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HOW DID THE COVID-19 PANDEMIC AFFECT NET WORKING CAPITAL IN INDUSTRIAL PRODUCTION COMPANIES?

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ABSTRACT. Industry is one of the key sectors of Slovakia's economy and accounts for approximately 22% of GDP. Industrial production accounts for an average of 85% of the industry's contribution to GDP. The period of 2020 and 2021 was a crisis for all sectors of the economy due to the announcement of the global COVID-19 pandemic. Regarding the importance of industrial production in Slovakia's economy, we examine the impact of the coronavirus crisis on a sample of companies operating in this sector. Changes in the operational activity of enterprises are directly reflected in the volume of their net working capital. The aim of the study is to research changes in the volume of net working capital of enterprises in individual branches of the manufacturing industry in Slovakia from 2017 to 2021. The Wilcoxon signed-rank test was used to examine the significance of interannual changes in this indicator. The findings point to the growth of the volume of net working capital in crisis periods in almost all branches of industrial production and confirm the increase in requirements for managing working capital in periods of economic decline.

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Introduction

According to the report of the Ministry of Economy of the Slovak Republic (Industrial Production, 2018), the economy of the Slovak Republic showed healthy development from 2010 to 2017. Gross domestic product per capita in purchasing power parity reached 77% of the EU average in 2014-2017. Labour productivity grew mainly thanks to the inflow of foreign direct investments by multinational companies. Compared to the average in the EU in 2012, the Slovak industry contributed to the creation of GDP with a share approximately 1.54 times higher. Industrial production in Slovakia is the dominant economic sector. Its dominant position with regard to the openness of the Slovak economy depends on the demand of foreign markets. Its growth and development source is largely cost competitiveness based on low wages and other production factors.

Importance of industry in the Slovak economy

Industry of Slovakia, broken down according to NACE Rev. 2 sectors B to E, together with the sector Wholesale and retail trade and repair of motor vehicles and motorcycles (G), Transportation and storage (H) and Accommodation and food services activities (I) belong to the most important sectors in terms of their share in the creation of GDP. The average share of industry in the creation of GDP in the years 2017 to 2022 (1.Q-3.Q) was 22.26%, sectors G – I created an average of 17.37% of GDP.

The industry sector consists of: “Mining and Quarrying” (B), “Manufacturing” (C), “Electricity, gas, steam, and air conditioning supply” (D) and “Water Supply; sewerage, waste management and remediation activities” (E). Manufacturing (C) accounts for an average of 85 per cent of the industry's contribution to GDP creation. The same average share is occupied by industrial production in total sales for own services and goods in the industry. Among Slovakia's most important branches of industrial production is (CL) Manufacture of transport equipment, which has accounted for an average of 34.3% of the industry's sales since 2008. In terms of the sector's share of industry sales, the second order is (CH) Manufacture of basic metals and fabricated metal products, except machinery and equipment (15.7% on average). Other branches of industrial production participate in the creation of sales by less than 10 per cent. The share of industries in industry sales, expressed in current prices, is shown in Table 1.

Table 1. The share of selected industries in sales for own services and goods in industry

	2018	2019	2020	2021	2022
	1.Q.-4.Q.	1.Q.-4.Q.	1.Q.-4.Q.	1.Q.-4.Q.	1.Q.-3.Q.
B,C,D,E Industry together (in thous. €, curr. prices)	99914398	100157533	91977447	106172814	100982748
B Mining and quarrying	0.60%	0.59%	0.62%	0.57%	0.44%
C Manufacturing	85.32%	85.58%	84.47%	84.47%	80.30%
CA Manufacture of food products, beverages and tobacco products	5.29%	5.65%	6.17%	5.73%	5.98%
CB Manufacture of textiles, apparel, leather and related products	2.31%	2.17%	2.14%	1.87%	2.08%
CC Manufacture of wood and paper products, and printing	4.89%	4.85%	4.91%	5.29%	5.68%
CD Manufacture of coke, and refined petroleum products	3.72%	3.48%	2.58%	3.31%	4.53%
CE Manufacture of chemicals and chemical products	2.00%	1.90%	2.02%	2.31%	2.96%
CF Manufacture of pharmaceuticals, medicinal chemical and botanical products	0.22%	0.21%	0.24%	0.21%	0.19%
CG Manufacture of rubber and plastics products, and other non-metallic mineral products	8.23%	8.24%	8.71%	8.43%	8.21%

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

CH Manufacture of basic metals and fabricated metal products, except machinery and equipment	16.50%	15.56%	15.34%	18.00%	19.89%
CI Manufacture of computer, electronic and optical products	5.47%	4.98%	4.83%	5.17%	3.77%
CJ Manufacture of electrical equipment	4.68%	4.59%	4.74%	4.68%	4.88%
CK Manufacture of machinery and equipment n.e.c.	6.54%	6.44%	6.52%	6.67%	6.60%
CL Manufacture of transport equipment	36.08%	37.54%	37.74%	34.50%	31.40%
CM Other manufacturing, and repair and installation of machinery and equipment	4.08%	4.40%	4.08%	3.81%	3.82%
D Electricity, gas, steam and air-conditioning supply	12.81%	12.47%	13.47%	13.46%	17.93%
E Water supply, sewerage, waste management and remediation	1.28%	1.36%	1.45%	1.50%	1.33%

Source: datacube.statistics.sk. Authors' calculations.

In addition to the importance of the share of industry in the creation of Slovakia's GDP, industrial enterprises (B - E) together with the wholesale and retail sector (G - I) are also important employers. In 2021, sectors G to I (23.7%) contributed the most to total employment, the share of industry as a whole was 23.3%, and manufacturing 21.3%. The third most important employer is public administration, defence, compulsory social security, education, healthcare and social assistance (O – Q) with a share of 20.6%. Of the number of persons employed in industrial production, approximately 10% were self-employed, the rest were employees. When examining individual sectors of the national economy, we find that the highest total employment in 2021 was in retail trade (G47, 8.8%), further education (P85, 7.5%) and public administration and defence; compulsory social security (O84, 7%). The highest proportion of employees work in these industries (G47: 8.9%, P85: 8.6%, O84: 8.2%). The highest proportion of self-employed persons works in the sector (F43) Specialized construction activities (22.9%). It is followed by G47 – Retail trade, except motor vehicles and motorcycles (9.8%), C25 – Manufacture of fabricated metal products, except machinery and equipment (7.9%), G46 – Wholesale trade, except of motor vehicles and motorcycles (6.7%). Sector C25 is also among the largest employers within group C – Manufacturing with a share of 3.4% in total employment. The second largest employer is sector C29 – Manufacture of motor vehicles, trailers and semi-trailers (3.3%). Manufacture of machinery and equipment n.e.c. (C28) accounts for 2 percent of total employment.

In addition to the above, we can also document the importance of the Slovak industrial production by the share of small and medium-sized enterprises that operate in the industrial sector. According to the Report on the State of Small and Medium-sized Enterprises for 2021, prepared by the Slovak Business Agency (SBA), the business sector in Slovakia has long been characterized by a high representation of micro-enterprises. From the total number of active business entities in 2021, micro-enterprises with the number of employees from 0 to 9 made up to 97.3%. Small businesses with the number of employees from 10 to 49 (2.1%) and medium-sized businesses with the number of employees from 50 to 249 (0.4%) achieve a significantly lower representation. The sectoral structure of SMEs is characterized by the most significant representation of the service sector (47.6%; 302,111 entities). Almost one fifth of active SMEs operated in the construction industry (18.9%, 120,140 entities). The three most important industries are completed by trade (16.1%, 102,203 entities). In addition, 13.4% of active SMEs operated in the industry sector (85,200 entities) and 3.9% in agriculture (24,655 entities).

