global market, as chemicals and materials are ubiquitous in modern-day lifestyles. Ongoing disruptions caused by the Russian invasion of Ukraine curbed factory output worldwide. As a result, growth in global chemical output has been lower than the previous year. Although there is predicted to be a recovery in the global economy and further expansion in demand for chemistry products, the path is still uncertain. For the first time, the EU imported more chemicals than it exported, both in volume and value. Not to mention, fertilizer prices in Europe are six to seven times higher than in the United States (US). The situation in the result is severely impacting the industry's competitiveness⁵. Moreover, the war has caused thousands of casualties and significant damage to the oil and food industries. Most definitely, the decision of Russia to freeze gas exports to several EU members has had a powerful effect on the situation in the European market⁶. As of 2023, the security and cost of food

⁴ T. Kacprzak, K. Himstedt, *The Influence of the Russian Embargo on the Economic Situation of Apple Producers in the Eastern Part of the Masovia Province*, „Scientific Journal Warsaw University of Life Sciences – SGGW” 2019, vol. 19, no. 2.

⁵ M. Burke, *European Chemicals Industry Struggling to Compete as Costs Surge*, „Chemistry World” published on 27th of October 2022, <https://www.chemistryworld.com/news/european-chemicals-industry-struggling-to-compete-as-costs-surge/4016444.article> (accessed 24.11.2022).

⁶ European Council, „Impact of Russia's invasion of Ukraine on the markets: EU response”, <https://www.consilium.europa.eu/en/policies/eu-response-ukraine-invasion/impact-of-russia-s-invasion-of-ukraine-on-the-markets-eu-response/> (accessed: 24.11.2022).

worldwide are directly impacted by Russia's military assault against Ukraine. There are effects, mainly on feed prices and for the EU food sector, from the decrease in imports of maize, wheat, rapeseed, and sunflower oil and meal from Ukraine. The fundamental issue in the EU is affordability due to high market prices and inflationary tendencies brought on by the Ukrainian conflict⁷.

Table 1. Factors influencing share prices

Source	Industry/Sector of research	Factors affecting stock prices
Polska Grupa Energetyczna (PGE), 2016	Energy sector	Company: implementation of the strategy, expected interim results, mergers and acquisitions, the volume of dividends, and transactions by critical shareholders. Environment: global sentiments (news), stock exchange sentiments, macroeconomic data, regulation changes, commodity markets information.
Tandon, Malhotra, 2013	NSE 100 Companies	Positive association: book value, earning per share, price-earnings ratio. Inverse association: dividend yield.
Pindyck, 1986		Risk aversion, profitability, interest rates, equity returns.
Boston Consulting Group (BCG), Rothman, Gocke, Schönberger, Flock, Zhou, 2022	Chemical	Reported news concerning inflation, the war in Ukraine, disrupted supply chains, and prices for oil/gas.
Celej, 2014	Warsaw Stock Exchange	Macroeconomic factors do not influence stock prices
Burggraf, Fendel, Huynh, 2019	Trump's Trade War	Political news
Pearce, Roley, 1984		Information about monetary policy Discount rate changes
Ramelli, Wagner, 2020		Disruptions
Ma, Kao, 1990		Exchange rates

Source: own elaboration.

For a long time, research has been analyzing which factors influence changes in the stock market which is presented in Tab.1. Authors like Tandon and Malhotra analyzed how internal factors of the company, like book value, earnings per share, and a company's dividend yield, impact the prices of stocks on the market⁸. Some

⁷ World Trade Organization, *Crisis in Ukraine: Implications of the War for Global Trade and Development*, https://www.wto.org/english/res_e/booksp_e/imparctukraine422_e.pdf, (accessed: 21.01.2023).

⁸ K. Tandon, N. Malhotra, *Determinants of Stock Prices: Empirical Evidence from NSE 100 Companies*, „IRACST- International Journal of Research in Management & Technology (IJRMT)” 2013, vol. 3.

authors, like Buggraf et al., focused on the company's external environment, focusing on how tweets from Donald Trump would shake up the market⁹. Other research, like Celej's, explicitly focused on the Warsaw Stock Exchange. It analyzed whether macroeconomic factors, such as inflation, exchange rate, or interest rate, can cause a change in the stock market¹⁰. Z. Arsha, A. R. Arshaad, S. Yousaf, and S. Jamil state that the increase or decrease in the demand and supply of share prices can be categorized into three main types: technical factors, fundamental factors, and market sentiments¹¹. The corporation issuing the shares determines the fundamental elements, which include earnings, dividends, book value, etc. Similar to macro factors, technical factors are those that originate from outside of the organization. Examples include interest rate, inflation, economic policy, political environment, gross domestic product, trends, etc. Similarly, market sentiment refers to the overall attitude of investors regarding the market's predicted price development.

