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The Influence of Working Capital Management on the Food Industry Enterprises Profitability

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ABSTRACT

The article presents the results of working capital management efficiency in the food industry in Poland and selected countries of the Eurozone. The research was conducted on the basis of the unpublished data by the Polish Central Statistical Office in the trade structure and dimension of food industry enterprises in Poland in the period of 2005-2009, and comparatively, in respect of the food sector in selected Eurozone countries. The working capital management efficiency was assessed by means of the inventory, accounts receivables, current liabilities turnover cycles, cash conversion cycle, and in respect of the obtained rates of return from non-financial assets. The research proved that in the food industry sectors with the shortest working capital cycles, relatively higher rates of profitability were obtained. A favorable influence of working capital cycles reduction of the profitability was also verified by means of a multiple regression analysis.

KEY WORDS: working capital, rate of return, food industry

JEL Classification: F30, G30, G31

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Introduction

In the financial theory and economic practice, a high level of current assets, through the generation of excessive liquidity costs, exercises a negative influence on the company profitability, whereas their insufficient level may increase a risk of the loss of liquidity, and as a consequence, lead to a range of difficulties in maintaining undisturbed operation of an enterprise (Van Horne and Wachowicz, 2004). The level of current assets should thus be optimized in every company. Nonetheless, this optimization should concern not only the assets level itself, but also their sources of financing. This entails a need of working capital management, which

is taking decisions that maintain a balance between two contrary objectives of the ability of value creation and liquidity (Shin and Soenen, 1998). At present, due to an increasing pressure to create shareholders values, monitoring of an optimum level of working capital determinants (e.g. inventory, accounts receivables, cash and current liabilities) becomes more important (Afza and Nazir, 2009). In numerous enterprises, current assets constitute a half or more of the total asset value, and at the same time, they are financed from various sources. To some extent, it naturally entails a need of shaping their level in a rational manner.

Cash conversion cycle is a basic tool applied in the assessment of working capital management efficiency (Richards and Laughlin, 1980). It is based on an analysis of three partial cycles, that is, the inventory and accounts receivables, which mark the length of a so-

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called operational cycle and current liabilities cycle, forming one synthetic measure of the aforementioned cash conversion cycle.

In a large majority of research, these cycles constituted a basis of the assessment of working capital management efficiency and its influence of rates on return (Gentry, Vaidyanathan, Lee, 1990; Shin and Soenen, 1998; Lyroudi and Lazaridis, 2000; Deloof, 2003; Howarth and Westhead, 2003; Lazaridis and Tryfonidis, 2006; Padachi, 2006; Ózbayrak, Akgiin, 2006; Ramachandran and Janakiraman, 2007; Raheman and Nasr, 2007; Gill, Biger, Matur, 2010; Dong and Su, 2010; Mohamad and Saad, 2010; Nabone, Abdullatif, Al Hajjar, 2010).

Relationships between the length of working capital cycles and the profitability were studied by Deloof (2003), who – on the basis of a panel of non-financial enterprises and by means of a regression analysis – proved that enterprises with a long cash conversion cycles and long inventory, accounts receivables, and current liabilities cycles obtained lower rates of return measured through the operational profit in respect of enterprises with shorter cycles. Lazaridis and Tryfonidis (2006) drew similar conclusions. A method of linear regression applied by these authors showed a statistically significant and negative relationship between the profitability ratios and the length of cycles, except for the current liabilities cycle. The research of Gilla, Biger and Mathur (2010), aimed at extending these findings, led to similar conclusions in that they confirm a negative relationship between longer cycles with the enterprise profitability and value. Dong and Su (2010) also referred to the conclusions drawn by Lazaridis and Tryfonidis, whose research also confirmed the negative influence of inventory, accounts receivables and cash conversion long cycles, and a positive relationship of the longer current liabilities cycle with the profitability. Dong and Su (2010), on the basis of these findings, stipulate a necessity of optimization of these cycles (maintaining them in a reasonable scope), which - in their view - creates real premises for the creation of positive shareholders values.

A wide research on the working capital efficiency was also conducted in the production, trade and service sector in Japan (Nabone, Abdullatif and Al Hajjar, 2010). They indicated a significantly negative relationship between the cash conversion cycle, and the return

on investment from small-, middle- and large-sized Japanese enterprises in all the industry sectors, excluding trade and consumption services. On their basis, postulates were formulated. They said that managers should search for possibilities of the profitability improvement in reducing cash conversion cycles and/or reduction of accounts receivables level, as well as extending current liabilities payment terms to suppliers.

In turn Lyroudi and Lazaridis (2000), who analyzed enterprises in Greece, drew different conclusions. Their findings indicated a positive relationship between the cash conversion cycle and a return on invested capital, although this relationship was not linear. These findings are thus contradictory with the findings of other research, which, in the opinion of Lyroudi and Lazaridis (2000), indicates a need to extend the scope of research method, i.e. with non-parametric statistical methods.