Government measures to prevent the spread of the COVID-19 pandemic and their impact on the Slovak economy with an emphasis on the industrial sector

Initial forecasts of the economic development of the Slovak Republic for the year 2020 predicted a slowdown in growth. However, the beginning of 2020 was a shock for the society of the whole world, which rewrote all forecasts. At the end of 2019, the 2019-nCoV coronavirus was recorded for the first time, and it spread from China to the whole world. The first statements of the Prime Minister of the Slovak Republic about the preparedness of the state with the aim of maximum protection of people were made on January 27, 2020. On January 30, 2020, the WHO crisis committee declares a state of global health emergency. On February 27, the Security Council of the Slovak Republic met in connection with the COVID-19 disease and decided to introduce the first measures to prevent the spread of the virus. The Public Health Office of the Slovak Republic (hereinafter referred to as PHO) subsequently issued recommendations for people coming from areas where the disease is affected by COVID-19. The guidelines of the chief hygienist of the Slovak Republic were subsequently updated many times and gradually extended to all aspects of the social and economic life of citizens and business entities. As a reaction to the first confirmed case of COVID-19 in Slovakia on March 6, 2020, the Central Crisis Staff adopted the first prohibitions and restrictions regarding visits, participation in mass events, and travel abroad. From March 10, 2020, Slovakia prohibits sports, cultural and public events for a period of 14 days with the possibility of extending this time period. Persons returning from selected countries are ordered to undergo a mandatory 14-day quarantine in home isolation. March 12, 2020, The Central Crisis Staff introduces additional measures and closes schools, international airports, stops international bus and train transport except for supplies, domestic train transport has started operating in holiday mode, mandatory 14-day quarantine applies to all persons arriving from abroad, and from 13.3. 2020 border controls were launched. 12.3.2020 PHO takes a measure and prohibits the operation of swimming pools, sports facilities, facilities for the care of the human body, facilities for children and youth, public catering establishments, wellness centres, entertainment and leisure establishments, reconditioning stays. It specifies establishments that are allowed to operate even on the weekend. Further restrictive measures are adopted by the PHO on March 15, 2020, with effect from March 16, 2020, closing for 14 days all retail and service establishments, except for food, pharmacies, drugstores, gas stations, newspaper and print shops, animal feed shops and veterinary clinics, telecommunication operators, fast food and catering, postal, banking and insurance companies, e-shops and delivery services. Selected groups of people are ordered to be isolated in facilities designated by the Ministry of the Interior of the Slovak Republic. The following day, the PHO updates its measure and expands the scope of operations exempted from the ban on funeral services, car-tyre-services and towing services, taxi services carrying out the transportation of things and goods, laundries, and clothes dry cleaners. 19/03/2020 PHO extends 14-day home isolation to all persons who have returned from abroad, including persons who live in the same household with this person, and introduces sick leave due to quarantine for COVID-19. March 23, 2020, i.e. 17 days after the first occurrence of a positive case of COVID-19 in Slovakia, the PHO extends the ban on organizing mass events of a sporting, cultural, social or other nature with effect from 24/03/2020 until further notice. With effect from March 25, 2020, until further notice, food and animal feed establishments, pharmacies, drugstores, newsstands, and veterinary clinics have been ordered to close every Sunday of the month, and these establishments are ordered to disinfect their premises. On March 28, 2020, the PHO adopts another update of the measure and decides to open veterinary clinics and emergency pharmacies on Sundays as well. On March 29, 2020, with another measure, with effect from March 30, 2020, the range of operations exempted from the ban on leasing services,

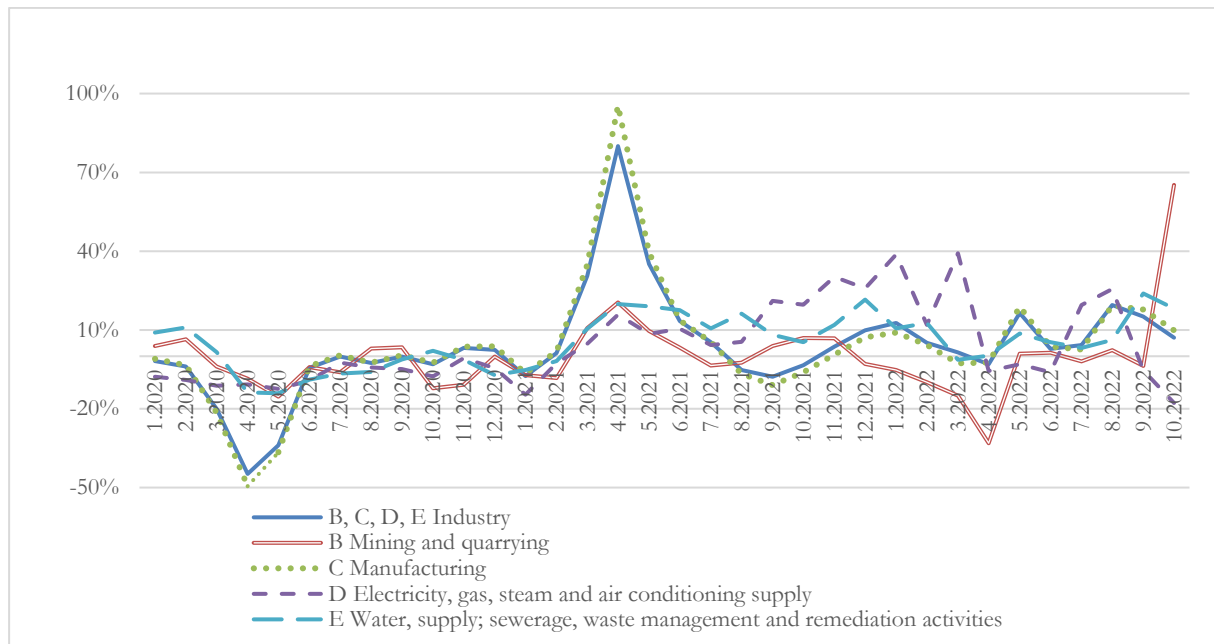
INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

technical and emissions control services, computing and telecommunications technology services, lawyers, notaries, interpreters and translators, executors, key services, collection yards, textile and haberdashery stores, bicycle sales and service, gardening and garden equipment, building materials, installation material stores, hardware stores, paints, varnishes. On April 15, 2020, the PHO developed general principles of a crisis plan for food establishments, based on which food business operators had to establish a crisis unit, which is responsible for developing an individual crisis plan for the establishment and updating it regularly. The government of the Slovak Republic is approaching the first relaxation of business activities, but still with certain restrictive measures, starting from 6/5/2020 and opening the outdoor terraces of restaurants, hairdressers, barbershops, pedicures and manicures, outdoor tourist attractions, allowing short-term accommodation in boarding houses and hotels, allowing the operation taxi services with passenger transport and the conduct of religious services. The government of the Slovak Republic is introducing another more significant relaxation of measures from May 20, 2020.