The main subject of this case study is Grupa Azoty S.A., a Poland-based producer and one of the leading players in the fertilizer and chemical markets. It is one of the biggest companies in all of Europe, and the largest in Poland, accounting for around 75-80% of the country's fertilizer production. As of 2023, it is the EU's number two nitrogen and compound fertilizers manufacturer. Its product portfolio comprises the fertilizers segment, which includes manufacturing and sales of nitrogenous fertilizers, compound fertilizers, ammonia, plastics, OXO alcohols, and pigments manufacturing and selling titanium white. The other Activities segment includes energy, laboratory services, catalysts, and rental of properties. The Company operates through subsidiaries, including Grupa Azoty ZAK S.A., ATT Polymers GmbH, and Zakłady Chemiczne Police S.A.

A multinational corporation headquartered in Norway, Yara International ASA manufactures, distributes, and retails nitrogen-based mineral fertilizers and associated industrial goods. The company has 11 subsidiaries, including Fertilizer Holdings AS, Yara International Employment Co AG, Yara North America Inc., and Yara Clean Ammonia AS. The company operates in over 60 countries, has production facilities on six continents, and sells products in roughly 150 nations. The Norwegian government owns more than a third of Yara and is its largest shareholder, and the main headquarter is based in Oslo¹².

⁹ T. Buggraf, R. Fendel, T. Huynh, *Political News and Stock Prices: Evidence From Trump's Trade War*, „Applied Economic Letters” 2019, vol. 27.

¹⁰ M. Celej, *Impact of Macroeconomic Factors on Prices Listed on the Polish Stock Market*, „Studia Ekonomiczne” 2014, vol. 204.

¹¹ Z. Arsha, A.R. Arshaad, S. Yousaf, S. Jamil, *Determinants of Share Prices of listed Commercial Banks in Pakistan*, „IOSR Journal of Economics and Finance” 2015, vol. 6(2), pp. 56–64.

¹² Yara, „Yara At a Glance”, <https://www.yara.com/this-is-yara/yara-at-a-glance/> (accessed: 07.01.2023).

2. Research methods

Our methodology focuses primarily on the secondary research method, using secondary information from already available data, and the financial analysis using benchmarking. Secondary data sources include literature, scientific articles, financial statements, reports, and press releases, among many others¹³. We derived our data from the European Council website, scientific publications were available in journals, and the LSEG Eikon database to correctly present the situation as of 2023 as well as to present all necessary information for this case study. Benchmarking, on the other hand, is a method used to compare the company's performance against similar companies to identify any areas of possible improvement¹⁴. Its goal is to improve the company's performance. It looks at current data and projects future trends. Additionally, we found it crucial to use statistical data analysis, which studies the company's income statement, balance sheet, cash flow statement, and rates of return. It is a process that analyses the performance of transactions related to finance. It analyzes whether an entity is stable, solvent, liquid, and profitable. This method also evaluates the economic trends and helps establish the long-term strategy. The collection of the financial statement is necessary for conducting financial analysis. It also entails using financial information to evaluate a company's performance and provide suggestions on enhancing its prospects¹⁵, similar to the previous method. All this information was obtained from the LSEG Eikon database and the official websites of the studied companies. After accessing the company's financial data, the next step was comparing ratios to assess risks and interpret the results. Information about financial ratios was also derived from the LSEG Eikon base and consolidated reports provided by Grupa Azoty S.A. and Yara International ASA. This analysis is of service to analyze the financial statements of Grupa Azoty alongside its competitors and how the crisis influenced the companies' financial situation from February 2022 until March 2023.

3. Results and discussion

The analysis of changes in the share price of Grupa Azoty S.A. and its main competitor, Yara International ASA, has been divided to distinguish internal and

¹³ D.W. Stewart, M.A. Kamins, *Secondary Research: Information Sources and Methods*, „Sage Journals“ 1993, vol. 4.

¹⁴ P. Kyrö, *Revising the Concept and Forms of Benchmarking*, „Benchmarking: An International Journal“ 2003, vol. 10, no. 3, pp. 210–211.

¹⁵ Corporate Finance Institute, <https://corporatefinanceinstitute.com>, (accessed: 29.03.2023).

external factors. During the study, some specific dates were derived from presenting the percentage decline or an increase resulting from internal or external factors during the crisis. In Tab. 2, below are chronologically presented dates for Grupa Azoty and the general trend for its competitor compared with Grupa Azoty that were the results of such factors.

We analyze the general trend for Yara International ASA from February 2022, when the share price declined before the invasion. This was connected to the volatility of the market and the demand. Because of the strained situation due to the excessively high energy prices, Yara eventually had a high in its regard, a decline of 5.04% change on the 8th of March 2022 in its share price. It was caused by the halt in production in its Italian and French plants.

On the day of the invasion, the share price of Grupa Azoty had a negative change of 10.96%. The company has suffered due to the market panic and its ties to Western Europe. The share price started to rise because the Ministry of Agriculture announced aid for farmers affected by drastic increases in fertilizer prices, which caused a positive change of 11.21% on the 18th of March, 2022. Soon after, Prime Minister Mateusz Morawiecki presented the assumptions of the so-called “anti-Putin” shield, which caused again a positive change of 6.30%.