The aim of the presented article is to analyze relationships between the working capital and the profitability on the example of the national food industry in the trade (class) sector, and enterprise dimension. This aim was attained through a presentation of source materials and research methods, a definition of working capital in the functioning of food industry enterprises as well as an analysis of different determinants of working capital management and their quantitative relationships with the profitability of food industry enterprises.

1. Source Materials and Research Methods

The article draws upon two data sources. The first one is aggregated financial statements related to the food sector enterprises of the European Union (production of food and beverages) of selected Eurozone countries published by the European Central Bank (ECB) in the BACH (Bank for Accounts of Companies Harmonized) database. They allow an analysis of sectors by Classification of Economic Activities in the European Community (NACE Revision 1.1 i 2) on the basis of consolidated financial statements in a division by the enterprise dimension¹. The second source is unpublished materials by the Polish Central Statistical Office in years 2005-2009 (Niepublikowane., 2010) in the trade (class) sector, and the dimension of food industry enterprises according to według PKD [Polish Classifica-

tion of Activities] 2007 in conformity to NACE Revision 2 (Polska Klasyfikacja..., 2007).

The analysis of working capital management efficiency in the food industry referred to the indices of management efficiency of inventory, accounts receivables, current liabilities, and the period of cash conversion. In the analysis, simplified indices were applied, that were calculated by means of the following formulas (Sierpińska and Jachna, 2004)²:

$$\text{Inventory turnover cycle} = \frac{\text{Average inventory} \times 365}{\text{Net sales}}$$

This cycle defines the frequency in days of refreshing the inventory by the enterprise or the period of cash freezing in the inventory. In the interpretation of this index, limit values are not stated as it is the most characteristic for this industry.

$$\text{Receivables cycle} = \frac{\text{Average receivables} \times 365}{\text{Net sales}}$$

The receivables cycle informs of the number of days from the moment of sale (issuing of invoice) until receiving of payment. In other words, it shows to which extent the enterprise credits its receiver. The value of this index depends on numerous factors that do not allow the defining normative value³.

The inventory turnover cycle and receivables cycle determines the length of operating cycle that defines the time passed since purchasing of trade materials and goods to the moment of collection of accounts receivables from the sale of final products or goods. Efforts should be taken as much as possible to shorten it, mainly in order to reduce the cost of capital and advancing its rotation.

$$\text{Current liabilities payment cycle} = \frac{\text{Short-term current liabilities (excluding credits and loans)} \times 365}{\text{Net sales}}$$

Granting a trade credit, the enterprises themselves use this instrument, that is they buy materials with deferred terms of payment. A measure of the current liabilities payment period is the cycle, the extension of which is beneficial for the enterprise in terms of liquidity risk,

as it reduced the working capital demand. However, in a well-functioning enterprise, this cycle should not be unnecessarily prolonged, but synchronized with the operating cycle.

A part of operating cycle that is not financed by current liabilities determines a cash conversion cycle, which may be written as follows:

$$\text{Cash conversion cycle} = \text{Inventory turnover cycle} + \text{Receivables cycle} - \text{Current liabilities payment cycle}$$

A positive direction change of this cycle is not so clear, as in the case of other cycles. It is beneficial when it oscillates around zero (Wędzki, 2009). A short conversion period may be a result of a short period of the operating cycle, and quite a long current liabilities cycle in the same time. It is beneficial for the enterprise, as it is then financed by the suppliers, although excessively long delays of payment may mean the absence of cash for current liabilities due. A long conversion cycle, in turn, resulting from a long operating cycle and a short current liabilities payment cycle may entail a non-moving inventory situation, and difficulties in debt collection and the suppliers' dissent on the enterprise crediting, which as a consequence, may lead to its bankruptcy (Wędzki, 2009).

In the assessment of working capital management efficiency, tools of regression analysis were also applied. Their aim was to establish a force and direction of influence of specific partial cycles and a synthetic cycle on the industry efficiency of enterprises measured by the return of non-financial (operating) assets (ROA).

