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DETERMINANTS OF CAPITAL STRUCTURE MANAGEMENT BY SHELTERED WORKSHOPS IN THE ERA OF INDUSTRY 4.0

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Purpose: Among Polish enterprises there are so-called sheltered workshops. These enterprises play an important role in the economy by activating disabled people professionally. They function under competitive conditions in a market economy. In order for an enterprise to obtain the status of a sheltered workplace, it must meet a number of requirements. Obtaining the status of a sheltered workplace involves meeting a number of requirements, but also entitles the company to use financial support instruments, the main purpose of which is to reduce the risk of operation of this type of enterprise. The purpose of the study was to analyze the capital structure of sheltered workshops and identify the determinants affecting the optimal capital structure. If sheltered workshops have the opportunity to take advantage of a wide portfolio of financing sources this will affect their development and active participation in the fourth industrial revolution - the concept of Industry 4.0. Optimal sources of financing for the activities of sheltered workshops will allow full implementation of the concept of Industry 4.0, which can allow to raise the level of operational efficiency and accelerate productivity growth.
Design/methodology/approach: A study of the capital structure of sheltered workshops in Poland was conducted in 2024 and an attempt was made to identify the determinants of this structure. A survey was adopted as the form of data collection. The survey was addressed to 200 randomly selected sheltered workshops that are SMEs. In addition to qualitative issues, the survey questions included questions about the value of basic financial data. Learning about the factors influencing the optimization of capital structure is one of the main elements of effective management of capital structure by sheltered workshops. In order to identify the determinants affecting the capital structure of sheltered workshops classified as SMEs, a multivariate regression method was used.
Findings: During the analyzed period, unfavorable changes were observed in the structure of the sources of financing of the surveyed entities through an increase in the share of foreign capital, which affects the deterioration of the financial situation of sheltered workshops and a reduction in their number. Therefore, it is necessary to develop a new model of instruments to encourage the operation of sheltered workshops.
Originality/value: The value of the article is the research on the sector of sheltered workshops, in particular the model of determinants of capital structure. The results are mainly aimed at managers of enterprises with the status of sheltered workshops in the SME sector.
Keywords: sheltered workshop, management, capital structure, Industry 4.0.
Category of the paper: Research paper.

1. The concept and specifics of sheltered workshops in the era of Industry 4.0

In today's environment, companies are challenged to cope with large amounts of data, the speed of accurate decision-making or the flexibility of production processes (Arouri, Pijourlet, 2017, p. 263). Flexibility in production is an important element here, as nowadays, the nature of production is shaped by paradigm shifts from mass production to on-demand, customer-driven production (Schwab, 2015, p. 18-26). The development of the technological process results in an increase in the complexity of business areas (Caroll, 2008, p. 19).

The result is an increased demand for innovation in new materials and technologies, innovative production processes as well as new business models (Griffin, Ebert, 2013, p. 26). In order to innovate, optimal sources of funding are required. Given the aforementioned additional aspects: big data processing and decision-making, a company faces a huge challenge and a technological leap (Kazmierczak, 2017). The challenge to provide innovative platforms and tools for all areas of the enterprise to collaborate with each other. It appears that many enterprise production systems are unprepared to manage large amounts of data due to the lack of intelligent analytical tools.

To cope with the expected complexity of modern production systems, a new concept based on knowledge, technology and tools has emerged, simulating, optimising and monitoring existing production systems. The phenomenon of the next phase of socio-economic development, which is referred to in the literature as the Fourth Industrial Revolution, is linked to three phenomena:

- widespread digitisation and the provision of constant communication between people with each other, people with devices and devices with each other,
- the increasing implementation of disruptive innovations, which make it possible to leapfrog the efficiency and effectiveness of the functioning of the socio-economic system,
- the development of machines that gain the ability to behave autonomously by using ‘artificial intelligence’ (AI) to control them.