A brief overview of the measures adopted in the Slovak Republic documents the extent of their impact on social life, but mainly on the business environment, which was prohibited from operating in many sectors of the economy to protect public health. The randomness and unsystematic nature of the adoption procedure and the content of the adopted government measures made it impossible for business entities to plan their activities. The limited mobility of citizens contributed to the decrease in sales even of those establishments that were not prohibited from operating. This was particularly evident in the first wave, but also in subsequent waves of the corona crisis, when access to selected establishments was regulated based on information about the health status of citizens, who had to prove whether they had been vaccinated, had overcome the disease, or had been tested for the disease. The adoption of measures of this type was not specific only to the Slovak Republic, similar measures were introduced across the board in all countries of the world. Businesses and population were forced to interact in the pandemic “new normal” with increased employment risks (Dvorsky et al., 2022; Mishchuk et al., 2023), sudden stops of numerous economic activities including those with impossible remote employment (Bilan et al., 2023; Popescu, 2021) negative consequences for communications, the necessity of finding new responses to the global challenge particularly, by adopting new technologies in business (Dias et al., 2023; Siderska et al., 2023; Nicolae et al., 2023). Thus, economic, and social life was not only paralyzed in Slovakia, but in the whole world.

The average increase in the annual production of industry in Slovakia just before the onset of the corona crisis in 2018 and 2019, expressed in constant prices of 2015, was 13.1%. The onset of the corona crisis manifested itself in a rapid year-on-year decrease in the volume of production in the entire industry sector, manufacturing fell by -32.6% in April 2020 and by -19% in May. Recovery occurred only in September to November, with an average growth of production of 18.7%. In 2021, in terms of industrial production, the strongest months were February to June and October to November, with an average year-on-year increase of 18.6%. While the average annual increase in manufacturing in 2020 was 3%, in 2021 it was already 13.8%, which corresponds to the period before the onset of the corona crisis. Changes in industrial production were also reflected in the volume of generated sales for own services and goods. Graph 1 shows the development of year-on-year changes in sales of industry sectors of the Slovak Republic expressed in constant prices of 2015.

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY



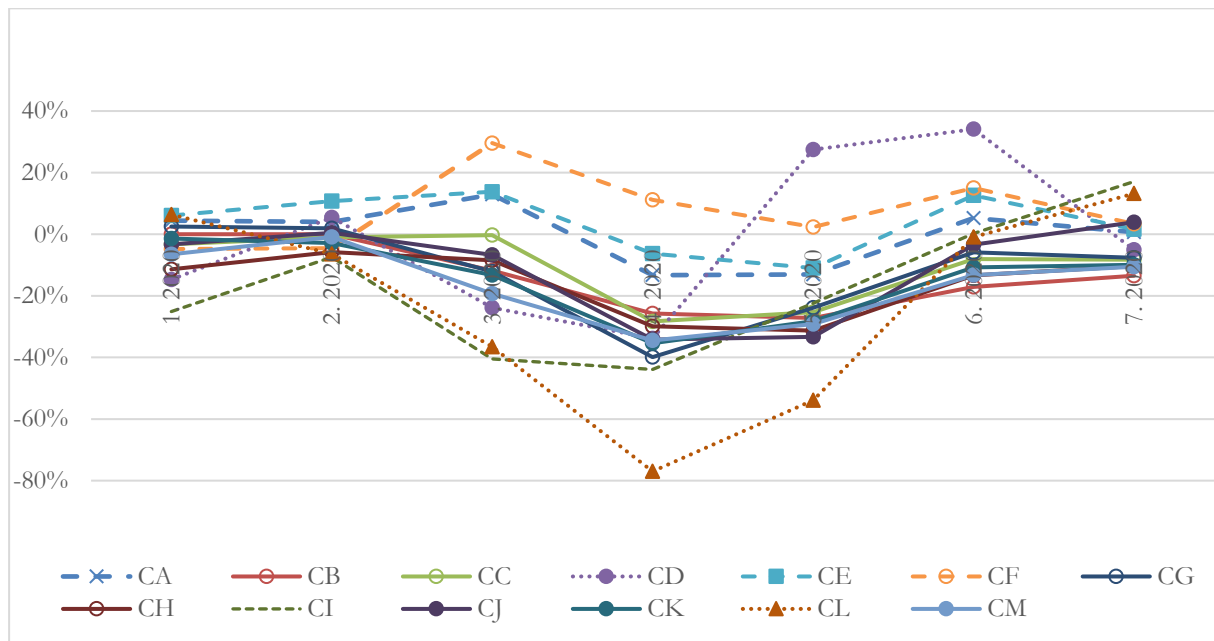
Graph 1. Change in sales for own services and goods in industry, constant prices 12.2015
Source: datacube.statistics.sk. Authors' calculations.

As Graph 1 shows, because of the measures taken by the Slovak government during February and March 2020, there was a rapid decline in all branches of industry. Sales for own services and goods in the entire industry sector, expressed in constant 2015 prices, fell by -20% in March, by -44.8% in April, and by -33.9% in May 2020. An even more significant decrease was recorded in the industrial production sectors, in March 2020 by a total of -21.5%, in April by -49.5% and in May by -36.6%. The adoption of easing measures helped manufacturing companies and they recorded the first slight increases in sales. Businesses in the industry sector began to do better only from March to June 2021, when the second wave of the corona crisis was taking place. However, this was no longer solved by the government by mass closure of establishments and strict restrictions on mobility, but strict hygiene measures were adopted, including the obligation of regular testing using PCR tests. In April 2021, the industry sector recorded a record increase in sales (+80%), the increase in industrial production sectors was +95.4%.

As Graph 2 shows, there are also companies operating in the manufacturing sectors that were relatively successful even during the critical first wave of the corona crisis. Pharmaceutical industry (CF) companies did the most, which recorded an average decrease in sales by -4.7% only in the months of January and February 2020, then they already achieved year-on-year sales growth, by +29.6% in March, and by an average of +8 in April to July 2020 %. In the second wave, which we present in Graph 3 for the period from December to July 2021, they did not experience such significant changes, their sales decreased by -0.7% on average. Due to the measures taken related to the obligation to disinfect premises, companies that produce chemicals and chemical products (CE) also did well in the first wave of the crisis (Graph 2). In the first wave of the corona crisis, these companies recorded an increase in sales in the months of January to March 2020 (+10.2% on average), in April and May their sales have decreased by an average of -17.3%, in June and July they again recorded an average growth of 7.1%. Enterprises that produce food, beverages, and tobacco products (CA) did not record significant changes in sales during the observed period of the first wave of the corona crisis (an average of +0.1%). They recorded the most significant increase in March 2020 (12.9%), when people

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

stocked up excessively due to the declared lockdown, but then in April and May their sales have decreased by -13.2% on average.