From March 2022 onwards, the share price of Yara kept steadily rising until the 14th of April. The reason for that was positive news about the company’s projects connected to ammonia fuel, experts raising the price target, and its positive financial results. After that moment, the share price started declining again due to increased energy prices, increased raw materials costs, and disruptions in supply chains.

Table 2. Internal and external factors influencing the share price of Grupa Azoty S.A.

INTERNAL FACTORS		
Date	Change	Circumstances/response
11.05.2022	+4.82%	The company published the results from Q1 2022 on its official website.
07.07.2022	+5.13%	PGNiG signed an estimated 13.4 billion PLN deal extension with the company. PGNiG declared it would export gas for Grupa Azoty as its new strategic supplier.
10.11.2022	-5.77%	Financial results for 3Q 2022 were published, driven by an unprecedented rise in commodity prices. This decline is the result of excessively high prices. The company was said to start commercial exploitation of the Polimery Police expansion project planned for 2023.
20.12.2022	+6.44%	Grupa Azoty signed a deal to buy propane, and it was said that the propane deliveries under this deal would secure over 50% of the unit’s demand in 2023–2024 ^a .

EXTERNAL FACTORS		
24.02.2022	-10.96%	As a result of Russia's aggression on Ukraine, from this day, we have been observing extraordinary, historically high prices of natural gas on European exchanges. Inflation in February amounted to 8,5% - analysts started expressing concern regarding rising prices for food and gas. Poland, a neighbor of Ukraine, was soon feared to be involved in military actions. Exchange rates: EUR moved from (23.02.2022) 4,5352 to 4,6284 PLN ^b
18.03.2022	+11.21%	After the announcement of the Ministry of Agriculture about aid for farmers affected by drastic increases in fertilizer prices ^c . EUR on that day - 4,7221, the day before - 4,6876 ^d , inflation – 11%
21.03.2022	+6.30%	"Anti-Putin shield" ^e .
30.05.2022	+2.55%	On the 17th of May 2022, analysts of DM BOŚ recommended BUY on Grupa Azoty S.A. shares, with the target price set at PLN 62.00 ^f . Euro on that day – 4,5869, the day before – 4,6582 ^g . Inflation – 13,9%
23.08.2022	-5%	Shares of Grupa Azoty tumbled after Poland's biggest chemicals company halted production of nitrogen fertilizers and trimmed ammonia output because of record gas prices. Shares of the country's leading chemical maker drop as much as 10% ^h . Euro on that day – 4.7603, the day before – 4.7480 ⁱ , inflation – 16,1% ^j
30.01.2023	-3.53%	New fertilizer offer, and as announced by the Ministry of Agriculture, this year, farmers will not be able to count on support in terms of subsidies for purchased fertilizers. Inflation was 17.2%
20.03.2023	-4.39%	Negative supply and demand situation on the market. Grupa Azoty reduced the production of nitrogen fertilizers. It introduced a balance standstill in the production of ammonia and urea

Source: own elaboration based on ^aLSEG Eikon database Grupa Azoty SA (accessed 21.12.2022), ^bNational Bank of Poland, <https://rss.nbp.pl/kursy/TabRss.aspx?n=2022/a/22a054> (accessed 26.12.2022), ^cBusiness Insider website, <https://businessinsider.com.pl/biznes/wizja-doplat-do-nawozow-podbila-kurs-grupy-azoty/115rvjk> (accessed 22.12.2022), ^dNational Bank of Poland, <https://rss.nbp.pl/kursy/TabRss.aspx?n=2022/a/22a038> (accessed 26.12.2022), ^ePrime Minister Mateusz Morawiecki presented the assumptions of the so-called anti-Putin shield, i.e., a program aimed at easing the economic turbulence caused by the war in Ukraine. The key objective of the first part of the shield was to mitigate food price increases. This was partly due to soaring grain prices and increased agricultural production costs. In this context, an essential factor is the prices of fertilizers, which have grown even three times over just one year. The abrupt increases were to be mitigated by the system of subsidies. The government's announcements boosted the prices of listed fertilizer producers. On Friday, 18.03.2022, Grupa Azoty's shares jumped by 11 percent to PLN 41.28, and on Monday, 21.03.2022, they continued the move and added an increase of 6 percent to PLN 43.78, which was the highest exchange rate since summer 2019. There was also news that Police chemicals can partly restore production on vital installations after the recent breakdown. The company said that the financial impact of the breakdown would be estimated in a separate filing. Source: LSEG Eikon database, op. cit., ^fGrupa Azoty SA official website, <https://tarnow.grupaazoty.com/en/investor-relations/news/analysts-of-dm-bos-recommended-buy-on-grupa-azoty-s-a-shares-2> (accessed 26.12.2022), ^gNational Bank of Poland, <https://rss.nbp.pl/kursy/TabRss.aspx?n=2022/a/22a103> (accessed 26.12.2022), ^hBloomberg website, <https://www.bloomberg.com/news/articles/2022-08-23/azoty-of-poland-halts-fertilizer-production-on-record-gas-prices?leadSource=verify%20wall> (accessed 26.12.2022), ⁱNational Bank of Poland, <https://rss.nbp.pl/kursy/TabRss.aspx?n=2022/a/22a115> (accessed 26.12.2022), ^jGłówny Urząd Statystyczny website, stat.gov.pl, (accessed: 26.12.2022).