The concept of ‘Industry 4.0’ features prominently in the vision of the world reaching a future level of development defined as the ‘Fourth Industrial Revolution’. The concept of Industry 4.0 (Industry 4.0) first emerged in 2011 in Germany (Lee, 2013, p. 9). At that time, it was stated that in the area of Industry 4.0 (Alexa, Alam, 2019), a company's production system will consist of an information system and numerically controlled machines that will operate autonomously and exhibit elements of artificial intelligence. The concept of Industry 4.0 should be considered on a case-by-case basis, depending on the needs of the enterprise in question. The nomenclature of the new concept is also changing, as evidenced by various scientific studies in which related terminology for Industry 4.0 can be found, such as Industrial

Internet or Digital Factory (Lasi, Fettke, Kemper, Feld, Hoffmann, 2013, pp. 240-242). The term Industry 4.0 signifies the fourth industrial revolution, which is assumed to be a vision of intelligent factories built with intelligent information systems. The implementation of this idea, allows the development of intelligent production systems that, in addition to the autonomy mentioned above, have the properties of self-configuration, self-control or self-repair (Janasz, Kozioł-Nadolna, 2011, p. 11). The concept of Industry 4.0 covers areas encompassing numerous technologies and related paradigms. The main elements that are closely related to the idea of Industry 4.0 thus include: cloud-based manufacturing, the industrial internet of things or smart factories (Hermann., Pentek, Otto, 2015, pp. 4-8).

The term Cloud Computing (CC) or cloud computing was first used in 1997. The most commonly used definition of CC is that which: 'cloud computing defines it as a model that allows access over a network to computing resources that can be provided and based on the use of services provided by an internal or external service provider' (Grance, Mell, 2019). Kevin Ashton in 1999 first defined the term 'Internet of Things' (Ashton, 2009). The author proposed the use of data transmission over the internet using RFID to control the supply chain at Procter & Gamble. The area of the Industrial Internet of Things also includes Industrial Control Systems (ICS). Industrial control systems already make use of advanced internet-based communication technologies to a certain extent and can therefore be rapidly integrated into enterprise IT systems. Integration activities are currently underway in many industries, providing an excellent basis for the launch of future intelligent production systems in the concept of Industry 4.0. The highest form of development is the 'Smart Factory' as a core component of the Industry 4.0 concept. It is defined as a factory that intentionally assists human resources and machines in performing their tasks based on elements of the cyber-physical Internet of Things system. This means that the factory will 'be aware and smart enough' to control the production process or keep machines and equipment in proper working order. Innovation will be the source of the development of the 'smart factory'. Building an optimal portfolio of financing sources for sheltered workshops will have an important role in building competitive advantage.

An enterprise that employs disabled workers can apply for the status of a sheltered workplace. This is associated with benefits primarily related to the possibility of benefiting from preferential funding sources for this type of business, cost reimbursements and tax exemptions (Misztal, 2007, pp. 11-20). The last decade has seen a reduction in the number of instruments supporting sheltered workshops. However, obtaining the aforementioned preferences, allowing the company to improve its competitive position, is connected with the obligation to fulfil the conditions specified in the law (Journal of Laws 1997, No. 776), necessary to obtain the status of a sheltered workplace. An enterprise will be granted the status of a sheltered workplace if it has been in business for at least 12 months, employs no fewer than 25 full-time employees and achieves an employment rate of at least 50 per cent of disabled

people (of which at least 20 per cent of the total number of employees are people with significant or moderate disabilities) (Wielgórka, 2009, p. 273).

In addition, the facilities and premises used by the sheltered workplace must comply with the regulations and principles of occupational health and safety and must take into account the needs of the disabled with regard to the adaptation of workstations, hygienic and sanitary premises and circulation routes. Another condition for obtaining the status of a sheltered workplace is the provision of emergency and specialised medical care, counselling and rehabilitation services. In addition to the above-mentioned obligations, so-called sheltered workshops also have beneficial entitlements. The basic support instrument is tax exemption from certain charges. i.e. exemption from real estate tax, agricultural tax and forestry tax with regard to land, buildings, structures notified to the provincial governor. The notification should be confirmed by a decision on granting the status of a sheltered workplace or by a certificate which facilities and land are covered by the sheltered workplace. The exemption is granted after a rigorous employment rate of at least 30% of blind or mentally ill or mentally handicapped persons classified as severely or moderately disabled has been met. The exemption from civil law transaction tax (PCC) is of great importance when an entrepreneur undertakes actions such as the sale of movables, real estate, conclusion of a loan agreement, etc. Preferences also apply to fees with the exception of stamp duty and fees of a sanctioning nature (among others, fees for laboratory tests, fees for the use of the environment, product and deposit fees). In addition to tax exemptions, an employer running a sheltered workplace is entitled to a monthly subsidy to the salaries of disabled employees realised through the PFRON Subsidy and Refund Service System (Wielgórka, 2011, p. 83). Currently, a monthly subsidy to the remuneration of a disabled employee is available in the amount of:

- PLN 2760 - in the case of disabled persons classified as having a significant degree of disability,
- PLN 1550 - in the case of disabled persons classified to a moderate degree of disability,
- PLN 575 - for disabled people with a mild degree of disability,

For persons with certified mental illness, mental retardation, holistic developmental disorders, epilepsy and the blind, these amounts are increased by:

- PLN 1380 - for employees with a significant degree of disability (in total, this subsidy will amount to PLN 4140),
- PLN 1035 - for employees with a moderate degree of disability (in total, the subsidy will amount to PLN 2585),
- PLN 690 for employees with a mild degree of disability (in total, the subsidy will amount to PLN 1265).

The existing system of support for the employment of disabled persons in the form of a subsidy to the remuneration of disabled employees recognises the wage costs of the Act as a whole and it is not possible to apply for a subsidy to only a part of these costs. Protected workplaces are obliged to transfer funds obtained from exemptions to the State Fund for

Rehabilitation of Disabled Persons - in the amount of 10% and the Company Fund for Rehabilitation of Disabled Persons - in the amount of 90%. Protected workplaces can also receive from the PFRON Fund:

- co-financing in the amount of up to 50% of interest on bank loans contracted, on condition that these loans are used for purposes related to the vocational and social rehabilitation of persons with disabilities,
- reimbursement of costs of construction or reconstruction related to modernisation of facilities and premises of the plant, transport, administration.

The reimbursement applies only to the employer's additional costs resulting from the employment of persons with disabilities and can be granted to an employer operating a sheltered workplace with an employment rate of at least 50% of persons with disabilities.

2. Determinants of capital structure management in sheltered workshops

Decisions regarding the management of capital structure formation have a significant impact on various areas of business operation, including sheltered workshops. These mainly concern the choice of types of financing sources(Koscielniak, 2014, p. 203). The capital structure in sheltered workshops is shaped by various factors, while at the same time the proportions of equity and external capital play an important role in the financial management of these enterprises and consequently determine their position in the structure of the economy. The term ‘capital structure’ is not uniformly understood in the literature. Most commonly, capital structure is defined as:

- the share of foreign and equity capital in the financing of the company's activities (Masulis, 2018, p. 18; Jerzmowska, 2004, p. 20),
- equity + long-term debt capital (fixed capital) (Downes, Goodman, 2011, p. 38),
- the ratio of long-term debt to equity (Weston, Copeland, 2020, p. 34),
- all applied capitals that incur costs (Skowronek-Mielczarek, 2005, p. 15).

Istotną rolę dla struktury kapitału odgrywają determinanty, które wpływają na jej kształt. Istnieje wiele kryteriów podziału determinant struktury kapitału:

- związek determinant z otoczeniem przedsiębiorstwa,
- możliwość reagowania przedsiębiorstwa na determinanty.

The first criterion makes it possible to distinguish microeconomic determinants related to the company's proximate environment (e.g. the competitive position of the plant on the market, quality of management, etc.) (Jędrzejczak-Gas, 2013, p. 585) and macroeconomic determinants related to the macro environment (e.g. tax system, economic indicators, industry specifics) (Adamczyk, Iwin-Garzyńska, 2009, p. 65).

When analysing the firm's ability to respond to determinants, we distinguish:

- exogenous factors (cannot be responded to by the entity),
- endogenous factors (can be shaped by the entity) (Chojnacka, Kłosowska, Tokarski, 2016, pp. 25-30).

Exogenous determinants can include, inter alia, economic, international, legal, technological factors, while endogenous determinants include, inter alia, capital providers, accounting system, cost of equity capital, etc. Another division of determinants affecting capital structure is into:

- economic factors,
- legal factors.