2. Working Capital Cycle and Rates of Return in the Food Industry of Selected Eurozone Countries and in Poland in 2005-2009

Table 1 contains, comparatively for seven Eurozone countries and Poland, the length of cycles of inventory, accounts receivables, current liabilities and cash conversion (funds) along with the average return of assets (ROA)⁴ in the food industry sector (production of foods and beverages) in these countries. Their analysis leads to a conclusion that small- and middle-sized enterprises in Belgium, Poland, Germany and Austria, where the cash freezing period in the inventory

Table 1. Working capital cycles and rate of return from non-financial assets in the food industry of selected Eurozone countries and in Poland by enterprise dimension (\bar{x} – mean value, v_p – variation coefficient in % from the period of 2005-2009)

country	small-sized		middle-sized		large-sized	
Stock cycle (days)	\bar{x}	v_p	\bar{x}	v_p	\bar{x}	v_p
Poland	30.4	2.82	39.7	11.28	34.5	7.46
Germany	34.5	2.07	27.7	3.39	26.1	5.43
Belgium	25.1	2.82	27.7	6.24	27.8	3.77
Spain	79.3	3.97	71.2	11.50	37.3	3.35
France	65.4	5.05	60.8	5.32	49.6	8.46
Italy	87.9	4.05	61.3	1.69	42.9	5.38
Austria	36.4	7.24	36.2	11.39	31.6	4.66
Portugal	87.7	6.30	72.1	6.54	42.0	7.19
Receivables cycle (days)	\bar{x}	v_p	\bar{x}	v_p	\bar{x}	v_p
Poland	44.0	1.86	50.4	5.31	53.3	2.76
Germany	61.4	4.17	54.0	3.04	58.5	5.80
Belgium	95.3	6.85	80.5	7.72	77.9	7.29
Spain	88.9	5.25	96.3	7.04	83.0	13.31
France	75.3	0.67	77.2	2.48	76.4	2.86
Italy	140.2	2.20	132.0	4.61	111.1	2.24
Austria	52.6	7.68	70.5	19.04	83.9	8.35
Portugal	137.6	3.28	113.8	1.79	92.8	4.12
Liabilities cycle (days)	\bar{x}	v_p	\bar{x}	v_p	\bar{x}	v_p
Poland	55.8	5.59	54.6	5.35	59.1	4.30
Germany	62.8	8.25	51.8	5.40	51.4	8.12
Belgium	104.2	2.98	78.6	5.02	98.0	29.93
Spain	104.5	3.72	96.3	2.59	88.4	8.69
France	84.4	1.43	77.7	3.10	75.7	4.40
Italy	124.3	2.14	105.8	4.68	99.9	3.52
Austria	62.3	7.46	57.3	21.76	54.8	10.24
Portugal	146.0	12.79	92.7	3.77	78.5	4.21
Cash conversion cycle (days)	\bar{x}	v_p	\bar{x}	v_p	\bar{x}	v_p
Poland	18.3	12.52	35.5	12.43	28.7	10.30
Germany	32.7	9.94	29.7	8.32	33.2	3.29
Belgium	14.6	49.20	29.5	16.50	3.2	828.11
Spain	63.5	9.82	70.8	16.03	31.6	22.70
France	56.2	7.03	60.3	6.05	50.3	9.69
Italy	103.8	4.15	87.5	3.05	54.0	4.47
Austria	26.8	7.49	49.1	13.11	59.8	17.58
Portugal	76.1	25.99	93.1	8.88	56.2	7.28
Profitability (%)	\bar{x}	v_p	\bar{x}	v_p	\bar{x}	v_p
Poland	14.9	6.21	13.3	5.83	18.5	4.77
Germany	13.1	7.74	14.8	2.15	13.8	7.03
Belgium	12.1	10.43	13.3	4.67	15.2	12.15
Spain	7.3	2.46	8.5	13.02	15.9	5.70
France	10.0	1.45	10.1	2.30	11.6	5.44
Italy	21.3	7.23	7.4	6.58	9.4	5.06
Austria	25.1	8.11	13.2	5.72	18.2	13.31
Portugal	20.2	7.03	8.4	5.39	11.5	16.15

Source: Own study on the basis of Bank for Accounts of Companies Harmonized.

amounted to about 1 month, manage their inventory in the most efficient manner.

Small- and middle-sized companies from other countries, that is, Italy, Spain, Portugal and France, present significantly worse results. In small- and middle-sized enterprises of these countries, the inventory rotation was significantly slower, and it was translated in a much longer period of cash freezing in inventory equaling from 2 to 3 months.

In connection with the other countries, Polish small- and middle-sized food companies clearly stand out also in terms of accounts receivables management. Data listed in Table 1 indicate quite a rigorous crediting policy of receivers and, as a consequence, cash in small- and middle-sized food companies is frozen in accounts receivables for the relatively shortest time (about 1.5 month). Analyzing in turn the average length of these cycles in small- and middle-sized food companies of the other countries, it may be noted that they indicate on a significantly longer crediting period of receivers.

Data presented in Table 1 indicates that except for Austria, Germany and France, where the accounts receivables cycle was 54-77 days, in the sector of small- and middle-sized enterprises of the other countries, the accounts receivables were converted in a cycle that usually exceeded 3 months.

