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CREDIT BORROWER SECTOR OF ECONOMY AND CREDIT RISK FOR BANKS

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ABSTRACT

The purpose of the article. Business entities in different industries operate differently. Therefore, different sectors are characterized, among other things, by different profitability, the need for external financing, and, consequently, a different level of risk of default on credit commitments to banks. Borrowers from specific industries may be, from the perspective of banks' interests, better or worse customers and contribute to strengthening or weakening the quality of their credit portfolios.

The purpose of the article is to compare sections of the economy in terms of the credit risk accompanying banks lending to them. The analysis conducted will be used to verify the hypothesis that industries are significantly different in terms of banks' credit risk related to credits they grant.

Methodology. The article supplements the literature with a cross-sectional analysis of economic sectors and includes an assessment of the differentiation of each of them in terms of their economic condition and the associated potential risk of banks lending to their respective industries. The first section of the article presents a literature review covering the issue of comparing the risk of operating in different industries, and the second presents the classification of sections of the economy according to the Polish Classification of Activities (PKD) . The third part presents data from the National Bank of Poland NBP on the repayment of credits in various industries. The fourth section of the article presents the characteristics of each section of the economy. The size of the operating of each industry, taking into account the size of its revenues and the number of enterprises, as well as the scale of investment and the demand for credit and loans in each section of the economy are presented. The cost level index, debt-to-equity ratio, the

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share of credit s and credits of each section in relation to equity are also examined. The relationships between: debt and financial results of sectors, financial costs and credit, and financial costs and net financial results of industries are also characterized in this chapter. In addition, the profitability and liquidity of economic sections were examined. The fourth chapter also analyzed data on bankruptcy and restructuring proceedings opened by section of the economy.

Results of the research. The assumptions and results of the analysis of the risk of credit defaults by each section of the economy are presented in the last section of the article. In addition, the results of the analysis carried out in the article are discussed and compared with NBP data on the share of credits in phases 2 and 3 in each industry. The conclusion of the study is that industries are significantly different in terms of credit risk from the perspective of the banks providing them with financing.

Keywords: credit risk, sector of economy, bank credit, credit quality, loans quality.

JEL Class: G21.

1. LITERATURE REVIEW

Banks have important functions in the economy. As Jaworski and Szelągowska (2014) point out, they influence the development of almost all sectors of the economy and the level of investment and consumption in the economy. However, banks, when considering an application for credit granted, must first and foremost assess the credit risk associated with their decisions, and such a risk may be differentiated by the industry of the economy to which a borrower belongs.

There is a number of studies examining the risks associated with entities operating in a particular industry. Zalewska and Sokół (2022) have studied the financial health of companies in the construction industry listed on the Warsaw Stock Exchange under conditions of a changing environment, and have been concerned with measuring the associated level of risk. The industry was chosen by the authors for the study as having significant importance for the economy of each country and the quality of life of society. The study showed that entities in this section of the economy are characterized by a fairly high level of total debt, which is associated with its high capital absorption and, at the same time, a relatively low level of financial risk.

Kamińska and Nowak (2022) have focused on analyzing the risks of doing business in the automotive industry, pointing out the main risks in the form of component unavailability and broken supply chains, and emphasizing the role of effective management leading to risk reduction. The logistics industry was also dealt with by Siciński (2021), focusing on the causes of insolvency of entities in this section. He pointed to dependence on suppliers and connections linking entities in the production chain and competition emerging in the market, as well as buyer power and price flexibility as determinants of insolvency risk in the industry. On the other hand, Boratyńska and Yafremava (2023), conducting

research in a similar area, assess that analyzing the bankruptcy risk of entities in the automotive industry requires the use of a variety of research methods in order to identify warning signals of bankruptcy risk early enough.

Zuba-Ciszewska (2020), on the other hand, focused on a detailed analysis and role of the food industry in Poland. She noticed the problems of this industry, such as the limitations of the absorptive capacity of the internal market, or the issue of increasing import of most types of products and competition in the market.

Nakonieczny et al. (2022) have taken upa topic of assessing liquidity and profitability on the example of the mining and steel industry. Based on an analysis of the situation of selected companies, the authors noted that despite the safe levels of liquidity and profitability ratios in the studied group, they are becoming worse over time (2017–2020). The observed results made the authors conclude that this could "lead to bankruptcy and the slow disappearance of the industry in the domestic market".

Kantor (2021), using the example of the food service industry, showed that even experienced entrepreneurs operating in the sector who are aware of the risks associated with its operation may have difficulty managing risks in extraordinary situations, as presented against the backdrop of the Covid-19 pandemic.

Zemlińska-Sikora (2021) also based her research on the Covid-19 pandemic period when analyzing the IT industry. According to the author, the difficult time of the pandemic opened growth opportunities for the industry, as the time of working remotely gave the IT industry the opportunity to increase sales of products and solutions offered.

The above studies focused on a selected industry and were not conducted in the context of credit risk for banks. This topic was dealt with, for example, by Kokczyński and Witkowska (2020) or Konopka (2021), but not in the context of dividing the economy into industries, but focusing only on the issue of credit risk assessment by banks in connection with financing provided to specific companies.

A cross-sectional assessment of industries was undertaken by Jaki and Kruk (2022). The study, covering the period 2007–2019 and the following categories: fuels and energy; chemicals and raw materials; industrial production and construction; consumer goods; trade and services; health care; and technology, examined the profitability of companies. Its results showed that health care was the worst performer on the list. In other categories, the results were much less varied. The basis for the division of companies was the sector classification according to the Stock Exchange Yearbook. However, the analysis according to this classification does not correspond to that resulting from the categorization of companies' activities according to the industry of the PKD, and focuses only on listed companies.

A comparative analysis by PKD section was completed by Zawadzka (2009), however, only to the extent of covering the importance of short-term liabilities in corporate financing. Moreover, the study covered a distant time period, i.e., 1998–2007.

The risk assessment of individual industries, based on companies listed on the Warsaw Stock Exchange, was carried out by Homa and Mościbrodzka (2017). The authors were concerned with determining the value at risk for individual industry sectors of listed companies. The mining and fuel and energy industries proved to be the most risky. However, the analysis did not cover all PKD industries. An assessment of selected sector indices on the Warsaw Stock Exchange was also made by Konarzewska (2017), focusing on the analysis of the market risk of investments rather than the credit risk of the industry in the context of bank credit granting.

In the literature, it is difficult to find the studies that focus on comparing the operating risks of companies active in different industries. This study presents a characterization of all industries with a focus on credit risk, which is associated with operating in a specific section of the economy and determines the ability of these industries to repay their credit commitments to banks.

2. CLASSIFICATION OF ECONOMIC ACTIVITY ACCORDING TO PKD

The division of various types of economic activity is defined in the Regulation of the Council of Ministers of December 24, 2007 on the Polish Classification of Activities (PKD). Its use is mandatory in statistics, record-keeping and documentation and accounting, as well as in official records and public administration information systems. The division structure comprisesfive levels, which include, in order from the most general: section, division, group, class and subclass. The most general division includes 21 sections, designated by a single-letter symbol, which are types of activities that, as the Regulation indicates, consist of activities related to each other from the point of view of the traditionally formed, general division of labor. The 21 sections mentioned above are:

1. A agriculture, forestry, hunting and fishing;
2. B mining and quarrying;
3. C manufacturing;
4. D electricity, gas, steam, hot water and air conditioning supply;
5. E water supply; sewage and waste management and remediation activities;
6. F construction;
7. G wholesale and retail trade; repair of motor vehicles, including motorcycles;
8. H transportation and warehouse management;
9. I accommodation and food service activities;

10. J information and communication;
11. K financial and insurance activities;
12. L real estate activities;
13. M professional, scientific and technical activities;
14. N administrative and support service activities;
15. O public administration and defense; obligatory social security;
16. P education;
17. Q health care and social assistance;
18. R cultural, entertainment and recreational activities;
19. S other service activities[1];
20. T households employing workers; households producing goods and providing services for own use;
21. U extraterritorial organizations and groups.

From the definition that comes from the Regulation, it follows that an operation is involved when factors such as equipment, labor, production technology, information networks or products are combined to produce a specific product or perform a service. An operation is characterized by its input products (goods or services), technological process and output products. In addition, it is worth noting that business entities usually carry out different types of activities. In order to properly classify an entity, it is therefore necessary to determine its leading activity, .i.e., the largest share of the indicator characterizing the entity's activity. The Regulation recommends that statistical surveys for determining the predominant activity should be guided by value added[2].

3. NBP DATA ON CREDIT REPAYMENT BY INDUSTRY

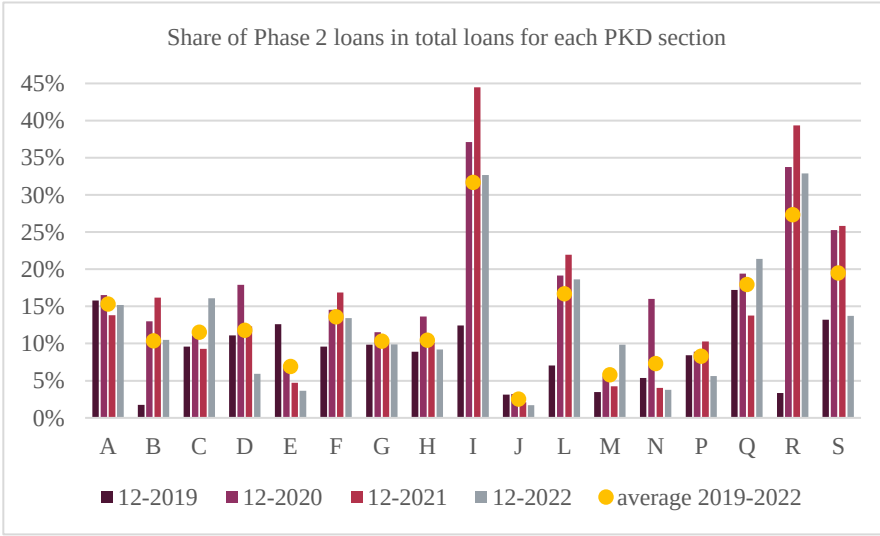
The inspiration for the study on comparing sections of the economy in terms of the credit risk accompanying banks that grant credits to them, and looking for own indicators that would demonstrate that particular industries may have a problem with credit repayment, came from the NBP's financial system stability reports[3], showing the volumes of credit in banks' portfolios, in phases 2 and 3.