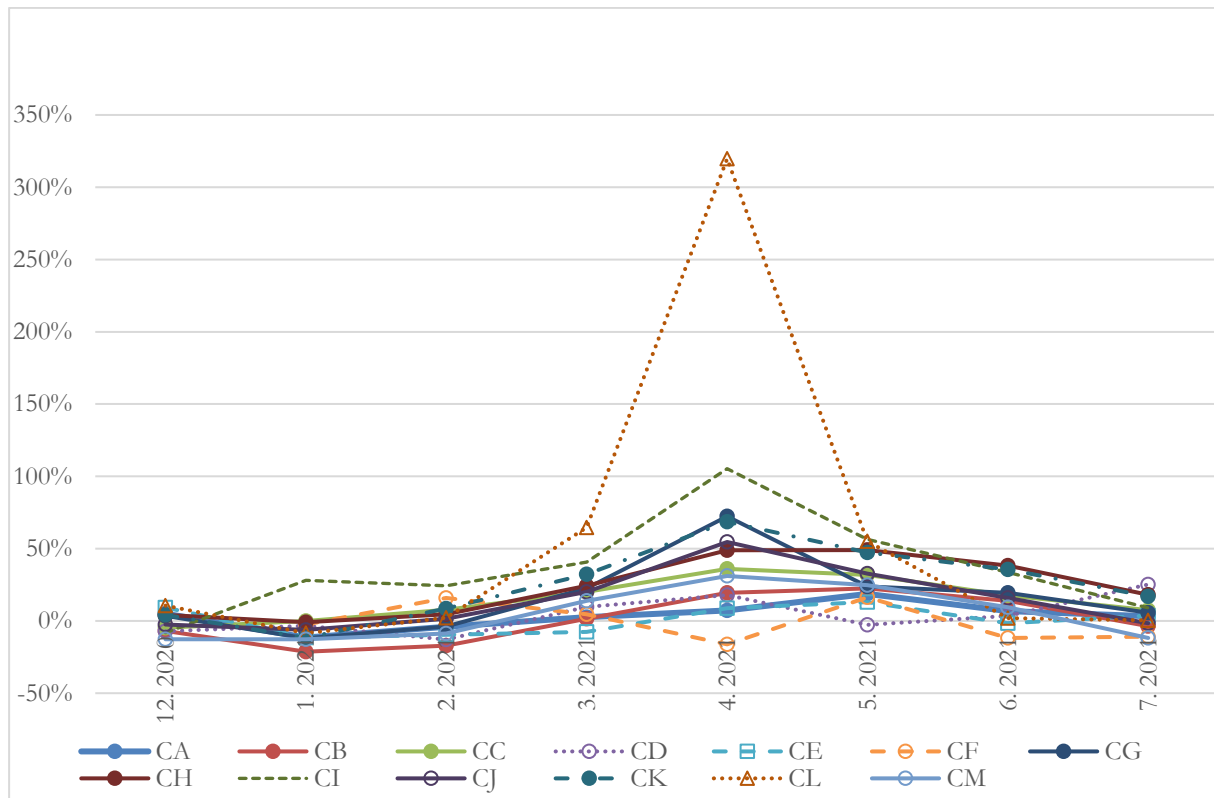
Graph 2. Change in sales for own services and goods in manufacturing in the period 01.2020 - 07.2020, constant prices 12.2015

Source: datacube.statistics.sk. Authors' calculations.

There were significantly more businesses that failed during the first wave. The automotive industry (CL) recorded the most significant drop in sales. In March 2020, their sales fell by -36.5%, in April by -77%, in May by -53.9%. The increase in sales occurred only in July by +13.2%. We also see a significant decline in sales in the CI (Manufacture of computer, electronic and optical products) industry, an average of -35.6% between March and May. In April 2020, only the pharmaceutical industry profited, other industries recorded a decrease in sales by an average of 35.5%.

Changes in sales expressed in constant prices in 2015 during the second wave of the corona crisis are presented in Graph 3.

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY



Graph 3. Change in sales for own services and goods in manufacturing in the period 12.2020 - 07.2021, constant prices 12.2015

Source: datacube.statistics.sk. Authors' calculations.

In this period, January 2021 was the most critical for the entire manufacturing sector, when sales growth was recorded only in the production of computer, electronic and optical products (CI) (+28.1%), other industries had a decrease in sales, the lowest in the CD industry (-0.1%), the highest in CB industry (-21.3%), average -8.5%. In February, the situation slowly turned for the better, 6 industries (CA, CB, CD, CE, CG and CM) recorded a decrease in sales, the highest in CB (-17%), the lowest in CG (-3.8%), on average -9.35%. We see an increase in sales in 7 industries (CC, CF, CH, CI, CJ, CK, CL), the highest in CI (+24.3%), the lowest in CL (2.2%), an average of +9.27%. March 2021 and the following months were successful for most industries of the manufacturing sector. Fluctuations in sales are recorded only in the production of chemicals (CE) and pharmaceutical products (CF), which may be associated with market oversaturation. The automotive industry (CL) improved rapidly, which in April 2021 recorded a record increase in sales of +319.7%. The second industry that was among the more successful was the manufacture of computer, electronic and optical products, where sales grew by 105.3% in April 2021 and continued to grow until the end of the period under review, albeit at a slightly slower pace.

The paper is organized as follows. After the introduction, the literature review is provided in Section 2. Section 3 illustrates the applied methodology through research design, sample size, data collection and data analysis methods. The paper presents and discusses the empirical results in Section 4. The Conclusion sums up the most important research outcomes, weakness of the study and recommendations for future research.

1. Literature review

Changes in the production of enterprises and also in sales are inevitably reflected in individual items of working capital, with the help of which enterprises ensure the results of their production activities, but also in the management processes of there. We generally define the working capital of a company as short-term assets, which include money, receivables, and inventories. Net working capital is determined by deducting short-term assets from short-term liabilities. If the volume of short-term assets exceeds the volume of the company's short-term liabilities, the company has created a certain financial cushion that allows it to finance its operational needs from the company's long-term resources. Managing all related processes is the task of working capital management. In general, the role of working capital management is to make decisions in relation to the management of the company's short-term assets and ensuring their financing from short-term liabilities.

The goal of working capital management is to achieve that the company will be able to carry out its operational activities without interruption and that it will have enough cash to ensure the payment of its short-term debts and operating expenses. The importance of working capital management is confirmed by its time-consuming nature, the share of working capital items in the total invested capital of the company, but also the fact that working capital is necessary to ensure the company's growth. In addition to profitability, the company's working capital policy also affects its liquidity and financial health. Non-systemic measures and non-conceptual management by the macro-environment, which we witnessed during individual waves of the corona crisis, confirm the importance of working capital management at the corporate level even more.

Several authors have devoted themselves to the research of working capital in the corporate environment. Many contributions are focused on evaluating the efficiency of working capital management (Venkatesh & Murugan, 2022; Günay & Cokins, 2021; Lukic, 2023), which the authors measure using the index method and apply it directly to selected companies. Mannetta et al. (2022) used regression analysis to investigate the impact of working capital management on the profitability of industrial enterprises from 2005 to 2018. Their findings show a strong positive impact of inventory turnover time on company profitability, while the receivables maturity period has a negative impact.

The impact of working capital management on corporate performance and efficiency was also investigated by Rahemann et al. (2010), Samiloglu & Demirgunes (2008), Zariyawati et al. (2009), Shin & Soenen (1988), Padachi (2006), Nimalathan (2010), Banos-Caballero (2012), Czerwonka & Jaworski (2023). Research on the effect of working capital efficiency on the financial performance of the firm was also conducted by Prasad et al. (2019), their goal was to introduce a working capital efficiency multiplier that would serve as a direct measure of the profitability of working capital management. They understand working capital efficiency as a measure that indicates how a firm finances capital tied up in receivables and inventory from its short-term liabilities. A firm with high working capital efficiency minimizes the need for short-term liabilities and thus helps the company plan long-term loans for expansion or investment in new projects.

The concept of calculating the cash conversion cycle (hereinafter referred to as CCC) is another measure of the efficiency of working capital, to which several authors have devoted their attention. CCC is determined as the sum of the maturity period of inventory and receivables minus the maturity period of liabilities. A positive value of the indicator indicates the number of days during which the company needs to invest in working capital. The relationship between CCC and company profitability was investigated by several authors, some identified a positive relationship (Mathuva, 2009; Dong & Su, 2010; Banos-Caballero et al.,

2012; Rahemann et al., 2010), others found a negative relationship (Deloof, 2003; Wang, 2002; Falope & Ajilore, 2009). Talonpoika et al. (2014) in their study introduce a modification of the CCC indicator by advance payments, which represent part of the company's working capital. They point out that advance payments can have a significant impact on working capital management, despite the fact that most research focuses on assessing the impact of inventories, receivables and payables.