Table 2 shows that at the beginning of April, the share price of Grupa Azoty had declined due to problems with the physical and economic availability of fertilizers which were supposed to be intensified for Polish farmers, both in connection with the war in Ukraine and as a result of the situation on world markets¹⁶. On the 10th of May, there was a negative change of 3,75% when Grupa Azoty published its results for 1Q 2022.

A positive influence brought about the recommendations from DM BOŚ that opted for “buy” for the company’s shares with the target price at PLN 62 on the 30th of May with a change of 2,55%. In June, a negative change of 10,06% on the 22nd and negative 7,66% on the 23rd occurred due to a media scandal in which e-mails came to light suggesting that some people were appointed to positions of office through the acquaintance of people in high places and bribery. On the 7th of July, a positive change was reported that Polskie Górnictwo Naftowe i Gazownictwo S.A. (PGNiG) signed an estimated 13.4 billion PLN deal extension with the company. The company was to export gas for Grupa Azoty as their new strategic supplier, resulting in a positive 5,13% change.

For Yara, from the 3rd of June 2022, the trend started going downward again due to the previously described situation. Between these brief moments, there were positive increases connected to lowered fertilizer prices by Yara and because of positive feedback from the market when Yara proved itself to be a strong figure, despite these difficult circumstances. In August, there was a negative trend for the Grupa Azoty when it halted the production of nitrogen fertilizers and trimmed the ammonia output because of record gas prices. Shares of Poland’s leading chemical company dropped as much as 10%¹⁷.

Yara International’s lowest decline appeared on the 30th of September 2022, caused by the news of its short interest being 196.9% in August. After September, the trend started to go up - information reported that Yara received a consensus recommendation of “hold” from brokerages. Also, the company published third-quarter results in 2022, which were pleasantly welcomed¹⁸.

In November, the energy prices were still alarming, which caused Grupa Azoty to decline in their share price. However, there were talks about EU support to ease the tense situation. On the 10th of November, there was a negative change of 5,77% when the financial results for the third quarter were published that were affected by the unprecedented rise in commodity prices.

¹⁶ G. Tomczyk, *Ministry of Agriculture About Prices and Availability of Fertilizers*, <https://www.farmer.pl/produkcja-roslinna/nawozy/ministerstwo-rolnictwa-o-cenach-i-dostepnosci-nawozow,117795.html> (accessed: 26.12.2022).

¹⁷ K. Krasuski, *Azoty Drops as Polish Fertilizer Output Halts on Gas Prices*, https://www.bloomberg.com/news/articles/2022-08-23/azoty-of-poland-halts-fertilizer-production-on-record-gas-prices?lead_source=uverify%20wall (accessed: 26.12.2022).

¹⁸ LSEG Eikon database Yara International ASA (accessed: 21.12.2022).

On the 20th of December, there was a positive change of 6,44% when it was announced that Grupa Azoty signed a deal to buy propane. It was assured that the propane deliveries under the agreement would secure over 50% of the unit's demand in 2023-2024¹⁹.

In December of that year, JP Morgan cut the target price for Yara to NOK 500 from NOK 540²⁰ which caused a slight decline. The percentage change in price share was reported to be 7.59% during the year. From 2023, the share price is still steady, and we can observe positive percentage changes, such as on the 5th of January when it was reported that Yara was speeding up the hydrogen economy in Germany and that the Board of Directors was changed. A positive 2.20% change was also present when the price target was again raised, and the reports informed Yara's profit from decarbonization and that it is in demand. Currently, on the 16th of March 2023, Yara International ASA's share price is worth NOK 457.55, a decline from when it was worth NOK 493.45 on the 9th of March. It could be somewhat connected to the news about Brazil no longer being dependent as much as before on imports of fertilizers. It is essential to note that Yara has been exporting its products in incredible amounts there.

For our primary focus, Grupa Azoty, during January 2023, the trend was steady and primarily positive due to worthwhile news from business analytics and promising forecasts for the upcoming month. There was also a new investment in Tarnów and a change in the management board, where the new acting chief executive officer was appointed—the last information caused a negative change of 2.05%. On the 31st of January, the Ministry of Agriculture informed that that year farmers would not be able to count on support in terms of subsidies for purchased fertilizers. The next day, Grupa Azoty cut fertilizer prices as gas prices stabilized in Europe. In March 2023, the market's negative supply and demand situation was still present. Grupa Azoty reduced the production of nitrogen fertilizers and introduced a balance standstill in the production of ammonia and urea. As of the 16th of March, Grupa Azoty S.A.'s share price is worth PLN 34.44, a decline since the previous days. It was reported that the percentage change in price share was 7.45% during the year²¹.