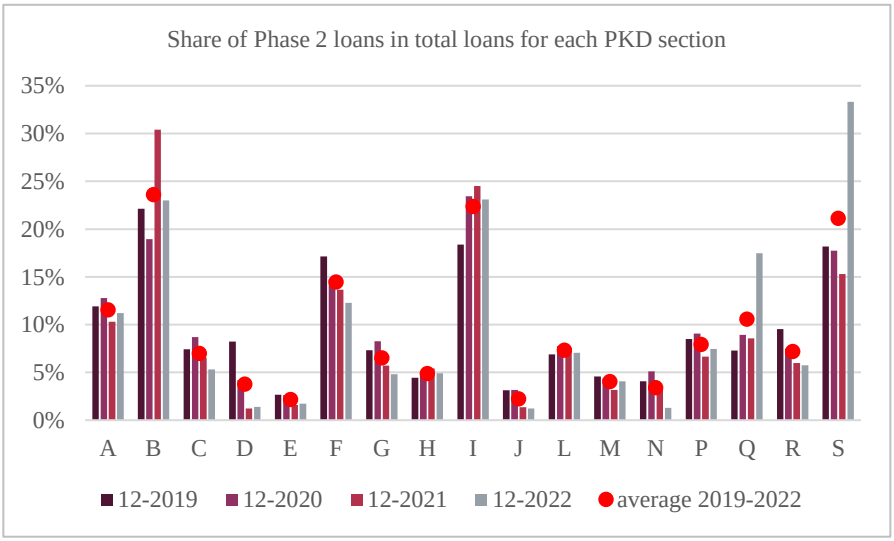
[1] This category includes activities of membership organizations, repair and maintenance of computers and personal and household goods, other individual service activities.

[2] According to the Statistics Poland, gross value added in public statistics "represents the sum of gross value added of all institutional sectors or branches of economic activity. It is calculated as the difference between output and intermediate consumption (production side) or as the sum of employment-related costs, amortization of fixed assets, gross operating surplus/gross mixed income and other taxes decreased by production-related subsidies (income side)" – GUS.

[3] NBP Reports on the stability of the financial system for the periods June 2021, June 2022, June 2023.

Chart 1. Share of phase 2 (top graphic) and phase 3 (bottom graphic) loans in total loans for each PKD section, 2019–2022[4]





Source: based on the NBP Reports on the stability of the financial system for the periods June 2021, June 2022, June 2023.

[4] Data according to the National Bank of Poland including estimates of loan shares based on reporting of so-called large exposures. Data includes share of loans to entrepreneurs and individual farmers.

Phase 2 includes banks' non-performing loan exposures, excluding POCI[5] assets , for which, at a given point in time, the credit risk associated with a given loan has increased significantly since initial recognition. On the other hand, phase 3 includes impaired credit exposures as defined in Appendix A of IFRS 9[6], excluding POCI assets, where there is evidence/indication of impairment as of a given date. Banks' phase 2 and phase 3 receivables thus show loans where repayment difficulties have occurred or the borrower's economic and financial situation is suspected to be deteriorating. The information on the share of loans in phase 2 and phase 3 by each section of the economy makes it possible to infer the credit risk associated with the financing of particular industries.

As can be seen in Chart 1, the share of loans in phases 2 and 3 changed from year to year. This is particularly noticeable in phase 2 in the accommodation and food service activities (I) section, where the share of phase 2 loans in relation to all loans increased significantly in 2020–2022 with relation to 2019. A similar situation applies to the culture, recreation and entertainment (R) and mining (B) sections.

Analyzing Phase 3, increases in the share of non-performing loans have been recorded in recent years, especially in sections S other services, as well as Q health care.

Considering the average of 2019-2022, the industries with the largest share of loans in phase 2 are as follows:

- accommodation and food service (I) (31.7%);
- culture, recreation and entertainment (R) (27.3%);
- other services (S) (19.5%);
- health care (Q) (18.0%);
- real estate services (L) (16.7%).

In turns, the industries with the largest share of phase 3 loans according to the 2019-2022 average are:

- mining (B) (23.6%);
- accommodation and food service (I) (22.4%);
- other services (S) (21.1%);
- construction (F) (14.5%);
- agriculture (A) (11.6%).

When analyzing the above data, it is important to consider the impact of the Covid-19 pandemic on the economy. As the UKNF[7] points out, wholesale and retail trade (G), real estate services (L) and manufacturing (C) were the most affected by the pandemic, but accommodation and food service activities (I) and

[5] Purchased or originated credit-impaired asset – purchased or originated financial asset(s) that are credit-impaired on initial recognition, as defined in Appendix A of IFRS 9.

[6] International Financial Reporting Standard 9.

[7] UKNF information on the situation of the banking sector in 2020.

construction (F) also suffered. The data mapped information on the industry structure of loans covered by non-statutory moratoria in 2020[8].

As mentioned above, the data from the NBP reports became the motivation for conducting our own research, which is presented in Chapter 5. In this chapter, the results of own analysis are also compared with the data from the NBP reports.

4. CHARACTERISTICS OF SECTORS

In the article, the sections of the economy are presented in different terms to best reflect their nature. Not all the sources used in the study provide information on each of them. In addition, the various sources publish information in different terms, as noted later in the paper.

In the article, the term "section" of the economy is used interchangeably with the terms "industry" or "sector", which are not mentioned in the aforementioned PKD Regulation, but are commonly used phrases for a specific group (i.e., a section) of economic activity.

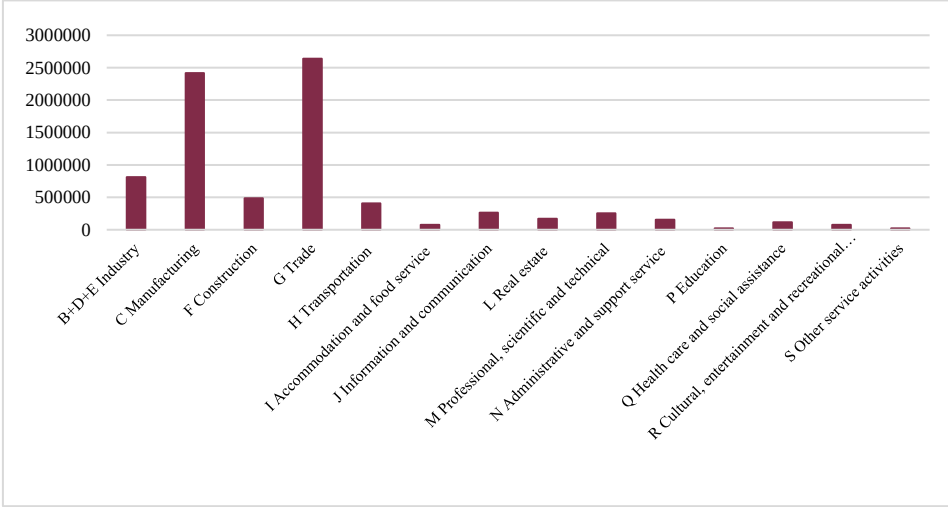
What is excluded from the analysis is the section of financial and insurance activities (K), which includes banks, i.e., entities whose risk exposure to financing other industries is examined in the article.

4.1. Revenue volume and number of operators by industry

It is useful to start characterizing industries by determining their size. For this purpose, the revenue data of each industry was collected and presented in Chart 2. In 2022, the largest revenues were generated by trade and manufacturing, clearly standing out in this category compared to other industries. These two sectors together accounted for two-thirds of the total revenue of all analyzed industries. With the revenue data, it is also worth comparing information on the number of entities operating in each industry (Chart 3). Trade is again the leader in this category, with 20% of entities concentrated in this industry, followed by construction (15%) and professional, scientific and technical activities (14%, with a 3% share of total industry revenues). Construction, the second largest industry in terms of revenue, is only 5th in terms of the number of entities clustered in an industry. Therefore, it can be seen that various industries have quite different characteristics, primarily characterized by different degrees of fragmentation.

[8] Banks temporarily suspend the requirement for customers to repay capital installments.

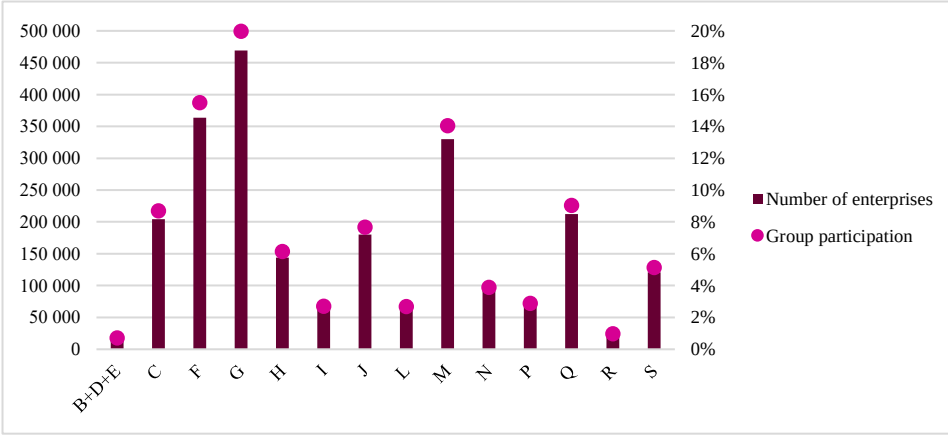
Chart 2. Revenue volume by industry (PLN million), 2022



* Data on industry, i.e., sections B+D+E, are given collectively without a split into individual industries, only with the separation of manufacturing, i.e. section C.

Source: own study based on GUS Report data.