Working capital determinants were investigated by Mansoori & Muhammad (2012), who identified a negative correlation between working capital management and selected working capital determinants (firm size, operating cash flow, capital expenditures, and gross domestic product). Chiou & Cheng (2006) found that the debt ratio and the share of operating cash flow to total assets of the firm are negatively correlated with working capital management, while firm age and return on assets are positively correlated with working capital management. Moreover, they found that during a downturn in economic activity, businesses have increased requirements for working capital management.

The study of Zheng et al. (2022) investigates the role of managerial personality traits on working capital management of Chinese SMEs during of corona crisis period. They draw attention to the need to take steps to reduce the financial burden on businesses in the form of various support programs aimed at limiting the spread of the virus, or to help introduce new methods of operation while expanding market reach. They list several forms of financial assistance with immediate effect, e. g. tax breaks, special loan programs, public guarantees, loans with zero interest, without collateral, possibly speeding up the loan approval process. These processes are determined by entrepreneurial orientation (Belas & Sopkova, 2016; Horobet et al., 2022) and the quality of the business environment in the SME segment (Belas et al., 2019). Besides, they should be considered in companies' strategic management (Lesníková et al., 2022).

Anton & Nucu (2022) investigated the impact of institutional factors on working capital management. The results indicate that firms located in countries with a stronger institutional framework maintain lower levels of working capital on average.

In their study, Sawarni et al. (2023) focused on researching the impact of earnings management on the effectiveness of working capital management and its components. The authors found that earnings management can indirectly affect the working capital management effectiveness of Indian firms. Managers who engage in revenue management tend to operate with a longer cash conversion cycle and manage inventory sub optimally.

2. Methodological approach

The aim of the study is to examine changes in the volume of net working capital of enterprises in individual branches of manufacturing industry in Slovakia in the period from 2017 to 2021. With regard to the importance of working capital in ensuring the operational activity of companies, we are interested in how the volume of working capital items changed in the crisis years, compared to the immediately preceding economic years. An indicator integrating the key components of working capital is net working capital, which is the difference between the company's short-term assets and its short-term liabilities. We used the following indicator to calculate the net working capital:

$$\frac{\text{current assets} - \text{long term receivables}}{\text{short term liabilities}} \quad (1)$$

The basic idea of our research is inspired by the results of Chiou & Cheng (2006), who found that during a decline in economic activity, companies have increased requirements for working capital management. Our expectations of the research results are not clear-cut, because

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

stopping or the limitation of production activity and social life necessarily brought with it also limitations in cash flows on the financial market. At the corporate level, this could be manifested by a slowdown in cash flows, an increase in the volume of inventories, receivables, and liabilities of individual companies. The selected indicator of net working capital aggregately assesses the development of the volume of money tied up in all these items. With regard to the nature and role of working capital items in the operating process, we anticipate an increase in the volume of net working capital with the onset of the corona crisis.

The years 2020 and 2021 were critical for most business entities. In the study, we focus on companies operating in Slovakia in the industry sector, with an emphasis on individual branches of manufacturing industry. From the results of our analysis of the economic activity of individual branches of the industrial sector, which we processed based on data available in the public database of the Statistical Office of the Slovak Republic, and stated above in the article, we can see that the economic activity of enterprises decreased significantly in the monitored years. According to Plutzer (2021), who analysed the effects of the first wave of the corona crisis on Slovakia's industry, it was a historic decline in activity and the slump in Slovakia was the highest of all EU countries.

We obtained selected information about the short-term assets and liabilities of the companies in question from the database of financial statements provided by the company CRIF – Slovak Credit Bureau, Ltd., which operates CRIBIS.sk Universal Register. The investigated period is the priority years 2018 to 2021. In order to ensure the comparability of the results of the solution, we selected from the provided data base companies whose financial year coincides with the calendar year. From this group of companies, we selected those that published all the financial indicators necessary for the research in the evaluated period.

The sample data set consists of a total of 4227 companies operating in a total of 24 branches of the manufacturing sector (C). We divide the companies into 13 groups (CA – CM, see table 1) in accordance with the industry classification NACE Rev. 2. The number of subjects in the sample set in individual groups of the Industrial Production sector (C) is shown in Table 2.

Table 2. The number of enterprises in individual groups of manufacturing industries

NACE No.	10-12	13-15	16-18	19	20	21	22-23	24-25	26	27	28	29-30	31-33	10-33
NACE	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	Total
No. of firms	519	252	560	6	90	17	526	1018	112	178	316	159	474	4227

Source: Authors' calculations.

We evaluate the performance of individual industries using selected indicators, mainly sales for own services and goods, and industrial production. We evaluate these by comparing the same periods using indices expressed in constant prices of 2015, or in current prices, and converted to year-on-year percentage changes.

Interannual changes in the volume of net working capital in the monitored period are compared using non-parametric tests for two dependent samples, specifically the Wilcoxon signed-rank test, which is considered a non-parametric equivalent of the Paired-samples t-test. We perform the Wilcoxon signed-rank test using the SPSS. The calculation procedure was as follows. For each variable, the difference of its value between two period is computed. If the difference is zero, then we exclude these data from the ranking. All nonzero absolute differences are sorted into ascending order, and ranks are assigned. In the case of ties, the average rank is used. Then the sums of the ranks corresponding to positive and negative differences are separately computed. The test statistic (T) is the smaller of the two values. To calculate the significance of the test statistic (T), we calculate the Z-score as follows:

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

$$Z = \frac{T - \bar{T}}{SE_{\bar{T}}}, \quad (2)$$

where:

$$\bar{T} = \frac{n(n+1)}{4}, \quad (3)$$

$$SE_{\bar{T}} = \sqrt{\frac{n(n+1)(2n+1)}{24}}, \quad (4)$$

and where “n” is the size of sample.

We formulate 1-tailed hypotheses: H_0 : There is no difference in the value of net working capital between two investigated periods ($H_0: \mu_0 = \mu_1$), and H_1 : There is a difference in the value of net working capital between two compared periods ($H_1: \mu_0 < \mu_1$ resp. $H_1: \mu_0 > \mu_1$). We verify the hypotheses at the significance level $\alpha = 0.05$.

Next, we calculate the effect size (r), which informs about an objective and usually standardized measure of the magnitude of an observed effect between variables. We calculated the effect size (r) as follow:

$$r = \frac{Z}{\sqrt{n}}. \quad (5)$$

3. Conducting research and results

Descriptive statistics of the total value of the examined variable in the Manufacturing sector in individual monitored periods are presented in Table 3.

Table 3. Descriptive statistics: Net Working Capital in the Manufacturing sector (total value in EUR)

Period	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
2017	1593887	4770486	73375	1450034	1737740	-20171	120091352
2018	1437362	5210859	80148	1280229	1594494	-63773890	127269948
2019	1216745	4501386	69236	1081007	1352483	-42864103	71055631
2020	1226413	4971940	76473	1076486	1376341	-84047732	93661932
2021	1489941	5403971	83118	1326985	1652897	-46585830	104545239

Source: Authors' calculations.

The results of the descriptive statistics of the net working capital (hereinafter referred to as NWC) of industrial production enterprises of the Slovak Republic show an increase in the volume of NWC between the years 2019, 2020 and 2021, which documents the fact that, in general terms, industrial enterprises increased the volume of their short-term assets at a higher rate with the onset of the corona crisis, as was the change in their short-term liabilities. The standard error of the estimate (Standard Error of the Mean) gradually increases in individual years, which signals the increasing variability of the sample set in individual years, which was also reflected in the growing range of the confidence interval (confidence interval for Mean). The changes to which businesses were exposed in 2020 were also reflected in the 96 percent drop in the minimum NWC value in 2020 compared to 2019.