To the first group of determinants we can include factors that the enterprise can create, e.g. the efficiency achieved by the enterprise, the propensity to risk, the weighted average cost of capital, the profitability of the enterprise, etc. To the second group of determinants we can include, among others, the tax system, the availability of various sources of financing, the legal form of the enterprise and others (Ickiewicz, 2014, pp. 205-207).

Factors affecting capital structure also include: asset structure, sales stability, operating leverage, growth rate, profitability, management control, market conditions, financial flexibility, taxation (Brigham, 2005, pp. 173-175).

When analysing the factors influencing the capital structure of sheltered workshops, it should be stated that the vast majority of these entities belong to the group of small and medium-sized enterprises. These enterprises differ significantly from those classified as large, both quantitatively and qualitatively. Protected workplaces as SMEs are characterised by certain specific qualitative features, e.g. economic and legal independence of the owner, specific organisational and legal structure, public support.

Two criteria are taken into account in defining SMEs: a quantitative one, based on economic measures such as the number of employees, turnover size, asset size, market coverage. The second criterion is qualitative, based on the characteristics of the company such as unity of ownership and management, decision-making and financial independence, degree of organisational structure, innovativeness, management system, market share (Janiuk, 2004, p. 18). A sheltered workshop as a small enterprise, in the light of the definition of Article 105 of the Act on Freedom of Economic Activity (Journal of Laws 2004, no. 173, item 1807), is an entrepreneur who in at least one of the last two financial years:

- employed on average less than 50 employees per year,
- achieved an annual net turnover from sales of goods and services and financial operations not exceeding the PLN equivalent of EUR 10 million, or the total assets of its balance sheet did not exceed EUR 10 million.

A medium-sized enterprise according to Article 106 of the Freedom of Economic Activity Act meets at least 2 conditions in at least one of the last two financial years:

- employed on average less than 250 employees per year,
- achieved annual net turnover from sales of goods, products and services as well as financial operations not exceeding the PLN equivalent of EUR 50 million, or the total assets of its balance sheet prepared at the end of one of those years did not exceed the PLN equivalent of EUR 43 million.

The Act on Freedom of Economic Activity adopted the recommendations of the European Commission into Polish law.

3. Analysis of the capital structure of sheltered workshops

A study was conducted in 2024 on the capital structure of sheltered workshops in Poland and an attempt was made to identify the determinants of this structure. A survey was adopted as the form of data collection. The questionnaire was addressed to 200 randomly selected sheltered work establishments constituting SMEs, which accounted for 31.29% of establishments operating on 31-12-2023 (Table 1). The return of the questionnaires was 58%.

Table 1.
Number of sheltered workshops in Poland 2013-2023

Years	Number of ZPCh	Number of persons with disabilities employed
2023	639	6649
2022	691	7579
2021	750	8634
2020	797	9256
2019	867	10 752
2018	922	11 818
2017	1 038	13 199
2016	1 102	14 447
2015	1 179	16 297
2014	1 278	18 862
2013	1 416	18 981

Source: own study based on the conducted research.

In addition to qualitative issues, the survey questions included questions on the value of basic financial data. The sheltered workshops surveyed cover on average 52% of the balance sheet total of all sheltered workshops in Poland during the period under review. The set of sheltered work establishments under study are business entities with accounting books or a tax revenue and expenditure ledger belonging to the category of small and medium-sized enterprises. The study covered the years 2019-2023. The following ratios were chosen to characterise the capital structure of the sheltered workshops under study (Table 2):

- equity to total liabilities ratio,
- total debt ratio (total liabilities/total assets),
- capital structure ratio (equity/foreign capital).

Table 2.
Selected capital structure indicators in the surveyed sheltered workshops in the years 2019-2023

Years	Small sheltered workshops			Medium sheltered workshop		
	Kw/P [%]	Ko/A [%]	Kw/Ko	Kw/P [%]	Ko/A [%]	Kw/Ko
2019	51,3	48,7	1,05	55,6	44,4	1,25
2020	50,6	49,4	1,02	55,3	44,7	1,24
2021	49,7	50,3	0,99	54,2	45,8	1,18
2022	46,6	53,4	0,87	52,3	47,7	1,10
2023	45,8	54,2	0,85	51,1	48,9	1,05
average	48,8	51,2	0,96	53,7	46,3	1,16

Source: Own study based on the conducted research.