Chart 3. Number of enterprises by industry (left axis), % share of total industries (right axis), 2022

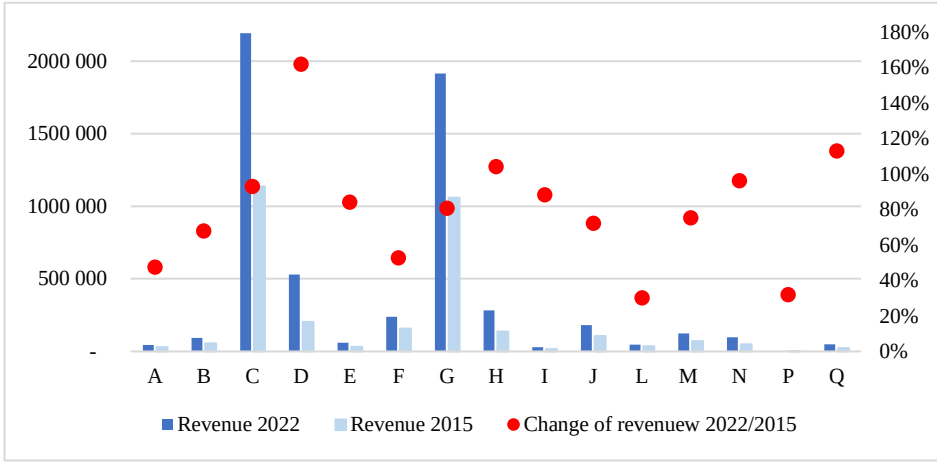


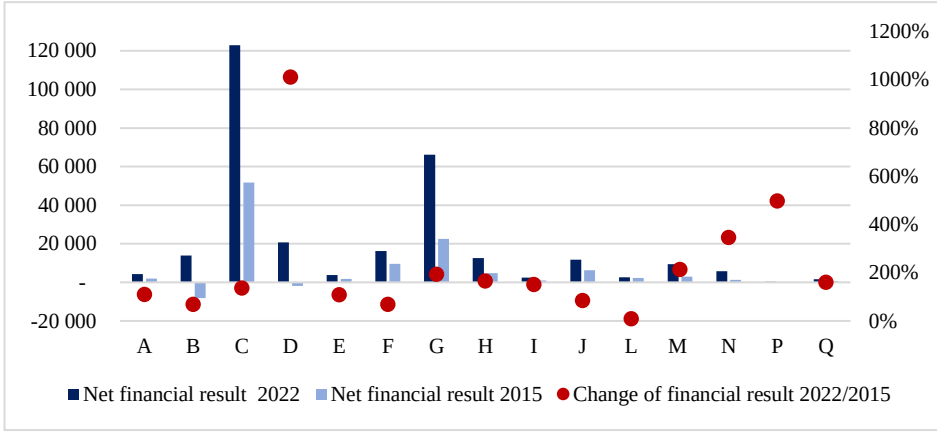
* Data on industry, i.e., sections B+D+E, are given collectively without a split into individual industries, only with the separation of manufacturing, i.e., section C.

Source: own study based on GUS Report data.

For evaluating industries, it is not only the value of revenues that is important, but more significant are the financial results achieved by them, as well as the change in both values over time. Comparing the years 2022 and 2015, it can be seen that revenues in all industries increased, but this took place at noticeably different tempos (Chart 4 top graphic). Quite similar were the changes in relation to net income (Chart 4 bottom graphic).

Chart 4. Revenue and change of revenue 2022/2015 (top graphic);
net financial result and change of net financial result 2022/2015 (bottom graphic)





Source: Statistical Yearbook of the Republic of Poland, 2023[9].

[9] The data is for non-financial enterprises with 10 or more employees. The data does not include entities engaged in banking, brokerage, insurance, as well as investment and pension

Table 1. Ratio of financial result growth to revenue growth

Section	A	B	C	D	E	F	G	H
Financial result/ Revenue	2,33	1,02	1,48	6,25	1,31	1,31	2,41	1,60
Section	I	J	L	M	N	P	Q	.
Financial result/ Revenue	1,72	1,18	0,35	2,84	3,60	15,52	1,42	.

Source: Statistical Yearbook of the Republic of Poland, 2023[10].

To assess the situation from the perspective of banks, it can be noted that a high revenue growth is perceived positively, while small changes in revenue growth can be alarming and signify a low growth potential of industries and decreasing ability to settle their liabilities relative to other sections. It is even more important to assess whether revenue growth over time is followed by an increase in net income, i.e., how effectively industries are able to use the growth potential. The most favorable translation of revenue dynamics into profit dynamics (see Table 1) can be observed for the industries of education (P), energy generation and supply (D), administrative services (N), professional, scientific and technical activities (M) and agriculture (A).

Comparing 2015 with 2022, it can be observed that all sectors recorded increases in both revenue and net income over time, but the lowest revenue increases occurred in the real estate services (L), education (P), agriculture (A), construction (F) and mining (B) sectors.

In contrast, the lowest growth over time in net income was in the real estate services (L), mining (B), construction (F), information and communications (J) and agriculture (A) industries.

4.2. Cost level index

When analyzing the efficiency of the industry, it is also worth looking at the cost level index, defined as the relation of costs to revenues (Figure 5). This index is the more favorable the lower values it takes, as it illustrates the share of costs incurred to the value of sales revenues. In this aspect, the best in 2022 was the mining and quarrying industry (B), but it is worth noting that this was also the industry with the worst cost level ratio in 2015. The next industry with the best cost level index was agriculture (A). The highest cost level index, and therefore

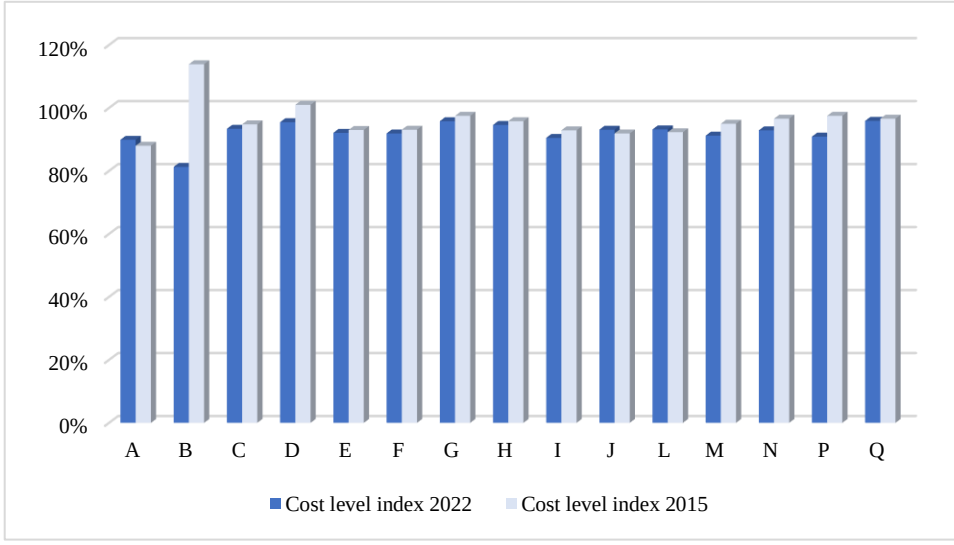
companies, national investment funds, universities, as well as independent public health care institutions, cultural institutions with legal personality and individual farms in agriculture, as well as trade unions, religious and political organizations.

[10] Ibid.

the worst performance in this category, can be observed for the following industries: health care and social assistance (Q), wholesale and retail trade (G) and electricity generation and supply (D).

Immense attention is drawn to mining (B), the least efficient in 2015, which became the leading industry in this regard in 2022. In the remaining sections of the economy, the situation of profitability and economic efficiency as measured by the cost level index was rather stable.

Chart 5. Cost level index, 2015 and 2022[11]



Source: Statistical Yearbook of the Republic of Poland, 2023[12].

[11] Data does not include the following industries:
- O. public administration and defense; obligatory social security;
- R. cultural, entertainment and recreational activities;
- S. other service activities;
- T. households employing workers; households producing goods and providing services for own use;
- U extraterritorial organizations and groups.

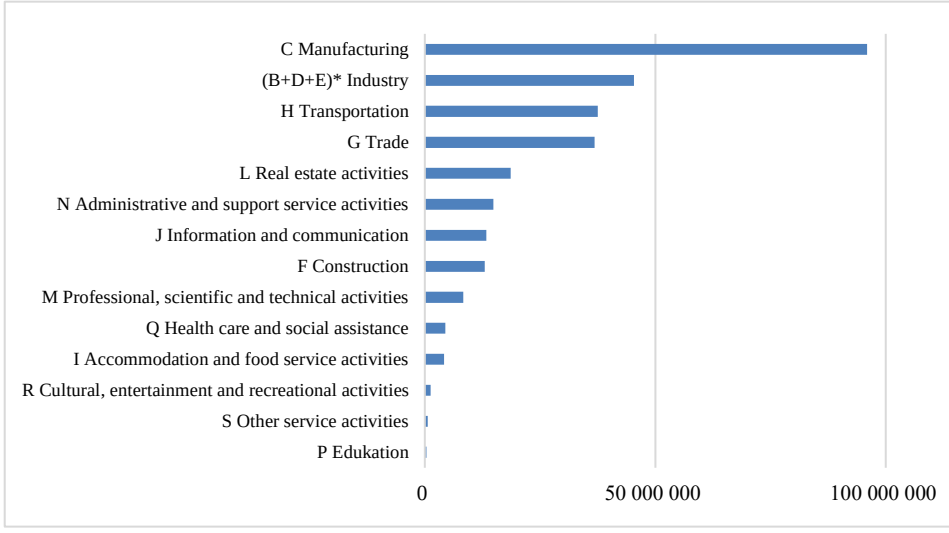
[12] The data is for non-financial enterprises with 10 or more employees. The data does not include entities engaged in banking, brokerage, insurance, as well as investment and pension companies, national investment funds, universities, as well as independent public health care institutions, cultural institutions with legal personality and individual farms in agriculture, as well as trade unions, religious and political organizations.

4.3. Investment and credit and loan demand by industry

When analyzing the issue of bank financing of the economy by industry, attention should be paid to the needs of various sections. Information in this regard is provided by GUS data on expenditures on property, plant and equipment incurred by enterprises, i.e., capital expenditures and expenditures on the purchase of used fixed assets (see Chart 6). The largest investment outlays are made in the industrial sector, which includes four sections: mining and quarrying, manufacturing, electricity generation and supply, and water supply and sewage and waste management[13]. The total outlays of these four sections account for approx. 48% of total outlays, with the largest outlays being incurred in the industrial processing sector (33%). High investment needs are also recorded in the transportation and trade industries, 13% and 12% of total outlays, accordingly.

Therefore, it can be noted that the manufacturing industry, which generates the highest revenues in the economy (see Chart 4), is also characterized by the highest level of investment.

Chart 6. Enterprises' expenditures on property, plant and equipment (investments and expenditures on the purchase of used fixed assets) in 2022 by industry, in thousands of PLN



* Data on industry, i.e., sections B+D+E, is given collectively without a split into individual industries, only with the separation of manufacturing, i.e., section C.