There needs to be a clear answer about which company dealt best with internal and external factors. However, said factors have an immense influence on the share price and the volume. Investors get swayed by the news coming not only from the company itself but also from stock brokerages, national sites, and global information that is reported, among many others. These dates were chosen to illustrate our previous belief that these determinants are crucial when discussing

¹⁹ LSEG Eikon database Grupa Azoty...

²⁰ LSEG Eikon database for Yara International ASA news (accessed: 21.12.2022).

²¹ LSEG Eikon database for Grupa Azoty S.A. ratios-overview (accessed: 14.03.2023).

share price. However, the Russian aggression had a more significant impact on Grupa Azoty's share price than on Yara's, which is connected to the proximity of the Polish company to the battlefield and connections to Russian and Ukrainian markets.

Table 3 shows a horizontal analysis of the consolidated data of Grupa Azoty between Q3 2021 and Q3 2022. The most considerable influence of the geopolitical situation of 2022 can be observed in an increase in revenue by 62.6% and in sales costs by 71.4%. According to the Food and Agriculture Organization (FAO), the prices of nitrogen fertilizers, ever since 2021, have been exceptionally high, and despite them slowing down around the middle of 2022, they were still three times higher than their long-term average around May and June of 2022²². Therefore, the increase in the company's revenues can be partially attributed to that change.

Table 3. Horizontal analysis of consolidated data for Grupa Azoty for Q3 2022 and Q3 2021

Item	Q3 2022	Q3 2021	% Change
Revenue	6,313,752	3,882,100	62.6
Cost of sales	(5,747,447)	(3,354,106)	71.4
Gross Profit	566,305	527,995	7.3
Selling and distribution expenses	(271,564)	(270,669)	0.3
Administrative expenses	(219,685)	(193,721)	13.4
Profit on sales	75,056	63,604	18.0
Net other income/(expenses)	6,907	43,290	(84)
Operating profit	81,963	106,894	(23.3)
Net finance income/(costs)	(136,124)	(75,436)	(80.4)
Share of profit of equity-accounted investees	5,318	4,169	27.6
Profit before tax	(48,843)	35,627	(237.1)
Income tax	(30,510)	(21,653)	40.9
Net profit	(79,353)	13,974	(667.9)
EBIT	81,963	106,894	(23.3)
Depreciation and amortization	188,810	193,306	(2.3)
Impairment losses	(4,155)		
EBITDA	266,618	300,200	(11.2)

Source: consolidated interim report for Q3 2022, Grupa Azoty.

Additionally, the cost of sales was a key factor causing the increase in revenues as the growing manufacturing costs raised the prices. According to Grupa

²² Food and Agriculture Organization of the United Nations..., p. 14.

Azoty, the main reason behind the rise in their production costs are the high prices of raw materials and energy, which is the main expense for the Polish company, ultimately causing a decrease in output and escalating the prices even more due to lack of supply²³. Growing costs of raw materials can be observed in the example of natural gas prices, which according to the World Bank, shows a peak increase in prices of natural gas in August 2022 when the prices reached 70.04 U.S. dollars per million British thermal units (USD/MMBtu), over 4.5 times higher than prices in August the previous year²⁴.

Table 4. Vertical analysis of the structure of operating expenses for Grupa Azoty for Q3 2022 and Q3 2021

	Q3 2022	Q3 2021
Depreciation and amortization	3.1	4.9
Raw materials and consumables used	80.9	67.9
Services	6.4	11.0
Salaries and wages, including surcharges and other benefits	8.2	11.5
Taxes and charges	0.8	4.1
Other	0.6	0.6
Total	100.0	100.0

Source: consolidated interim report for Q3 2022, Grupa Azoty.

The structure of expenses of Grupa Azoty has been expressed through vertical analysis. Table 4 displays the elements on which the company spends the most costs. Both in 2022 and 2021, raw materials and consumables used are the majority expense for the company, which is natural considering the manufacturing nature of the company. Other operating expenses can be decreased except for increased raw materials and consumables costs. The main reason behind this change is a higher increase in raw materials and consumables prices compared to different segments. Therefore, the increase in costs of one component had such significance that it decreased the share of expenses spent on the remaining parts.