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INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

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The total value of NWC broken down by individual groups (see table 1) of the manufacturing sector is presented in Table 4. The data for 2017 are expressed in euros, the data for other years present the year-on-year change in the volume of NWC, but also allow to determine its amount in monetary terms. The results show a gradual year-on-year increase in the volume of working capital even in individual groups of industries. In 2018, only 3 sectors recorded year-on-year growth: CB (1.1%), CF (5.6%) and CI (14%). The other 10 industries decreased the volume of their NWC year-on-year, the biggest decrease was in CE (-44%) and CD (-29.8%). In 2019, CE already recorded an increase in NWC by 19.3%, CB by 3.5%. In the other 11 industries, NWC decreased, the most in CD (-73.9%) and CI (-43%).

Table 4. Net Working Capital, mean (€) and interannual change of mean (%) in individual group of the Manufacturing sector

Period	NACE	NWC	NACE	NWC	NACE	NWC	NACE	NWC	NACE	NWC
2017		1547860		1207036		1824972		2186142		1183375
2018		-4.16%		-29.81%		-13.09%		-11.07%		-2.60%
2019	CA	-26.11%	CD	-73.94%	CG	-10.87%	CJ	-25.49%	CM	-2.15%
2020		-5.29%		671.81%		14.54%		16.28%		-17.29%
2021		20.20%		-67.85%		1.32%		15.86%		27.23%
2017		724606		2390959		1252678		2184731		
2018		1.06%		-44.02%		-14.02%		-2.20%		
2019	CB	3.15%	CE	19.32%	CH	-10.08%	CK	-4.77%		
2020		1.53%		20.11%		-0.36%		10.27%		
2021		5.42%		26.81%		32.77%		18.80%		
2017		595719		2750929		3056041		5853809		
2018		-12.46%		5.56%		14.03%		-17.72%		
2019	CC	-13.60%	CF	-0.35%	CI	-43.01%	CL	-28.17%		
2020		11.11%		14.53%		-13.96%		-17.09%		
2021		21.48%		11.70%		31.53%		42.47%		

Source: Authors' calculations.

In 2020, NWC decreased in only 5 industries: CM, CL, CI, CA and CI. In 8 industries, companies increased their NWC year-on-year, the highest increase was in CD (671.8%), the lowest in CB (1.5%), the other 5 industries averaged 14.5%. In 2021, NWC decreased only in the CD sector (-67.9%). In the other 12 industries, net working capital grew, the most in CL (42.5%), the least in CG (1.3%). The extreme fluctuations in changes in the volume of net working capital in the CD industry are caused, on the one hand, by the low number of companies surveyed in the given industry, and on the other hand, by the fact that these companies actually experienced high year-to-year changes in the volume of inventories, short-term receivables, and short-term liabilities.

Which of these changes can be considered statistically significant is the subject of the following research. We used the Wilcoxon signed-rank test to evaluate year-on-year changes in the volume of net working capital. We measure the size of the effect between the differences of average values using effect size (r). We present the results of the solution in Table 5.

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

Table 5. Wilcoxon Signed Rank Test, Effect size

Statistics	NACE	NWC18- NWC17	NWC19- NWC18	NWC20- NWC19	NWC21- NWC20	NACE	NWC18- NWC17	NWC19- NWC18	NWC20- NWC19	NWC21- NWC20
Z ^a		-1.975 ^c	-4.548 ^c	-.049 ^b	-2.567 ^b		-2.050 ^c	-2.647 ^c	-2.971 ^b	-5.484 ^b
Asymp. Sig. (1-tailed) ^a	CA	.024	.000	.481	.005	CH	.020	.004	.001	.000
Effect size (r)		-.087	-.200	-.002	-.113		-.064	-.083	-.093	-.172
Z ^a		-.493 ^b	-1.162 ^c	-2.176 ^b	-1.869 ^b		-.647 ^c	-1.177 ^c	-1.121 ^b	-.226 ^c
Asymp. Sig. (1-tailed) ^a	CB	.311	.123	.015	.031	CI	.259	.120	.131	.410
Effect size (r)		-0.03	-0.07	-0.14	-0.12		-0.061	-0.111	-0.106	-.021
Z ^a		-2.276 ^c	-3.782 ^c	-2.275 ^b	-3.244 ^b		-.452 ^b	-.014 ^b	-.422 ^b	-2.447 ^b
Asymp. Sig. (1-tailed) ^a	CC	.011	.000	.011	.001	CJ	.325	.494	.337	.007
Effect size (r)		-0.096	-0.160	-0.096	-.137		-0.034	-.001	-.032	-.183
Z ^a		-1.153 ^c	-.734 ^b	-.105 ^b	-.314 ^b		-.520 ^b	-1.345 ^c	-1.946 ^b	-3.536 ^b
Asymp. Sig. (1-tailed) ^a	CD	.124	.232	.458	.377	CK	.302	.089	.026	.000
Effect size (r)		-.471	-.300	-.043	-.128		-.029	-.076	-.109	-.199
Z ^a		-1.036 ^c	-.179 ^b	-2.231 ^b	-.585 ^c		-1.235 ^c	-2.115 ^c	-1.365 ^b	-.385 ^c
Asymp. Sig. (1-tailed) ^a	CE	.150	.429	.013	.279	CL	.108	.017	.086	.350
Effect size (r)		-.109	-.019	-.235	-.062		-.098	-.168	-.108	-.031
Z ^a		-.402 ^b	-.024 ^c	-1.775 ^b	-1.018 ^b		-2.604 ^c	-1.625 ^c	-1.297 ^b	-3.073 ^b
Asymp. Sig. (1-tailed) ^a	CF	.344	.491	.038	.154	CM	.005	.052	.097	.001
Effect size (r)		-.097	-.006	-.431	-.247		-.120	-.075	-.060	-.141
Z ^a		-1.005 ^c	-3.951 ^c	-3.059 ^b	-2.546 ^b					
Asymp. Sig. (1-tailed) ^a	CG	.157	.000	.001	.005					
Effect size (r)		-.044	-.172	-.133	-.111					

^a Wilcoxon signed-ranks test ^b Based on negative ranks. ^c Based on positive ranks.

Source: Authors' calculations.

In Table 5, we present the value of the Z-score of the Wilcoxon signed-rank test, which is based on positive or negative differences in each observed interannual period. If the Z-score is based on positive differences, it means that the majority of subjects recorded a year-on-year decrease in the value of net working capital during the given period under review. In the opposite case, when the Z-score is based on negative differences, in a given year the number of entities that recorded a year-on-year increase in the volume of net working capital prevailed.

Enterprises in the manufacture of food products, beverages and tobacco products industry (CA) in the month of the onset of the corona crisis due to the increased creation of food stocks by the population recorded an increase in sales revenue (12.9%) expressed in constant prices (2015), in current prices compared to the previous year in CA industry, however, sales in March 2020 decreased year-on-year (-18.3%). While the average annual industrial production in constant prices increased (9.1%) in 2020, expressed in current prices decreased (-2.6%) compared to the previous year. The data in Table 4 also show a decrease in the average value of NWC between 2019 and 2020 and an increase in NWC until 2021. Changes in the volume of NWC are also confirmed by the Wilcoxon Z-score, which was based on negative differences between 2017 and 2019, but these changes are not statistically significant, from 2019 to 2021 the Z-score value is already based on negative differences, which means that most subjects in CA recorded an annual increase in NWC. The changes during the year 2020 are statistically significant, albeit with a very weak effect ($r = 0.002$), which may also signal the short-term nature of the detected changes.