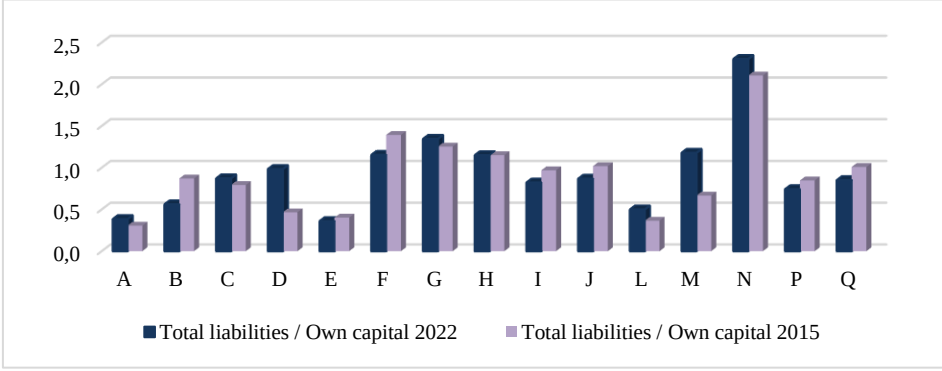
Source: own study based on GUS Report data.

[13] Data on industry, i.e. sections B+D+E, are given collectively without a split into individual industries, only with the separation of manufacturing, i.e. section C.

The level of credit and loan demand by sector can be illustrated by the debt-to-equity ratio. In Chart 7, the ratio is shown for each sector in 2015 and in 2022. It can be noted that the ratio of total liabilities to equity varies widely across industries. This is, of course, due to the different nature of the operation of these industries and the different needs for external financing. Some industries finance their operations mainly with own capital, borrowing less and reducing financing costs. In other sectors, on the other hand, a greater need to reach for external capital is noticeable, resulting, among other things, from high investment activity[14].

Among the industries whose financing source structure is dominated by own capitals are: water supply, sewage and waste management (E); agriculture (A), and real estate activities (L). On the other hand, among the industries that make the most use of external capitals to finance their activities are: administrative services activities (N), as well as wholesale and retail trade (G), and construction (F). It's also worth noting that in the case of the electricity generation and supply (D) and professional, scientific and technical activities (M) industries, debt to equity increased significantly in 2022 relative to 2015. Over the analyzed period, changes in the other direction were made primarily in mining (B), which significantly reduced the share of external financing.

Chart 7. Debt to equity ratio, 2015 and 2022



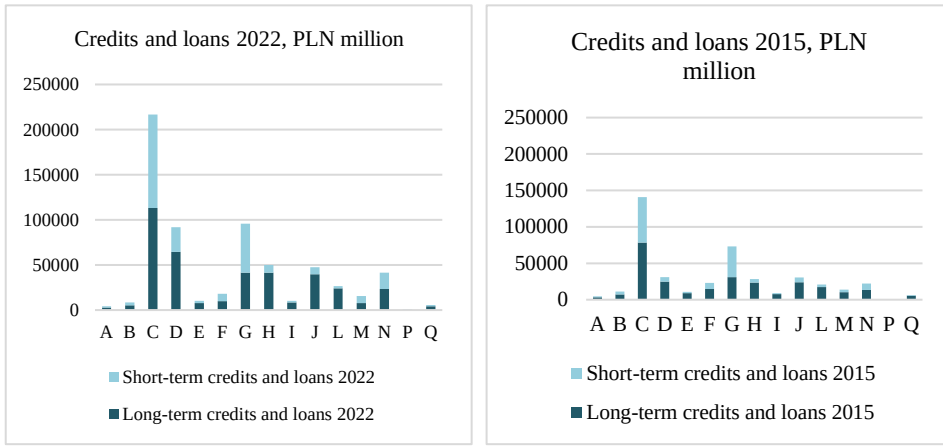
Source: Statistical Yearbook of the Republic of Poland, 2023[15].

[14] The speed of asset turnover and the resulting capital structure, shaped by the specifics of the industry, also feature significantly.

[15] The data ais for non-financial enterprises with 10 or more employees. The data does not include entities engaged in banking, brokerage, insurance, as well as investment and pension companies, national investment funds, universities, as well as independent public health care institutions, cultural institutions with legal personality and individual farms in agriculture, as well as trade unions, religious and political organizations.

Analyzing the interest of industries in credits and loans, it should be noted that the greatest use of this type of financing in 2022 was made by processing (at the same time an industry with a large share of the economy) (C), trade (G) and manufacturing and energy supply (D). For the last mentioned industry, a large increase in interest in credits and loans can be noted when comparing 2015 and 2022. A summary of long and short-term credits and loans granted to each industry is presented in Chart 8.

Chart 8. Credits and loans 2022 (left graphic), 2015. (right graphic), PLN million



Source: Statistical Yearbook of the Republic of Poland, 2023[16].

Complementing the information gathered in Chart 7 (debt-to-equity ratio) is a comparison of industries by the ratio of credits and loans to own capital (Chart 9). The highest value in 2022 is recorded for the sector of administrative services activities (N), accommodation and food service activities (I), transportation and storage (H) and information and communication (J). In 2015, the configuration of industries in this aspect was different, with the highest ratio also observed for the

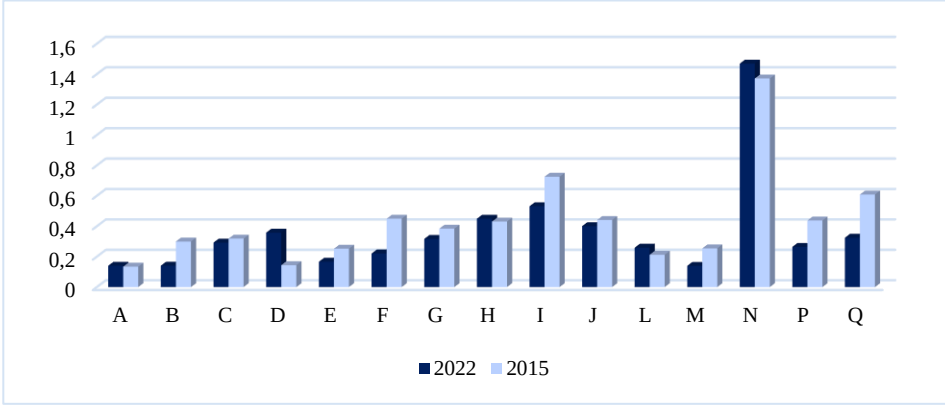
Data does not include these industries:

- O. public administration and defense; obligatory social security;
- R. cultural, entertainment and recreational activities,;
- S. other service activities;
- T. households employing workers; households producing goods and providing services for own use;
- U. extraterritorial organizations and groups.

[16] Ibid.

sectors of administrative services activities (N) and accommodation and food service activities (I), but followed by healthcare (Q) and construction (F).

Chart 9. Ratio of total credits and loans to own capital 2015 and 2022



Source: Statistical Yearbook of the Republic of Poland, 2023[17].

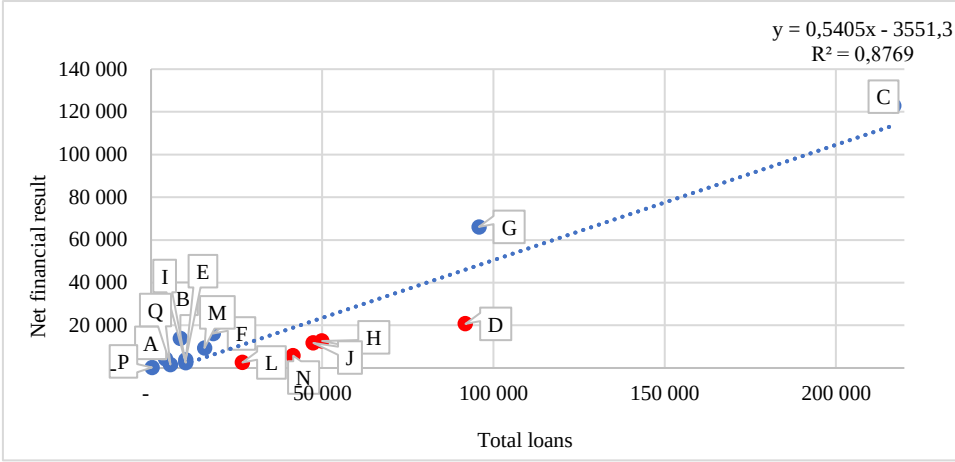
4.4. Relationship between credit liabilities and financial results of sectors

For banks, it is important to know how each sector's credit taken out translates into both revenue and financial result. Chart 10 summarizes information on total credits (long and short-term) taken out by industries and their net financial result. It can be seen that an increase in the capital raised by industries from banks is correlated with an increase in their net financial result. An increase in loans by one zloty results in an increase in the profit of industries by PLN 0.5405. If the capital raised from banks is used by industries to increase their income, then those sections of the economy that make an efficient use of credit, i.e., generate higher profits from each zloty borrowed, may be better borrowers for banks. Therefore, it can be concluded that industries below the trend line in Chart 10, make a less efficient use of the capital obtained from banks, i.e., generate lower profits using the same funds. This may have a negative impact on their credit assessment by banks. This situation applies to the following industries: real estate services (L); administrative services activities (N); information and communication (J); transportation and storage (H); manufacturing and energy supply (D).

A similar relationship is shown in Chart 11, but with regard to revenue. The results for the various sections of the economy are similar, but in this view, the accommodation and food service industry (I) additionally turns out to be less efficient.

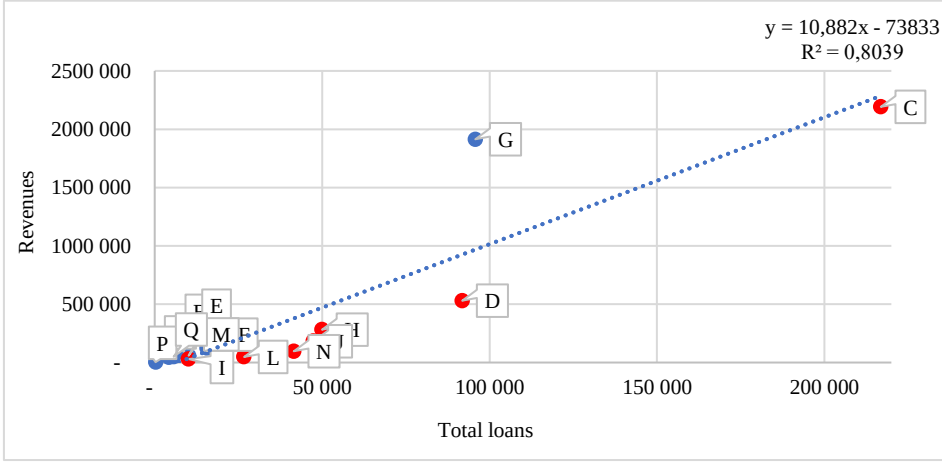
[17] Ibid.