The research carried out determined that throughout the whole of the analysed period, sheltered workshops classified as medium-sized enterprises financed their activities, to a greater extent than small sheltered workshops, with an average of 53.7 % equity capital, while for small sheltered workshops - 48,8%.

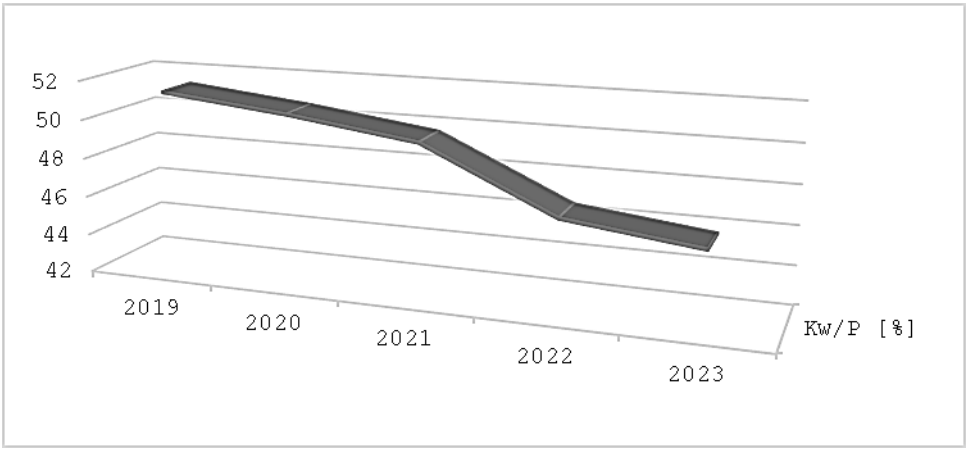

Figure 1. Equity financing ratio of small sheltered workshops in years 2019-2023.
Source: Own study based on the conducted research.

In 2019, small sheltered workshops financed themselves with equity at around 51.3%. In the following years, this ratio decreased to 45.8% in 2023 (Figure 1). This demonstrates the deteriorating financial situation of sheltered workshops classified as small enterprises, which make greater use of external capital by over-indebting themselves. This state of affairs is influenced by changes in legislation that have increased the requirements for sheltered workshops.

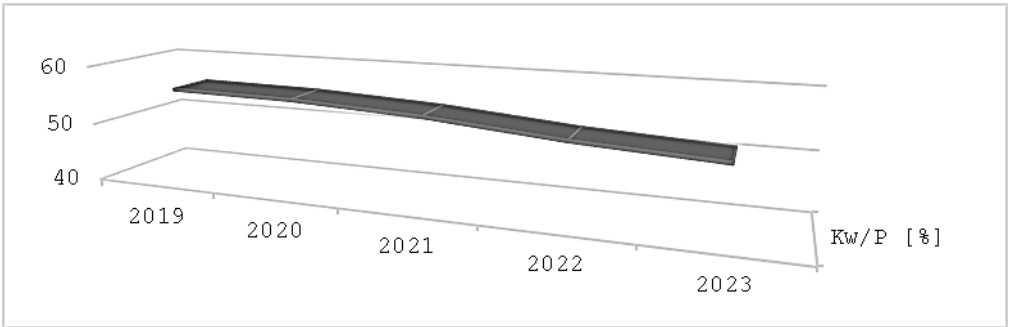

Figure 2. Equity financing ratio of medium-sized sheltered workshops in years 2019-2023.
Source: Own study based on the conducted research.

In medium-sized sheltered workshops, the equity ratio decreased steadily between 2019 and 2023, from a value of 55.6% in 2019 reaching 51.1% in 2023 (Figure 2).

The role of equity has decreased. The total debt index characterises the share of third-party capital (long- and short-term) in the financing of the company's assets. An index between 57% and 67% is accepted as the norm.