Figure 1 shows the change in revenue by segment for Grupa Azoty between Q3 2022 and Q3 2021. Both graphs show that the most significant segment generating revenue for the company is the segment of agro fertilizers. In 2021 it accounted for 54.3% of the company's revenue, and during the following year, the importance of this segment increased to 62.50%. This shows that for Grupa Azoty, this particular product segment continues to be the primary source of

²³ Grupa Azoty, *Grupa Kapitałowa Grupa Azoty publikuje szacunkowe wyniki finansowe za IV kwartał oraz za cały 2022 rok*, 17 march 2023, <https://grupaazoty.com/aktualnosci/grupa-kapitalowa-grupa-azoty-publikuje-szacunkowe-wyniki-finansowe-za-iv-kwartal-oraz-za-caly-2022-rok> (accessed: 21.03.2023).

²⁴ World Bank, <https://thedocs.worldbank.org> (accessed: 21.03.2023).

revenues, increasing its importance over the analyzed period. Therefore, most of the company's financial result relies on the performance of agro fertilizers. The energy sector is another segment that has increased from 2.2% in Q3 2021 to 4.7% in Q3 2022 due to the outcomes of Russian military aggression. This change is a consequence of the high inflation of prices in this segment, which increase the value of the revenues earned by the company.

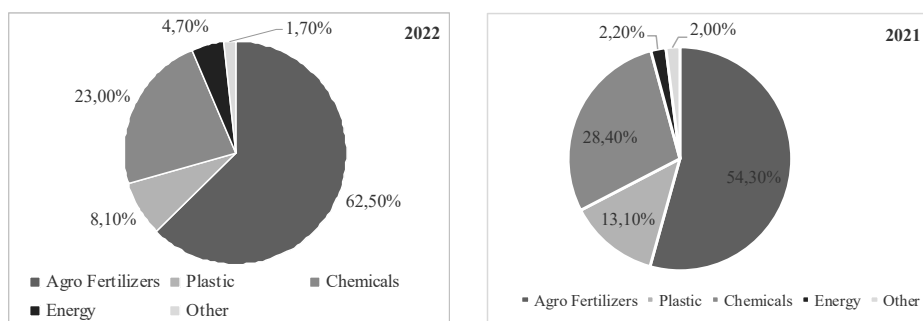


Figure 4. Change in revenue by segment for Grupa Azoty for Q3 2022 and Q3 2021

Source: consolidated interim report for Q3 2022, Grupa Azoty.

Table 5. Horizontal analysis of the balance sheet for Grupa Azoty for Q3 2022 and Q3 2021

	Q3 2022	Q3 2021	% change
Non-current assets, including:	16,631,186	14,832,104	12.1
Property, plant, and equipment	13,333,354	11,902,598	12.0
Intangible assets	1,021,619	1,019,785	0.2
Right-of-use assets	804,372	806,680	(0.3)
Other receivables	573,124	512,537	11.8
Goodwill	337,454	327,889	2.9
Current assets, including:	9,251,311	6,061,333	52.6
Inventories	3,117,519	1,683,772	85.2
Trade and other receivables	2,250,344	3,534,138	(36.3)
Cash and cash equivalents	1,885,390	706,675	166.8
Property rights	1,948,861	86,139	2,162.5
Total assets	25,882,497	20,893,437	23.9
	Q3 2022	Q3 2021	% change
Equity	10,945,217	8,534,909	28.2
Non-current liabilities, including:	6,919,075	6,488,874	6.6
Borrowings	4,571,495	4,010,890	14.0
Other financial liabilities	708,731	609,914	16.2

Deferred tax liabilities	438,726	535,009	(18.0)
Employee benefit obligations	397,987	477,954	(16.7)
Lease liabilities	352,821	333,260	5.9
Provisions	238,832	213,469	11.9
Government grants	190,046	194,530	(2.3)
Current liabilities, including:	8,018,205	5,869,654	36.6
Trade and other payables	5,057,685	3,818,852	32.4
Other financial liabilities	1,341,242	852,695	57.3
Borrowings	618,273	574,476	7.6
Provisions	75,824	45,537	66.5
Government grants	513,288	382,855	34.1
Total equity and liabilities	25,882,497	20,893,437	23.9

Source: consolidated interim report for Q3 2022, Grupa Azoty.

Analyzing the balance sheet of Grupa Azoty, a 52.6% increase in current assets between the Q3 2021 and Q3 2022 can be noticed as it is presented in Table 5. This increase is significantly higher than the increase in non-current assets, which amounted to 12.1%. An over 50% increase results from changes in positions like inventories, cash and cash equivalents, and property rights that constitute the current assets segment. Grupa Azoty increased its inventories by 85.2% since last year. This change happened due to the increase of prices in the critical raw materials, which by rising production costs, influenced the value of inventory. The increase in cash and cash equivalents might be a strategic decision to increase liquidity as a safety measure during the difficult economic situation in Poland. According to company information, a 2,162.5% increase in property rights is partially due to the performance of future contracts for purchasing carbon emissions allowances, settlement of emissions for 2021, and receipts of free assistance for 2022²⁵.