Chart 10. Net financial result, credits in total, 2022



Source: Statistical Yearbook of the Republic of Poland, 2023[18].

Chart 11. Revenues, credits in total, 2022



Source: Statistical Yearbook of the Republic of Poland, 2023[19].

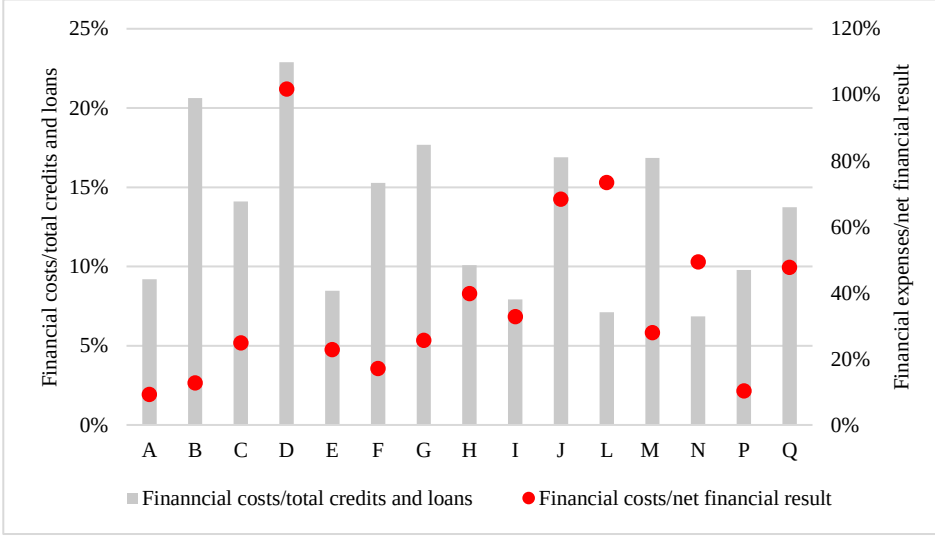
[18] The data is for non-financial enterprises with 10 or more employees. The data does not include entities engaged in banking, brokerage, insurance, as well as investment and pension companies, national investment funds, universities, as well as independent public health care institutions, cultural institutions with legal personality and individual farms in agriculture, as well as trade unions, religious and political organizations.

[19] Ibid.

It is important to compare financial costs to net income by industry (Chart 12 right axis). It can be noted that financial costs for some industries account for a much larger share of the net profit than for others. These industries are therefore relatively more burdened by a need to handle the debt incurred, and a smaller share of profit is left for other purposes. The worst relations are found for the manufacturing and energy supply (D), real estate services (L), information and communication (J), administrative services (N) and health care (Q) sections.

A comparison of financial costs with the value of loans and credits taken out by each industry also provides interesting information (Chart 12 left axis). For the manufacturing and energy supply (D), mining (B), trade (G), information and communication (J), professional, scientific and technical activities (M) or construction (F) sections, the share is noticeably higher than in other industries. This means that for the mentioned sections it is more expensive to take on debt. This may be related to the fact that banks rate these industries as riskier and compensate for the credit risk associated with providing financing to these sections of the economy by setting higher margins.

Chart 12. Ratio of financing costs to credits and loans by industry, 2022 (left axis)
Ratio of financial expenses to net income by industry, 2022 (right axis)



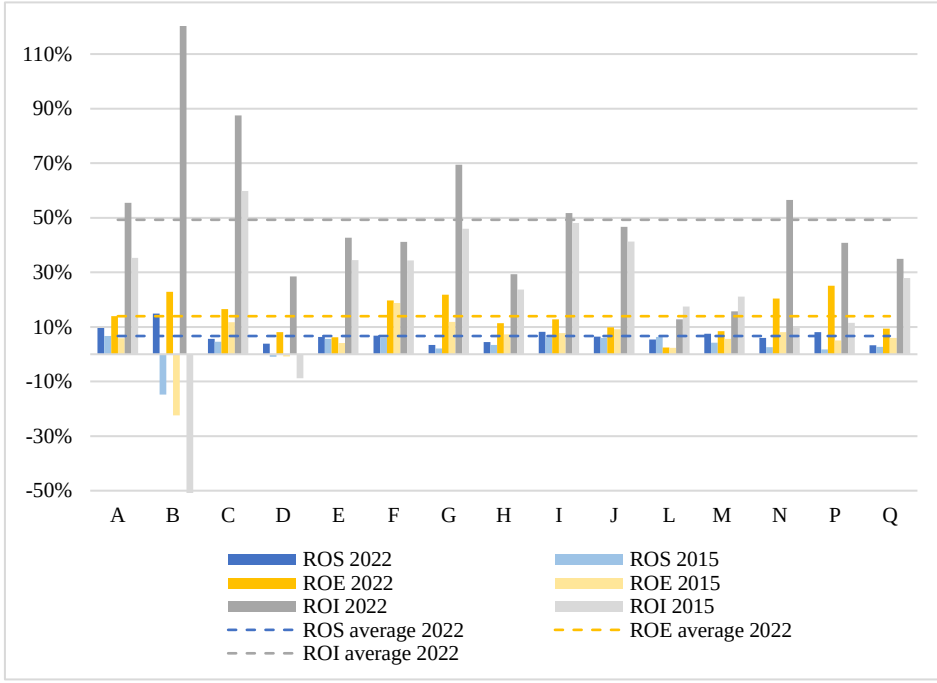
Source: Statistical Yearbook of the Republic of Poland, 2023[20].

[20] Ibid.

4.5. Profitability

An important element in the assessment of economic sectors is their profitability. Chart 13 shows the profitability results of the analyzed industries: ROS (net financial result/revenue), ROE (net financial result/own capital), ROI (net financial result/short-term investments)[21] for both 2022 and 2015. By comparing the profitability results in each of the analyzed areas (revenue, own capital, short-term investments) to the average (for 2022) in a given category for all industries, it is possible to identify those economic sectors that had below-average values in each of the three aforementioned categories (ROS, ROE, ROI). Such industries include: energy generation and supply (D), water supply, sewage and waste management (E), transportation and storage (H), information and communication (I), real estate services (L), and healthcare (Q).

Chart 13. Profitability ROS, ROE, ROI of specific industries, years 2015 and 2022



Source: Statistical Yearbook of the Republic of Poland, 2023[22].

[21] Profitability ratios were counted with reference to the availability of published data.

[22] The data is for non-financial enterprises with 10 or more employees. The data does not include entities engaged in banking, brokerage, insurance, as well as investment and pension

In 2015, profitability (ROS, ROE, ROI) below the average for the analyzed sectors were in mining (B) and energy generation and supply (D).

Moreover, assessing the changes in each category of profitability (ROS, ROE, ROI) between the analyzed periods of 2022 and 2015, there was a noticeable improvement in the indicators of almost all sectors over time. However, the performance of two industries deteriorated: ROI for professional, scientific and technical activities (M), and ROI and ROS for real estate services (L).

Looking at the results in Chart 13, special attention is drawn to the mining sector (B), which, in terms of both revenue, own capital and short-term investments, was unprofitable in 2015, which may have had a major impact on its assessment by banks as a borrower.

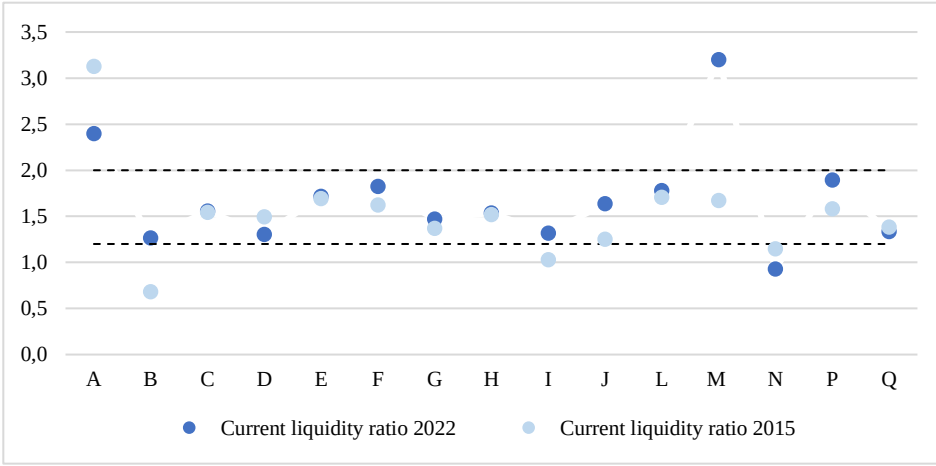
4.6. Liquidity

An aspect that undoubtedly needs attention to is the level of liquidity of industries, which is important for the ability to pay liabilities. The current liquidity ratio, expressed as the ratio of current assets to current liabilities, was adopted for the analysis. As Kuciński (2018) points out, there are no uniformly defined limits of the indicator in the literature, but it is assumed that its optimal value should be in the range of 1.2–2.0 or 1.5–2.0. This indicator, of course, can reach different values for individual industries, which is related to their specifics. However, taking a general interpretation of the indicator, its values below 1.0 may indicate difficulties in settling current liabilities and insufficient current assets. Excessively high values, above 3, may also indicate problems – with the turnover of assets or unused resources. Chart 14 shows that the lowest liquidity ratios are observed in administrative services (N), mining (B), energy generation and supply (D), accommodation and food service (I) and healthcare (Q). In contrast, increased liquidity ratios characterize agriculture (A) and professional, scientific and technical activities (M).