The level of indebtedness in small sheltered workshops is increasing during the period under study, reaching an average value of 51.2%. The highest value of indebtedness was achieved by the surveyed establishments in 2023, reaching an index value of 54.2% The level of indebtedness of medium-sized sheltered workshops can be described as low, as it does not exceed 50% in the surveyed period, reaching an average value of 46.3%. It should be emphasised that both small and medium-sized sheltered workshops show an upward trend in the level of indebtedness.

In medium-sized sheltered workshops, the total debt ratio increased by 4.5 per cent to reach 48.9 per cent in 2023, indicating that the percentage of assets financed with external capital has increased. This has the effect of increasing the risk borne by the owners of these establishments. The calculated capital structure index shows (figure 3) that between 2019 and 2023, in both small and medium-sized sheltered workshops, there is a decreasing amount of equity for every PLN of outside capital. This index declined steadily in the years under review and in 2023 in sheltered workshops reached the lowest value for small - 0.85; medium 1.05.

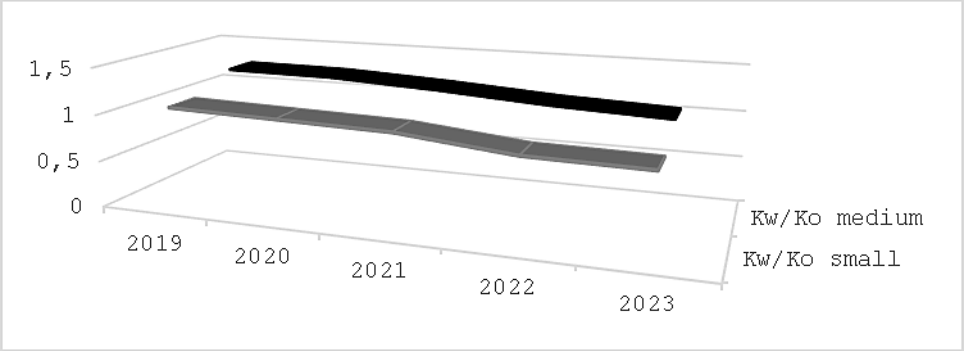

Figure 3. Capital structure of sheltered workshops in the years 2019-2023.
Source: Own study based on the conducted research.

The indexes examined indicate that a change in the capital structure of sheltered workshops took place in the period under review, with an increase in the share of external capital and a decrease in the share of equity capital. In order to analyse the impact of the changes on the optimal capital structure, an analysis of the financial leverage of the studied establishments was carried out.

Table 3.
Selected leverage ratios in surveyed sheltered workshops in the years 2019-2023

Years	Small sheltered workshops	Medium sheltered workshop
	DFL	DFL
2019	3,12	2,26
2020	3,58	2,67
2021	3,88	3,02
2022	4,16	3,36
2023	4,22	3,89
average	3,79	3,04

Source: Own study based on the conducted research.

The financial leverage ratio (DFL) allows an assessment of the efficiency of the use of external capital. In the analysed period, small sheltered workshops achieved a higher leverage ratio than medium-sized ones, which shows that they made better use of foreign capital (Table 3). The average leverage ratio of small sheltered workshops was 3.79 and that of medium-sized ones was 3.04. Between 2019 and 2023, the share of third-party capital in total liabilities increased, with a concomitant increase in leverage. As a result of this phenomenon, a link was observed between changes in the proportion of foreign and equity capital in liabilities and the taking of measures to optimise the capital structure. Knowing the factors influencing the optimisation of capital structure is one of the main elements of effective management of capital structure by sheltered workshops. A multivariate regression method was used to identify the determinants affecting the capital structure of sheltered workshops classified as SMEs. In the conducted research, the capital structure of the surveyed establishments was adopted as the explanatory variable (Y). Analysing the results of the survey and the literature, a list of potential determinants of capital structure was established. Given the limitations of data availability, the following explanatory variables were adopted for the study:

- X1 – asset structure (fixed assets/total assets),
- X2 – profitability of sales (net financial result/sales revenue),
- X3 – return on assets (net financial result/total assets),
- X4 – liquidity (current assets/current liabilities),
- X5 – plant size (value of sales revenue),
- X6 – growth prospects (% change in total assets),
- X7 – uniqueness of product (cost of sales/sales revenue),
- X8 – effective tax rate (income tax/gross profit),
- X9 – economic prosperity (GDP),
- X10 – inflation,
- X11 – cost of external capital (average lending rate).