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

The textile industry (CB) recorded a decline throughout the monitored period. Industrial production expressed in constant prices decreased in every monitored year (2018: -1.2%, 2019: -12.4%, 2020: -33.3%, 2021: -46.9%). Expressed in current prices, its decrease in 2020 is smaller (-23.9%) and in 2021 it rose slightly (0.2%). In CB enterprises, we identify the same changes in the volume of NWC as in CA, with the onset of the corona crisis, these enterprises also increase the volume of NWC. Based on the effect size, we define these changes as weak ($r = 0.14$; $r = 0.12$), but statistically significant.

In the wood, paper and printing industry (CC), we determine the statistical significance of NWC changes in each of the monitored periods, they have a small effect in the differences. The turnover in the NWC volume can also be seen from the values of the annual changes in the NWC average in this industry (see table 4). While in 2020 the sales and production in current prices of companies in the CC sector decreased, in 2021 their production increased by 8.7% and sales by 24.5%.

In the manufacture of coke and refined petroleum products industry (CD), we found extreme year-on-year changes in the volume of NWC in selected companies. However, based on the Wilcoxon test, these are not statistically significant and effect size is small. Based on data from the Statistical Office of the Slovak Republic for the entire CD industry, we know that sales expressed in constant prices between 2017 and 2020 decreased year-on-year, the highest decrease was in 2020 (-9.2%), from 2021 these companies have year-on-year increases in sales (on average 8.9 % in constant prices, an average of 35.9% in current prices). However, industrial production in this sector decreased, in the years 2020-2022 in constant prices by -11.9% per year on average, in current prices in these years we find a moderate growth of 1.4% on average per year.

The manufacture of chemicals and chemical products industry (CE) recorded success in the monitored period compared to other enterprises. While industrial production in the CE in the pre-crisis period in current prices decreased (by -8% on average), it recorded a moderate growth in the years of the ongoing corona crisis (2020: 0.9%, 2021: 8.1%). Sales at current prices grew most significantly in 2021 (32%), when many operations operated under increased hygiene measures, which created increased demand for chemical industry products. The gradual increase in production and sales was also reflected in the volume of NWC companies, which gradually grew year-on-year from 2019 (see table 4). We detect a statistically significant change in 2020. The Z-score value is based on negative differences, which indicates that most companies in this industry have increased their NWC volume year-on-year ($Z = -2.231$; $\text{Sig.} = 0.013$; $r = 0.235$).

The manufacture of pharmaceuticals, medicinal chemical and botanical products industry (CF) is among other industries that prospered during the corona crisis. While industrial production expressed in constant prices fell by an average of 7.8% in 2020 and 2021, expressed in current prices fell in 2020 (-16.3%) and rose in 2021 (2.2%). However, the decrease in production did not affect sales negatively, because they rose in current prices in 2020 (2.7%) and in 2021 (4.1%). The above signals an increase in the prices of pharmaceutical products. We observe an increase in sales despite the decrease in production in several industries. In this way, the companies at least partially covered the losses caused by the crisis period. After a slight decrease in NWC in the CF industry in 2019, these enterprises are increasing the volume of their NWC in the following years (2020: 14.5%, 2021: 11.7%). In 2020, this change is statistically significant ($\text{Sig.} = 0.038$), unlike the previous period, the Z-score is based on negative differences, which means that the year-on-year increase in NWC was recorded by more than half of the companies in the industry, and based on the effect size value ($r = 0.431$) we can say that the change in the average NWC value in this period had a moderately strong effect.

INTERDISCIPLINARY APPROACH TO ECONOMICS AND SOCIOLOGY

Enterprises operating in the manufacture of rubber and plastics products, and other non-metallic mineral products industry (CG) are among the companies that fared better during the second year of the corona crisis. While in 2020 their production decreased both in constant prices (-5.3%) and in current prices (-9.4%), the year 2021 was more successful and they recorded an increase in production in current prices by 11.1%. This was also reflected in an adequate increase in sales at current prices (11.8%). While in 2019 most companies in the CG industry showed a year-on-year decrease in NWC, in 2020 most companies showed a year-on-year increase in NWC. We can consider these changes as statistically significant (Sig. < 0.05), with a moderate effect (average effect size = 0.122).

The manufacture of basic metals and fabricated metal products, except machinery and equipment industry (CH) similar to the rubber industry recorded a decrease in production (-6.4%) and sales (-10.7%) in current prices in 2020, and their growth in 2021 (production 20.5%, sales 35.5%). The growth of production and sales was also reflected in the gradual increase in NWC, while in 2020 the decrease in the average value of NWC decreased from -10.1% (in 2019) to -0.4%, in 2021 CH industry companies increased their NWC, which was reflected in the growth of average value by 32.8% year-on-year (see table 4). Based on the data of the Wilcoxon test (see table 5), we can declare the changes in the volume of NWC in each of the observed periods as statistically significant, but with a weak effect between the differences of the average values of NWC. It is also worth paying attention to the fact that, while in the first two monitored periods, a statistically significant majority of companies achieved a year-on-year decrease in NWC, in 2020 and 2021, a significant majority of companies already showed a year-on-year increase in NWC.

The manufacture of computer, electronic and optical products industry (CI) belongs to others whose production and sales developed in a similar cycle as in the CB, CC and CH industries, i.e. in 2019 and 2020 a decrease (average, production -15.4%, sales -10.3%), and in 2021 an increase (production 14.5%, sales 23.7%). From the data in Table 4, we see a decrease in the average value of NWC in 2019 and 2020, and an increase in 2021. However, we cannot consider any of these changes to be statistically significant, the magnitude of an observed effect is small.

Production and sales in the manufacture of electrical equipment industry (CJ) decreased in 2020 (average -6.6%). In 2021, the industry achieved an increase in production (12.8%) and sales (14.1%) expressed in current prices. In the years of the ongoing corona crisis, companies in this sector also increased the volume of their NWC, which is documented by the year-on-year change in the average NWC value. We can consider a statistically significant change only in 2021 with a weak effect.

We also found statistically significant changes in the volume of NWC in 2020 and 2021 in the manufacture of machinery and equipment n.e.c. industry (CK), which also increased the volume of NWC in 2020. These changes were accompanied by a decrease in production in current prices (-12.8%) and sales (-8.3%) in 2020, and an increase in production (23.4%) and sales (18.2%) in 2021.

The manufacture of transport equipment industry (CL) is one of the most important branches of industry in Slovakia. The increase in industrial production at current prices decreased already in 2019, when compared to 2018 (20.6%) it was only 2.2%. With the onset of the corona crisis, production collapsed and in 2020 it fell by 16.4% compared to the same period last year. In 2021, it has grown again by 4.4%. Sales at current prices grew in 2018 (15.2%), in 2019 (4.6%) and in 2021 (5.5%). The critical year was 2020, when current sales of the transport industry decreased by 8.9% year-on-year. Changes in the volume of NWC (see table 4) refer to the reduction of the interannual decrease in the average value of the volume of NWC between 2019 and 2020 and the increase of NWC in 2021 by 42.5%. Only the change in

2019, which had a small magnitude of an observed effect between differences of two means of NWC, can be considered statistically significant.

The enterprises in the other manufacturing, and repair and installation of machinery and equipment industry (CM) reduced the volume of their NWC by 17.3% in 2020 and subsequently increased it by 27.2% in 2021. The change in 2021 can be considered statistically significant, but with a small effect. Production at current prices of enterprises of other industries decreased by 23.4% in 2020 and increased by 4.9% in 2021. Changes in production were reflected in a decrease in sales by -15.9% (in 2020) and their growth by 7.9% in 2021.