Changes in the liquidity index over time are also significant, indicating improving or deteriorating results. Negative changes over the analyzed period of 2015 and 2022 can be observed for manufacturing and energy supply (D), administrative services activities (N), health care (Q) (decrease) and professional, scientific and technical activities (M) (increase).

companies, national investment funds, universities, as well as independent public health care institutions, cultural institutions with legal personality and individual farms in agriculture, as well as trade unions, religious and political organizations.

Chart 14. Current liquidity ratio, 2015 and 2022



Source: Statistical Yearbook of the Republic of Poland, 2023[23].

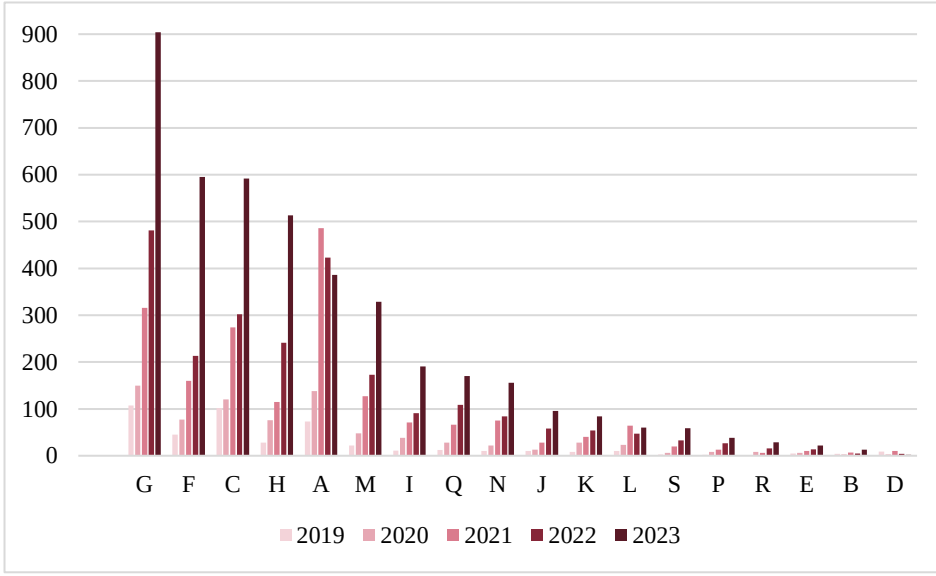
4.7. Bankruptcies and reorganizations

The number of reorganization and bankruptcy proceedings involving companies operating in the area can demonstrate the increased level of risk in the industry. Charts 15 and 16 show the number of reorganization and bankruptcy proceedings of companies by industry in 2019–2023. It can be noted that in the area of reorganization there were significant increases in the opening of proceedings in the following years. In the analyzed period of 2019–2023, there were 462, 795, 1,888, 2,375, 4,239, accordingly. In the same period, the number of total bankruptcy proceedings was more stable and amounted to, accordingly: 582, 581, 410, 357, 406. On the other hand, it can be observed that in both categories – reorganization and bankruptcy, in almost all the analyzed years the top three sections of the economy with the highest number of open proceedings are: wholesale and retail trade (G), construction (F) and manufacturing (C). However, keeping in mind the sizes of these industries, it is difficult to conclude unequivocally that operating in these sections of the economy, and thus providing them with financing, involves a higher risk.

Moreover, it is worth mentioning that according to the NBP, the highest share of entities with high exposure to bankruptcy risk is among companies producing durable consumer goods and in the energy sector (NBP Report – NBP Quick Monitoring…).

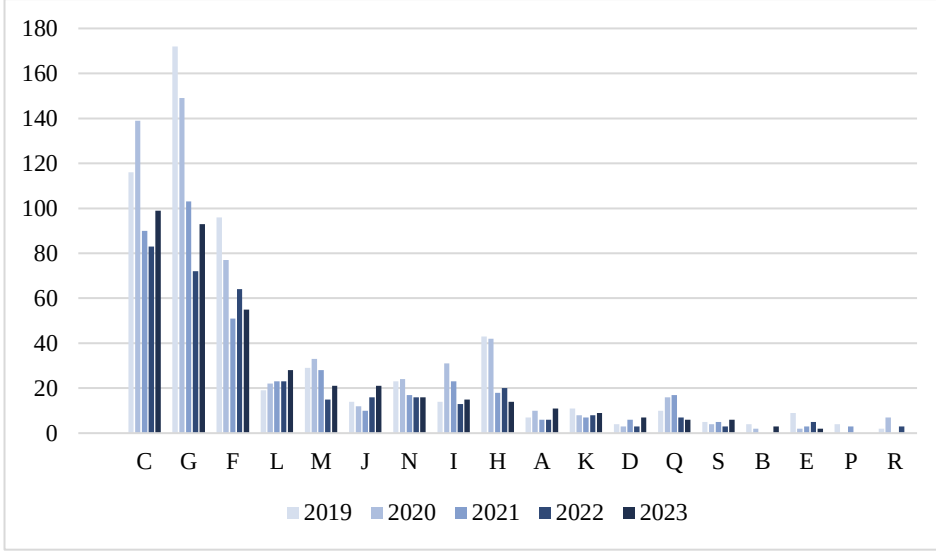
[23] Ibid.

Chart 15. Number of reorganization proceedings opened per year by industry, 2019–2023



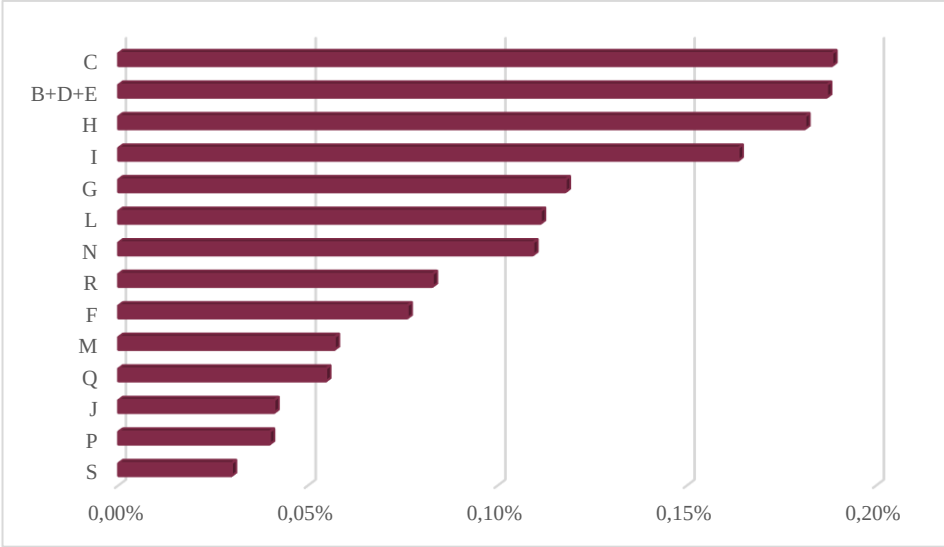
Source: own study based on COIG data for 2019–2023.

Chart 16. Number in bankruptcy proceedings opened in the year, by industry, 2019–2023



Source: own study based on COIG data for 2019–2023.

Chart 17. Share of reorganizations and bankruptcies opened in 2022 in the total number of companies in a given industry in the same year



Source: own study based on GUS Report data and COIG data for 2019–2023.

The characteristics of different sections of the economy should also be noted, e.g., the trade industry is noticeably more fragmented than the mining industry. Comparing the number of entities involved in bankruptcy and reorganization proceedings may therefore not fully show the level of risk associated with operating in a particular area. In addition to the sheer number of entities with difficulties in settling their liabilities, the size of their operations is also important, as is the relationship of entities subject to reorganization and bankruptcy proceedings to the total number of companies in a particular industry. This relationship for 2022 is illustrated in Chart 17. The least favorable industries in this comparison are:

- manufacturing (C);
- industry excluding manufacturing (B+D+E);
- transportation and warehouse management (H);
- accommodation and food service activities (I).

As Hybel and Strojny (2023) note, in 2016–2022, the difficulties in the trade industry were related to the problems of companies in enforcing timely payments, which received their receivables about two months late. As for the construction industry, on the other hand, the authors indicate that the problem of entities in this area is more complex, and point to the decline in investment in the private and public sectors, the increase in the prices of labor, construction materials, energy, as well as credit installments and leases to which high interest rates have contributed.

5. ANALYSIS OF THE RISK OF CREDIT DEFAULTS BY SPECIFIC SECTIONS OF PKD

The previous chapters presented a series of data and financial indicators of specific industries relevant to assessing the risk that arises for banks as a result of granting credits to companies in specific sections. This chapter summarizes the banks' own research of credit default risk based on the above-mentioned data. A comparison of the research results with data from the NBP reports on the share of loans of individual industries in phases 2 and 3 has also been carried out.

5.1. Self-study of the risk of credit defaults by specific sections of PKD

This part of the article presents an own study to determine the risk of credit defaults by specific sections of the economy. An assessment of the economic condition of each section of the economy was made. A multi-criteria analysis was carried out on variables affecting the ability of industries to settle their credit commitments. For this purpose, first a list of variables relevant to the performance of this analysis was extracted andit included:

– differences of empirical values from theoretical values determined from regressions between net income and total credits, for cross-sectional data of industries in 2022;

– differences of empirical values from theoretical values determined from regressions between revenue and total credits, for cross-sectional data of industries in 2022;

– dynamics of revenues in the 2022/2015 period;

– dynamics of net income in the 2022/2015 period;

– share of reorganizations and bankruptcies in the industry[24] in 2022;

– ROI i.e. net financial result/ short-term investments in 2022;

– ROS i.e. net financial result/revenue in 2022;

– ROE i.e. net financial result/own capital in 2022;

– profitability ROS, ROE, ROI simultaneously differing from the industry average in 2022;

– change in ROS, ROE, ROI – 2022/2015;

– cost level ratio (costs/revenues) in 2022 and in 2015;

– debt to equity ratio, i.e. total liabilities/own capital in 2022;

– total loans/own capital in 2022;

– ratio of financial expenses to credits and loans by industry in 2022;

– ratio of financial expenses to net income by industry in 2022;

– current liquidity ratio in 2022;

– dynamics of the current financial liquidity ratio in the period 2022/2015.

[24] The share of reorganizations and bankruptcies opened in 2022 in the total number of companies in a given industry in the same year.