Analyzing the equity and liabilities side of Grupa Azoty's balance sheet, we can notice an increase in equity by 28.2%. This increase was not due to any issuance of the shares of stock during the Q3 of 2022, as written in the consolidated interim report for that period²⁶. The main reason for the increase was caused by the changes in the equity attributed to owners of the parent company. A rise of 36.6% can also be observed in the current liabilities of the company, especially other financial liabilities, and provisions have an increase of over 50%. An increase in other financial liabilities is due to the rise of interest rates, as can be seen, based on the National Bank of Poland's benchmark reference rate, which after

²⁵ Consolidated interim report for Q3 2022, Grupa Azoty.

²⁶ *Ibidem*.

a constant increase since February 2022, has remained at the level of 6.75% from September 2022 up to March 2023²⁷.

Table 6. Calculated ratios for Grupa Azoty S.A and Yara International ASA as of 14.03.2023

Ratios	Grupa Azoty	Yara
Current Ratio (LFI) ^a	1.15	1.99
Quick Ratio (LFI)	0.76	0.98
ROE Comm Eqty (LTM) ^b	21.35%	35.40%
ROA Tot Assets (LTM)	8.42%	15.78%
Gross Profit % Margin (LTM)	20.49%	27.39%
Operating Income % Margin (LTM)	10.72%	16.01%

^aLFI – Latest Fiscal Interim; ^bLTM – Latest 12 Months

Source: LSEG Eikon database for Grupa Azoty S.A and Yara International ASA

Table 6 displays ratio analysis that has been conducted using six ratios. To have a complete overview of the company's financial health, selected ratios cover financial strength, management effectiveness, and profitability. Furthermore, the proportions of the competitive company, Yara, have been supplied for comparison to show a fuller picture of the industry.

The current and quick ratios showcase the two corporations' financial strength. The current ratio of Grupa Azoty equals 1.15, which means that the value of the company's existing assets exceeds the number of current liabilities and will be able to fulfill its obligations for short-term liabilities. It is a satisfactory outcome. However, when considering the current ratio of Yara, we can see that it amounts to 1.99, almost equal to the desired balance of 2²⁸. A similar situation can be observed for the quick ratio, excluding inventory, the least liquid current asset, and providing better information about the company's liquidity. Despite both companies being below the preferable ratio of 1, a clear advantage can be seen in the case of Yara Corporation, which once again is closer to the target ratio²⁹.

Management efficiency has been expressed through Return on Equity (ROE) and Return on Assets (ROA). These ratios indicate how well the company generates profits using equity for ROE and assets for ROA³⁰. In the case of Grupa Azoty, 21.35% of common equity invested in the company returns to the investors and

²⁷ National Bank of Poland, <https://nbp.pl/en/monetary-policy/mpc-decisions/interest-rates/> (accessed: 22.02.2023).

²⁸ A. Tracy, *Ratio Analysis Fundamentals: How 17 Financial Ratios Can Allow You to Analyse Any Business on the Planet*, "CreateSpace Independent Publishing Platform" 2012, p. 21.

²⁹ Y.A. Babalola, F.R. Abiola, *Financial Ratio Analysis of Firms: A Tool for Decision Making*, „International Journal of Management Sciences”, 2013, vol. 1, no. 4.

³⁰ G.T. Friedlob, L.L.F. Schleifer, *Essentials of Financial Analysis*, John Wiley & Sons, Hoboken, New Jersey 2003, p. 58.

about 8.42% of total assets. For Yara, both return on equity, which equals 35.4%, and return on assets amounting to 15.78%, are at a higher rate than in Grupa Azoty, which means that out of the two, Yara is the more profitable company.

Gross Profit Margin and Operating Income Margin convey profitability. Gross Profit Margin expresses the percentage of the revenues retained by the company after subtracting the manufacturing costs³¹. In the case of the Polish company, only 20.49% of the sales revenues remain. In the case of the Norwegian company, 27.39% of incomes stay in the company, almost 7% more. The Norwegian company retains 5.29% more of its revenues after paying all its operating costs than its Polish competitor. The operating Income Margin measuring the revenues from sales after subtracting operational expenses, also favors Yara.

A clear picture of Grupa Azoty is showcased based on the selected ratios. The company is profitable, has no liquidity problems, and generates profit through its assets and equity. However, compared to the competition, the results may need to be improved as they reveal space for improvement. The Polish company does not use its assets and equity as efficiently as the Norwegian company and retains less profit. Therefore, it is less competitive in the market than its competition.

Conclusions

In this research, the main focus was on concerns and consequences connected to the crisis caused by Russian aggression against Ukraine, which has been reported through countless sources and felt by the world. The condition of the European chemical industry as of 2023 was briefly explained. However, our primary focus was Grupa Azoty as an example of a manufacturing company in the chemical sector and how the crisis influenced its financial results and stock prices. After analyzing the situation in the chemical industry and a closer inspection of the stock prices, and economic consequences of Grupa Azoty, we can conclude that the crisis from 2022, caused by the war in Ukraine, has had a significant influence on the chemical industry in Europe. Published information about the developments of the war and its consequences influenced investors' confidence levels and caused the prices on the stock exchange to fluctuate. Furthermore, macroeconomic and political factors influence the financial results of the company. Even though it seemed like the sanctions on Russia created an opportunity to increase the market share by filling the gap created by the lack of imports, the market conditions hindered that process. Especially the rise in energy and raw materials prices played an important role as they are the main expense for manufacturing companies in the chemical industry.