The coefficient of variation was further estimated to eliminate variables with low variation (critical value of coefficient of variation 0.1). The following variables were eliminated:

- for small sheltered workshops: X1, X6, X7, X9, X10,
- for medium-sized sheltered workshops: X1, X4, X6, X7, X9, X10.

The stepwise 'backward' regression method was then used to build the final model. The linear regression coefficients between the capital structure and the statistically significant explanatory variables are shown in Table 4.

Analysing the conducted research by means of the constructed econometric model, it was deduced:

- the independent variables adopted in the regression models explained to a high degree the variability of the capital structure in small sheltered workshops 76.2% in large ones 71.3%,
- in the built regression model of capital structure of small sheltered workplaces, the following variables turned out to be statistically significant: financial liquidity, size of the establishment, while the variables X2, X3, X8, X11 turned out to be insignificant,
- in the constructed regression model of capital structure of medium sheltered workshops the variables: profitability of sales, size of establishment were statistically significant, while the variables X3, X8, X11 were insignificant,
- in small sheltered workshops, an increase in liquidity by 1 percentage point on average translated into an increase in the equity/debt ratio by 0.792 percentage points. On the other hand, an increase in the size of the establishment measured by the value of sales revenue by PLN 1 million on average translated into a decrease in the equity/debt ratio by 0.049,
- in medium-sized sheltered workshops, an increase in sales profitability by 1 percentage point on average translated into an increase in the equity/debt ratio by 6.242 percentage points. On the other hand, an increase in the size of the establishment measured by the value of sales revenue by 1 million PLN on average translated into a decrease in the equity/debt ratio by 0.006,
- from the point of view of the β-measure (relative importance of independent variables in explaining dependent variables) in small sheltered workshops, liquidity is of crucial importance, whose impact on the capital structure was approximately twice as strong as the impact of the size of the establishment,
- from the point of view of the β-measure, in medium-sized sheltered workshops the main significance is the profitability of sales, whose influence on the capital structure was about 1.5 times stronger than that of the size of the establishment.

Table 4.
Linear regression coefficients

Xi	Small sheltered workshops				Medium sheltered workshop			
	Coeffi-cients	β	standard error	Test t-student	Coeffi-cients	β	standard error	Test t-student
X4	0,792	1,392	0,188	4,321	-	-	-	-
X5	-0,049	-0,682	0,021	-0,698	-0,006	-0,641	0,002	-2,688
X2	-	-	-	-	6,242	1,062	1,510	4,176
constant	0,23	-	0,143	-	0,958	-	0,077	11,234

Source: Own study based on the conducted research.

The results of the research presented here make it possible to identify important determinants of the optimal capital structure. With knowledge of these determinants, the management process of sheltered workshops will improve their financial efficiency.

4. Summary

Sheltered workshops are specific economic units that, on the one hand, have to operate in a normal competitive market, implement the Industry 4.0 solution, and, on the other hand, employ people with disabilities. Due to increased operating costs, they can benefit from financial assistance instruments. A downward trend in the number of sheltered workshops should be noted in the period 2013-2023 under review. The decrease in the number of sheltered workshops is mainly related to the decreasing number of financial instruments supporting their activities. The research conducted on the capital structure of sheltered workshops allows the following conclusions to be drawn:

- between 2019 and 2023, small sheltered workshops financed their activities with equity to a lesser extent than medium-sized ones,
- the level of indebtedness in the analysed sheltered workshops systematically increased in the period under review,
- in the analysed period, in the structure of the sources of financing of the analysed entities, the share of foreign capital increased and the share of own capital decreased, which is a symptom of the deteriorating financial situation of sheltered workplaces,
- small sheltered workshops make better use of foreign capital (they achieve a higher DFL ratio),
- of the determinants adopted for the study, the capital structure of small sheltered workshops was influenced by liquidity and the size of the establishment, while in the case of medium-sized sheltered workshops, the profitability of sales and the size of the establishment have a significant impact.

During the period under review, unfavourable changes were observed in the structure of the sources of financing of the entities under review through an increase in the share of foreign capital, which worsens the financial situation of sheltered workshops and reduces their number.

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