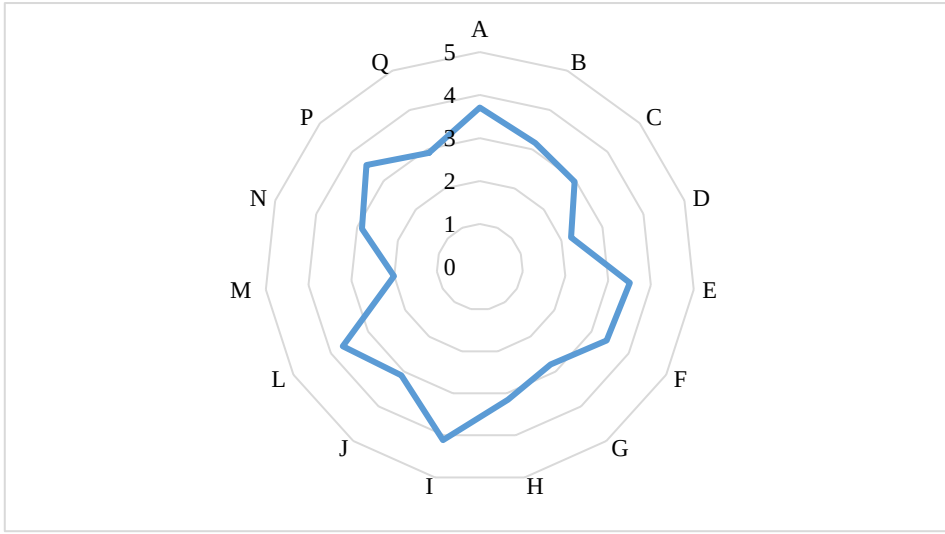
Among the above-mentioned variables, one can distinguish those that are stimulants affecting the ability of industries to regulate their liabilities (e.g., ROS), but there are also variables that are destimulants (e.g., debt-to-equity ratio).

Since the following section compares the self-analysis with the data of the NBP report (an increase in the share of loans in phases 2 and 3 means a deterioration in the ability of industries to regulate their liabilities), it was necessary to convert all variables into destimulants.

On this basis, six variables most correlated with the NBP participation data in phases 2 and 3 were selected[25]. Each variable was assigned the same weight. Further analysis included indicators such as:

– dynamics of net income in the period 2022/2015;
– dynamics of ROI i.e. net financial result/ short-term investments in the period 2022/2015;
– the ratio of the level of expenses (costs/revenues) in 2022;
– ratio of financial expenses to credits and loans by industry in 2022;
– ratio of financial expenses to net income by industry in 2022;
– current liquidity ratio in 2022.

Chart 18. Risk of industries



Source: own study.

Then, in order to bring the variables to comparability, normalization of variable values was applied. As Walesiak (2014) points out, such an effect is

[25] These were variables with a correlation coefficient > 0.22.

achieved by de-nominalizing the measurement results and standardizing their orders of magnitude. As already mentioned, the variables were transformed into destimulants. The study used one of the possible normalization methods which is the quotient transformation with the normalization base equal to the maximum. The final results of the multi-criteria analysis are shown in Chart 18. Increased values were identified with the situation causing potential increased problems with the repayment of credit commitments by the industry in question and increased risks for banks in connection with credit granting. Therefore, the sections with the highest scores represent the highest risk for banks providing financing.

Considering the variables analyzed, the accommodation and food services (I), agriculture (A) and real estate services (L) industries were singled out as potentially riskier.

The self-analysis presented in the article provides some analogy to the assessment of creditworthiness based on a group of financial indicators used by commercial banks in the process of granting credit to businesses. Its advantage is a synthetic approach covering various aspects of the functioning of a section of the economy from among a wide spectrum of variables. A certain limitation when it comes to making conclusions on the basis of such an analysis is the comparison of industries with different business characteristics using the same indicators.

5.2. Comparison of NBP data on credit repayment by industry with the results of the analysis presented in the article

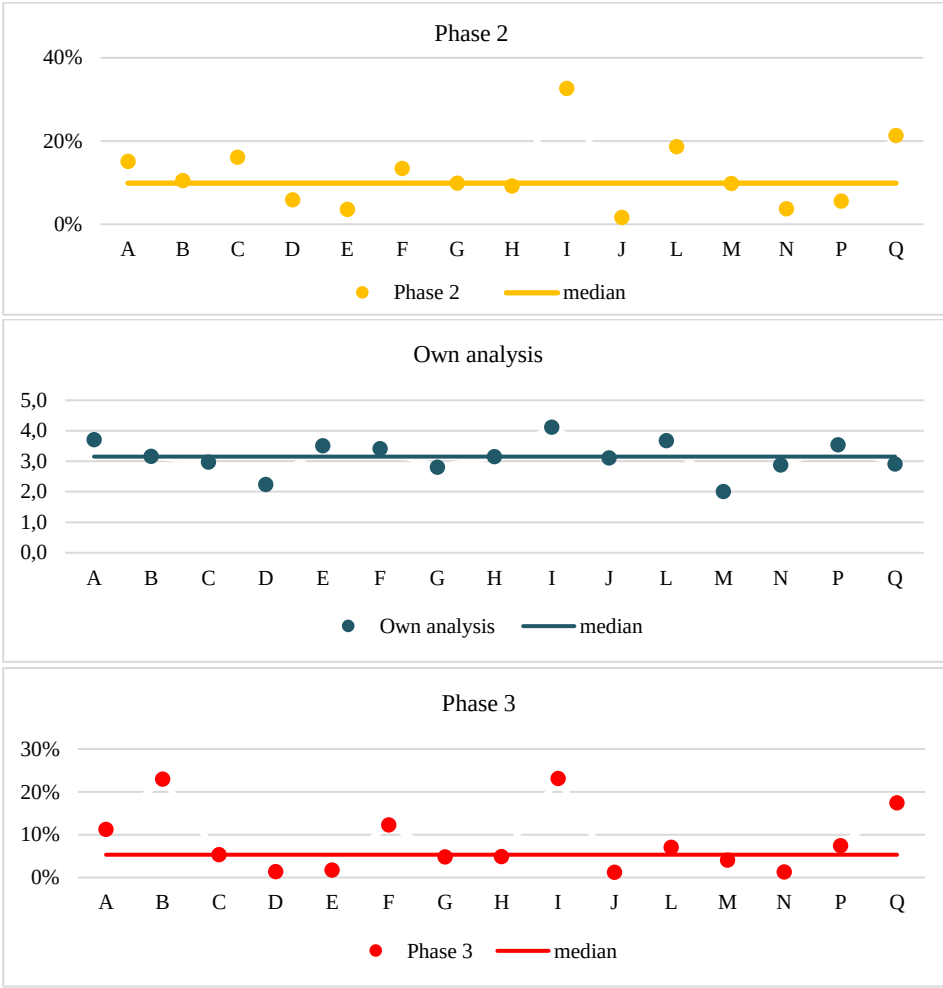
In the following part of the study, a comparison of the analysis results presented in the article with the NBP data on credit repayment by industry, relating to the share of credit in phases 2 and 3 in banks' credit portfolios, was carried out. The comparison was carried out for 15 industries for which data was available to conduct the study[26].

In order to compare the results obtained with the NBP data, an analysis of the distributions of values for each industry relative to its median was carried out. Separately, the median was counted for three data series: those presenting the share of credits in phase 2, in phase 3 and those resulting from the self-analysis. Chart 19 shows the industries, for each of the three above-mentioned data series, with their position relative to the median.

Chart 19 below is a table summarizing instances in which an industry, based on both the self-analysis presented in the article and the NBP data on the share of loans in phase 2 and phase 3 (separately for each phase), is above or below the median.

[26] Industries presented in Chart 19.

Chart 19. Analysis of the distributions of values (phase 2, own analysis, phase 3) for specific industries relative to their median



	< Median										Median	> Median								
Phase 2	-	D	E	-	H	J	M	N	P	-	G	A	B	C	-	F	I	L	-	Q
Own analysis	C	D	-	G	-	J	M	N	-	Q	H	A	B	-	E	F	I	L	P	-
Phase 3	-	D	E	G	H	J	M	N	-	-	C	A	B	-	-	F	I	L	P	Q

Source: own calculations and NBP data: NBP Financial System Stability Reports for June 2023.

Table 2. Differentiation of sections of the economy due to banks' credit risk

Own analysis																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**L**	**M**	**N**	**P**	**Q**	**R**	**S**
2022	3,710	3,159	2,966	2,234	3,506	3,407	2,798	3,152	4,112	3,107	3,677	2,008	2,881	3,542	2,905	**b.d.**	**b.d.**
Phase 2 (NBP)																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**L**	**M**	**N**	**P**	**Q**	**R**	**S**
12-2019	15,8%	1,7%	9,6%	11,1%	12,6%	9,6%	9,9%	8,9%	12,4%	3,1%	7,0%	3,5%	5,4%	8,4%	17,2%	3,3%	13,2%
12-2020	16,5%	13,0%	11,1%	17,9%	6,8%	14,6%	11,5%	13,7%	37,1%	3,2%	19,2%	5,6%	16,0%	8,9%	19,4%	33,7%	25,3%
12-2021	13,8%	16,2%	9,3%	12,3%	4,7%	16,9%	10,0%	10,1%	44,5%	2,1%	22,0%	4,2%	4,0%	10,3%	13,8%	39,3%	25,8%
12-2022	15,2%	10,5%	16,1%	5,9%	3,6%	13,4%	9,9%	9,2%	32,7%	1,7%	18,7%	9,8%	3,8%	5,6%	21,4%	32,9%	13,7%
average	15,3%	10,3%	11,5%	11,8%	6,9%	13,6%	10,3%	10,5%	31,7%	2,5%	16,7%	5,8%	7,3%	8,3%	18,0%	27,3%	19,5%
Phase 3 (NBP)																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**L**	**M**	**N**	**P**	**Q**	**R**	**S**
12-2019	11,9%	22,1%	7,4%	8,2%	2,7%	17,1%	7,3%	4,4%	18,4%	3,1%	6,9%	4,6%	4,1%	8,5%	7,3%	9,5%	18,2%
12-2020	12,8%	18,9%	8,7%	4,2%	2,6%	14,8%	8,2%	4,8%	23,4%	3,2%	7,8%	4,4%	5,1%	9,1%	8,9%	7,5%	17,7%
12-2021	10,3%	30,4%	6,6%	1,2%	1,6%	13,7%	5,7%	5,4%	24,5%	1,4%	7,6%	3,2%	3,2%	6,6%	8,6%	6,0%	15,3%
12-2022	11,2%	23,0%	5,3%	1,4%	1,7%	12,3%	4,8%	4,9%	23,1%	1,2%	7,1%	4,1%	1,3%	7,4%	17,5%	5,7%	33,3%
average	11,6%	23,6%	7,0%	3,8%	2,2%	14,5%	6,5%	4,9%	22,4%	2,2%	7,3%	4,1%	3,4%	7,9%	10,6%	7,2%	21,1%

Source: own calculations and NBP data: NBP Financial System Stability Reports for June 2021, June 2022, June 2023.