³¹ A. Tracy, *Ratio Analysis Fundamentals...*, p. 14.

When it comes to managerial decisions main focus for Grupa Azoty is adapting to the conditions of the market, such as the prices of resources and demand for products. It will likely continue to do so until the situation stabilizes. Using the restrictions on imports from Russia to grow the company's sales and influence on the market seems unlikely under pressure. High prices of raw materials caused production costs to rise significantly, resulting in an increase in the merits of the company's products, among which the most crucial part play agro fertilizers. Those prices, coupled with the lower availability of fertilizers on the market, impact the agriculture industry and cause the prices of agricultural produce to rise. If the company continues to lower production below its capacity and struggles with rising operating costs, layoffs will become inevitable. Therefore, the consequences of the geopolitical situation as of 2022/2023 not only influence the company's financial position and managerial decisions through the economic situation in the country but also spread further to other industries and society.

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Summary

The crisis that started in 2022 due to the Russian invasion of Ukraine continued throughout the following year, and as of 2023, the market situation regarding the chemical industry was especially tense. In this case study, we try to portray the present status of Poland's leading manufacturer of fertilizers, Grupa Azoty S.A., with a comparison to its Norwegian competitor Yara International ASA. We look for an answer to how both have been affected by the crisis and the general trends between February 2022 and March 2023. To answer research objectives and questions, we use secondary research methods with the analysis of existing literature and financial study conducted with the available reports from the companies from the database of LSEG. After analyzing the situation as of 2023 in the chemical industry and a closer inspection of the stock prices and financial results of Grupa Azoty, we can conclude that the crisis caused by the war in Ukraine has had a significant influence on the chemical industry in Europe. Published information about the developments of the war and its consequences influenced investors' confidence levels and caused the prices on the stock exchange to fluctuate. Furthermore, macroeconomic and political factors influence the financial results of the company. Even though it seemed like the sanctions on Russia created an opportunity to increase the market share by filling the gap created by the lack of imports, the market conditions hindered that process. Especially the rise in energy and raw materials prices played an important role as they are the main expense for manufacturing companies in the chemical industry.

Keywords: chemical industry, energy crisis, sanctions, financial analysis, stock analysis

PRZEMYSŁ CHEMICZNY W EUROPIE W CZASIE KRYZYSU WYWOŁANEGO PRZEZ ROSJĘ: STUDIUM PRZYPADKU GRUPY AZOTY

Streszczenie

Kryzys, który rozpoczął się w 2022 r. z powodu rosyjskiej inwazji na Ukrainę, trwał przez następny rok, a od 2023 r. sytuacja na rynku była szczególnie napięta pod względem przemysłu chemicznego. W niniejszym studium przypadku staramy się przedstawić obecną sytuację największego polskiego producenta nawozów, Grupy Azoty S.A., w porównaniu z norweskim konkurentem, Yara International ASA. Szukamy odpowiedzi na to, w jaki sposób obie firmy zostały dotknięte kryzysem i jakie są ogólne trendy w tym okresie między lutym 2022 a marcem 2023 r. Aby odpowiedzieć na cele i pytania badawcze, korzystamy z metod badawczych wtórnych z analizą istniejącej literatury oraz analizy finansowej przeprowadzonej na podstawie dostępnych raportów firm z bazy danych LSEG. Po przeanalizowaniu sytuacji na rynku chemicznym w 2023 r. oraz dokładniejszym zbadaniu cen akcji i wyników finansowych Grupy Azoty, możemy stwierdzić, że kryzys spowodowany wojną na Ukrainie miał duży wpływ na przemysł chemiczny w Europie. Opublikowane informacje o przebiegu wojny i jej konsekwencjach wpływają na poziom zaufania inwestorów i powodują wahania cen na giełdzie. Ponadto, czynniki makroekonomiczne i polityczne mają wpływ na wyniki finansowe przedsiębiorstwa. Chociaż wydawało się, że sankcje nałożone na Rosję stworzyły okazję

do zwiększenia udziału w rynku przez wypełnienie luki powstałej w wyniku braku importu, to w rzeczywistości warunki rynkowe utrudniały ten proces. Szczególną rolę odegrał wzrost cen energii i surowców, ponieważ są one głównym kosztem dla przedsiębiorstw produkcyjnych w przemyśle chemicznym.

Słowa kluczowe: przemysł chemiczny, kryzys energetyczny, sankcje, analiza finansowa, analiza cen akcji