As we mentioned above, the industrial sector of Slovakia experienced its historic slump mainly in 2020. Production of the entire industry expressed in current prices fell by -9.1%. Industrial production itself fell by 11.6% this year. In the following year, the production of industrial production rose by 10.5%. Sales in industry expressed in current prices fell by 8.2% in 2020, in industrial production by 9.4%. In 2021, the current sales of industry and industrial production have already increased by 15.4%.

Shah & Sunil (2021) investigated the impact of COVID-19 on the food service sector, which is one of the most important in the Indian economy. Their findings point to a 40-50 percent drop in sales in this industry. Jain (2020) confirmed the negative effect of COVID-19 on the restaurant industry in their country.

The impact of the pandemic on selected sectors of the Indian economy was also investigated by Bharathi & Dinesh (2021) and Jagdale & Ganatra (2021). Bharathi & Dinesh (2021) focused their attention on the service sector. They summarize the development factors of India's service sector, but also point to the confusion caused by the pandemic in a sector where employees are dependent solely on daily wages because they do not have secure permanent jobs. They also point to the slump in passenger air traffic in April 2020. The same period was also critical for Slovakia's industry. Jagdale & Ganatra (2021) assessed the impact of the COVID-19 pandemic on the tourism industry of India and examined changes in the behaviour of service providers caused by the pandemic.

Impact of COVID-19 on Manufacturing and Supply Networks researched by Wuest et al. (2022). They draw attention to the huge potential of artificial intelligence and digital technologies that can strengthen the resilience and preparedness of manufacturing and distribution companies in the event of crisis periods similar to the COVID-19 pandemic.

The assessment of the impact of COVID-19 on the business environment in Slovakia was addressed by Svabova et al. (2022). They focused mainly on SMEs with an emphasis on the tourist, hotel, and gastro industry. They also analyse the impact of the pandemic on the automotive industry of the Slovak Republic. They point to huge declines in the management of companies operating in the given sectors. The results of their research correspond with our findings and supplement our research with information from the most affected sectors of the Slovak economy. The impacts of the pandemic on selected areas of management of small and medium-sized companies were also investigated by Belas et al. (2022). The authors' findings confirm the negative impact of the pandemic on the financial performance of companies.

Venkatesh & Murugan (2022) investigated the impact of the corona crisis on working capital management. In the article, they present year-on-year changes in the indicators namely current ratio, working capital turnover, debt to equity ratio, proprietary ratio on the example of a selected company in the period from 2017 to 2021. Their findings point to a decrease in the value of the indicator current ratio, decrease of working capital turnover, and debt to equity ratio too, increase of proprietary ratio. At the end of the paper, they point to the low quality of working capital management in the company.

Research on the impact of the COVID-19 pandemic on the management of working capital of small and medium-sized enterprises was carried out by Zimon & Tarighi (2021).

Their results point to a conservative working capital management policy during the COVID-19 pandemic. Businesses that had sufficient liquidity adopted the strategy of attracting new customers by increasing the maturity of receivables, businesses also reduced the turnover of liabilities in order to cooperate with more suppliers in the market. Companies with a higher cash conversion cycle and a higher share of receivables and short-term investments managed to achieve higher sales revenues.

The impact of the COVID-19 pandemic on the working capital management practices of companies operating in the financial sector was investigated by Hamshari et al. (2022). They consider selected indicators, namely quick ratio, financial liquidity, short-term liability turnover ratio, short-term receivables turnover ratio, cash conversion cycle and inventory turnover ratio, to be critical metrics of the working capital management strategy. Using the multiple regression model, they identified a negative impact on working capital management.

Conclusion

A large number of authors have devoted themselves to the research of the COVID-19 pandemic with regard to various aspects of its impact. In this contribution, we focused on research into the impact of the corona crisis on the management of industrial enterprises in Slovakia and changes in the volume of the net working capital of enterprises, broken down by individual branches of industrial production.

Slovakia's industry, especially in the first wave of the COVID-19 pandemic, experienced a historic slump. Industrial production and sales for own services and goods decreased rapidly year-on-year, and many of the enterprises ran into existential problems. Several companies tried to compensate for the resulting production slumps by increasing the prices of their production. In 2020, there was also a decrease in total employment in the entire industry sector (-4.15%), the most significant decrease was in the textile industry (specifically, the production of leather and leather products, -15.35%) and the production of computer, electronic and optical products (-11.3%).

The most important branch of industrial production in Slovakia is the manufacture of transport equipment industry (CL), which accounted for an average of 35.5% of the industry's total sales as of 2018. The second most important branch is the metal industry (CH), with an average share of 17.1% in total sales.

The sequence and strictness of the measures taken by the government to prevent the spread of the COVID-19 pandemic inevitably had an impact on industrial production and sales of individual branches of industrial production. The non-conceptual procedure of adopting government measures made it impossible for companies to plan their activities and purposefully manage operational processes. Industrial activity, especially in the first wave of the corona crisis, was mainly limited by insufficient demand, and restrictions on the supply side also played an important role, mainly the lack of employees and raw materials. Despite the crisis period, some branches of industrial production recorded an increase in sales, mainly the chemical industry (CE), the pharmaceutical industry (CF) and, for a short time, the manufacture of food products (CA). However, most industries recorded a decrease in both sales and production.

We examined changes in the volume of basic items related to ensuring the operational process, i.e. the volume of stocks, money, short-term receivables and liabilities of the company using the net working capital indicator, which is also a comparison of the rate of change in the company's short-term assets compared to changes in short-term liabilities. An increase in this indicator, on the one hand, signals the growth of a certain safety financial cushion, which enables the financing of operating activities from the company's long-term resources, but on the other hand, it points to the growing amount of money tied up in short-term assets, which,

compared to the investment of resources in long-term assets, brings the company a lower profitability.

The results of our research coincide with the results of other authors, who, like us, identified a negative impact on financial results and business management, and increased demands on working capital management during a period of economic activity decline, as also reported by Chiou & Cheng (2006). The stopping and the limitation of production activity and social life necessarily brought with it the limitations in cash flows on the financial market. At the corporate level, this was manifested by a slowdown in cash flows, growth in the volume of inventories, receivables, and liabilities of individual enterprises. The results of the descriptive statistics of the net working capital of industrial production enterprises of the Slovak Republic show an increase in the volume of net working capital between the years 2019, 2020 and 2021, which documents the fact that, in general terms, industrial enterprises increased the volume of their short-term assets at a higher rate with the onset of the corona crisis, as was the change in their short-term liabilities. The standard error of the estimate gradually increases in individual years, which signals the increasing variability of the sample set in individual years, which was also reflected in the growing range of the confidence interval. The changes to which businesses were exposed in 2020 were also reflected in the 96 percent drop in the minimum net working capital value in 2020 compared to 2019.

The weak point of this study is the limited capacities of the authors in data processing. The data that was the subject of processing had to be modified both in terms of its scope and content. On the one hand, the reason for the limitation was the limited availability of data from companies, on the other hand, the authors were also limited by the limited capacity of the software equipment. If more detailed data were available, it would be possible to quantify the changes in development during the monitored period more precisely, and thus to more accurately identify the determinants that caused the changes. The scope of the research, the depth of the analysis and the quality of the outputs were also influenced by the quality and scope of the data published by the Statistical Office of the Slovak Republic. A deeper investigation of the specific causes of the manifested changes also exceeds the scope of this contribution and will be the subject of our further research, aimed at identifying the determinants of the change in net working capital during the period of economic activity decline and their impact on the financial performance of companies.

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