In terms of the comparison of self-analysis with the share of credits in phase 3, for 11 sections the results were similar (i.e., the same industry was above or below the median). As for the comparison of self-analysis with the share of credit in phase 2, the results are similar – for 9 sections, the results converged (i.e., the same industry was above or below the median). The correlation coefficient of the results of self-analysis with the share of loans in phase 2 was 0.45, and with the share of loans in phase 3 was 0.46.

Therefore, it can be concluded that the above-mentioned variables relevant to assessing the risk incurred by banks in lending to particular industries reflect this risk well when comparing the results obtained with data published by the NBP on the shares of credits in banks' portfolios in phase 2 and phase 3.

As a result, a noticeably different financial situation of the various sectors was identified. The analysis carried out allows to conclude that different sections of the economy are characterized for banks by different risks associated with providing financing to these industries.

More detailed information in terms of comparing the self-analysis carried out with the share of loans in phase 2 and phase 3 according to the NBP data is provided in Table 2.

5.3. Conclusions

The NBP data shows that the largest share of worst-quality, i.e., phase 3 loans in loans for each PKD section was recorded at the end of 2022 in other service activities (S). However, the financial information on this industry necessary for the survey was not available, so it was not included in this article. The section includes: activities of membership organizations; repair and maintenance of computers and personal and household goods, as well as other individual service activities such as hairdressing and other beauty treatments; physical improvement service activities or other service activities not elsewhere classified, among others. The section therefore includes mostly small entities, which affects its large fragmentation. This industry may represent a large group of borrowers less resistant to financial difficulties.

Accommodation and food service (I), mining (B) and healthcare (Q) followed with the largest share of phase 3 loans.

On the other hand, the largest number of credits in phase 2 in 2022, according to the NBP, was recorded in culture, recreation and entertainment (R)[27]. Financial data was not available for this section either, making it impossible to conduct a study including this industry.

[27] Financial data on this industry, as well as the section of other service activities (S), was not available, so the analysis in this article does not include it.

The next worst results in terms of the share of credits in phase 2 were recorded for accommodation and food service (I), health care (Q) and real estate services (L).

The results of the analysis presented in the article also confirm that the accommodation and food service (I) and real estate services (L) industries, among others, are associated for banks with an increased risk of their financing.

In this regard, it is worth noting the specificity of the mining industry, which as recently as 2015 had the lowest profitability[28] (ROS, ROE, ROI) compared to other industries, but its performance in 2022 significantly improved, due to a sudden and very large increase in the price of coal. The section's recent major financial problems may affect the results taking into account the share of phase 3 loans at banks. On the other hand, accommodation and food service (I) – an industry with one of the highest shares of phase 3 loans is susceptible to seasonality, so this section may be more sensitive to temporary and cyclical financial difficulties that translate into problems with credit repayment. In the analysis conducted in the article, this section was not explicitly identified as highly risky for banks. Such a state of affairs may be related to the fact that the survey used data on non-financial enterprises with 10 or more employees. Therefore, the group of the smallest entities in this sector, which may have the weakest resilience to the financial difficulties that occur and increase the credit risk of banks, was not included.

It is noticeable that there are some differences in the assessment of banks' credit risk in connection with the financing of specific sections of the economy between the results of the own analysis and the NBP data based on information obtained from banks. The reason for this is primarily a different methodology, which in the case of the own analysis is based on the use of publicly available aggregated data on the financial situation of individual sections of the economy, while in the case of the data presented by the NBP, it is a direct result of the accounting and credit portfolio management policies applied at individual banks. In addition, it should be kept in mind that data on the share of credits of individual industries in phase 2, and especially in phase 3, does not take into account credits that are written off or sold by banks.

It should be stated that many factors can affect the overall situation of individual industries, and a number of variables can inform their ability to generate risk for banks. Changes in the economic environment over time are also important. Credits are granted for up to a dozen years or more. During such a period, the situation of the industry can change dramatically and present a completely different level of risk for banks. Therefore, it seems important for banks to pay attention to the widest possible range of factors that can affect the situation of individual industries and their ability to repay credits. This is because the above translates into the quality of banks' credit portfolios.

[28] The industry's recent major financial problems were caused, among other things, by continued low coal prices.

SUMMARY

The article pointed out that individual industries differ significantly in size, the number of entities they bring together, profitability, propensity to invest, liability structure and financing needs of banks. Significantly, based on an analysis of the share of loans from each section of the PKD in phases 2 and 3 in relation to banks' total credit portfolios, individual industries also differ in this regard, which was also confirmed by the article's own analysis. The above confirms the hypothesis that industries are significantly different in terms of credit risk from the perspective of the banks providing them with financing.

The highest credit risk for banks as expressed by the percentage of loans in phase 2 and phase 3 is recorded for the accommodation and food service (I), healthcare (Q) and real estate services (L) and mining (B) industries, among others.

It should be noted that the quality of loan portfolios is influenced by more factors than just the industry a bank finances. However, the results presented in the article indicate that individual industries generate varying levels of credit risk for banks, expressed through the level of non-performing credits (and those showing symptoms of possible repayment difficulties) in the entire credit portfolio.

In this regard, it is worth noting the role that banks play in the economy. They provide capital to all players in the economy, influencing the development of investment and consumption in the economy. Therefore, the task of banks is to finance both the most profitable industries and the less efficient ones. At the same time, it is important that this efficiency of individual industries can change over time.

It is also significant that banks must act in accordance with applicable laws and internal procedures and apply, example.g., certain restrictions on granting credits taking into account concentration limits, which also apply, among other things, to the financed sectors. As the KNF indicates in the guidelines of Recommendation C on concentration risk management[29], banks should set levels of limits reducing concentration risk, including taking into account, among other things, industry indicators.

Keeping the above in mind, it seems that by increasing or decreasing the value and number of credits granted to specific industries, banks can influence the level of credit risk and this can be one of their tools for managing the quality of credit portfolios.

[29] KNF Recommendation C on concentration risk management, May 2016.

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BRANŻA KREDYTOBIORCY A RYZYKO KREDYTOWE DLA BANKÓW

Cel artykułu. Podmioty gospodarcze w różnych branżach prowadzą odmienną działalność. Poszczególne sektory cechują się więc m.in. różną rentownością, zapotrzebowaniem na finansowanie obce, a w konsekwencji zróżnicowanym poziomem ryzyka braku spłaty zobowiązań kredytowych

wobec banków. Kredytobiorcy z określonych branż mogą być z perspektywy interesów banków lepszymi bądź gorszymi klientami i przyczyniać się do wzmocnienia lub osłabienia jakości ich portfeli kredytowych. Celem artykułu jest porównanie sekcji gospodarki pod względem ryzyka kredytowego towarzyszącego bankom udzielającym im kredytów. Przeprowadzona analiza posłuży zweryfikowaniu hipotezy, że branże są istotnie zróżnicowane pod względem ryzyka kredytowego banków związanego z udzielanymi kredytami.

Metoda badawcza. Artykuł uzupełnia literaturę o przekrojową analizę sektorów gospodarki i zawiera ocenę zróżnicowania poszczególnych z nich ze względu na ich kondycję ekonomiczną i związane z tym potencjalne ryzyko banków udzielających danym branżom kredytów. Przedstawiony został w nim przegląd literatury obejmujący zagadnienie porównania ryzyka działania różnych branż oraz zaprezentowana została klasyfikacja sekcji gospodarki według Polskiej Klasyfikacji Działalności (PKD). Ponadto przedstawione zostały dane Narodowego Banku Polskiego NBP o spłacalności kredytów w poszczególnych branżach, a także zaprezentowana została charakterystyka poszczególnych sekcji gospodarki. Przedstawione zostały rozmiary działania poszczególnych branż z uwzględnieniem wielkości ich przychodów oraz liczby przedsiębiorstw, a także skala inwestycji oraz zapotrzebowania na kredyty i pożyczki w poszczególnych sekcjach gospodarki. Badaniu poddane zostały również: wskaźnik poziomu kosztów, wskaźnik zadłużenia kapitału własnego, udział kredytów i pożyczek poszczególnych sekcji w relacji do kapitału własnego. Scharakteryzowane zostały także zależności pomiędzy: zadłużeniem a wynikami finansowymi sektorów, kosztami finansowymi i kredytami oraz kosztami finansowymi i wynikami finansowymi netto branż. Zbadano również rentowność i płynność sekcji gospodarki. Przeanalizowano też dane dotyczące otwieranych postepowań upadłościowych oraz restrukturyzacyjnych w podziale na poszczególne sekcje gospodarki. Przedstawione zostały założenia oraz wyniki analizy ryzyka braku spłaty zobowiązań kredytowych według poszczególnych sekcji gospodarki. Ponadto omówione zostały wyniki analizy przeprowadzonej w artykule oraz porównane z danymi NBP o udziale kredytów w fazach 2 oraz 3 w poszczególnych branżach.

Wyniki badań. W artykule wskazane zostało, że poszczególne branże różnią się pomiędzy sobą istotnie rozmiarami, liczbą podmiotów, które skupiają, rentownością, skłonnością do inwestowania, strukturą pasywów i potrzebami w zakresie finansowania udzielanego przez banki. Co istotne, na podstawie analizy udziału kredytów z poszczególnych sekcji PKD w fazach 2 oraz 3 w relacji do portfeli kredytowych ogółem banków, poszczególne branże różnią się także w tym zakresie, co potwierdziła również dokonana w artykule analiza własna. Powyższe potwierdza hipotezę, że branże są istotnie zróżnicowane pod względem ryzyka kredytowego z perspektywy banków udzielających im finansowania.

Słowa kluczowe: ryzyko kredytowe, sektor gospodarki, kredyty bankowe, jakość kredytów, jakość portfela kredytowego banków.

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