The length of current liabilities cycle also quite clearly distinguishes small- and middle-sized food companies in Poland, Germany, Austria and France. In these countries, current liabilities were settled within no more than 2-2.5 months, whereas in Belgium, Spain, Italy, and Portugal, small- and middle-sized enterprises settled their current liabilities to suppliers in a cycle that exceeded 3-4 months.

The resultant of the partial working capital cycles analyzed above is the cash conversion cycle that synthetically presents the time elapsed from the cash disbursement for materials and raw materials through the production and sale until granting a trade credit and collection. The length cycle analysis shows that in the sector of small- and middle-sized food enterprises, the working capital in Poland, Belgium, Germany and Austria was managed in the most efficient manner. It was regenerated on average after 15-32 days (small-sized companies) and 30-49 days (middle-sized companies), whereas in the other countries, this period

was 2-3 months. Yet, it is important to emphasize that the source of high efficiency measured with the cash conversion cycle in Poland, Belgium, Germany and Austria were quite clearly varied. For instance, in the national sector of small-sized food enterprises, it resulted mainly from a short operating cycle (inventory and accounts receivables cycle), whereas in Belgian enterprises, it resulted from a high inventory rotation strictly related with a longer settlement period.

Differences in specific partial working capital cycles were clearly smaller in the sector of large-sized food enterprises. The length of inventory cycle ranged about 30-50 days. This cycle was relatively shorter in large-sized food companies in Germany, Poland, Belgium and Austria, where the inventory was regenerated within a cycle of about 1 month, whereas in the other countries, large-sized food enterprises reproduced their inventory every 40-50 days. Larger differences, in turn, are noticeable in the management of accounts receivables, where the average collection period ranged 53-111 days. On the basis of data presented in Table 1, it may be stated that the most rigorous policy of current liabilities settlement had large-sized food enterprises in Poland and Germany, and a more liberal one had Italian and Portuguese enterprises. In the above-mentioned enterprises, accounts receivables were collected after less than 2 months, and 3-4 months, respectively.

The length of current liabilities cycle (50-100 days) differentiates the sector of large-sized enterprises to a similar extent. Financing of activity by means of current liabilities to suppliers played an important role above all, in the large-sized food enterprises in Belgium, Spain and Italy. In these countries, the cycle settlement of current liabilities was about 3 months, whereas in Poland, Germany and Austria, it did not exceed 2 months. The indicated differences in the policy of current liabilities and the differences in average collection period described above determine - to a large extent - the length of the cash conversion cycle, which is a measure of financial liquidity and efficiency of the working capital management. From these points of view, the most positive findings concerned large-sized food enterprises in Belgium, where the average cash conversion cycle amounted to 3 days⁵ in the analyzed years. It means that it was close to a theoretical optimum. Large-sized food enterprises in Poland, Germa-

ny and Spain have relatively efficient cash conversion. In these countries, the cash cycle was about 1 month, whereas in the other countries, it exceeded 50 days and reached almost 2 months.

In the light of the theory of finance as well as numerous empirical research described in the literature

research, the policy of working capital management is strictly related with the obtained rates of return. This relationship is also apparent (Table 2) in terms of the sector mean from specific countries, although it does not apply to all the enterprise dimension classes.

Table 2. Linear correlation coefficients between the profitability and the length of working capital cycles estimated on the basis of the sector means from 2005-2009 in the structure of enterprise dimension (dimensions with ** signify statistically significant correlations on the level of $p < 0.05$)

Cycles	Enterprise dimension		
	small-sized	middle-sized	large-sized
inventory cycle	0.101	-0.902**	-0.547**
accounts receivables cycle	0.245	-0.863**	-0.617**
current liabilities cycle	0.132	-0.869**	-0.354**
cash conversion cycle	0.224	-0.924**	-0.378**

Source: own study on the basis of Bank for Accounts of Companies Harmonized.

In the case of small-sized food enterprises a weak correlation between the length of all the cycles and the assets return was noticeable. Nonetheless, this correlation was statistically significant. In the case of middle- and large-sized food enterprises in turn the analyzed correlation is very strong and in the same time, negative. It means that in respect to these classes of enterprise dimension, reducing the inventory, accounts receivables, current liabilities, and cash conversion cycles corresponded to a significant increase in the rate of return measured with the return on non-financial assets. Therefore, it may be stated that in terms of attainment of the most frequently indicated objective at present that is the value creation for stakeholders, the efficient management of working capital through reducing its element cycles is very significant.

3. Trade Differentiation of Working Capital Cycles and Rates of Return in the National Food Industry in 2005-2009

Table 3 shows the average period of cash conversion and partial indices constituting this period in small-, middle-, and large-sized food industry enterprises altogether and the production of groceries and beverages

in Poland in 2005-2009. Moreover, basic descriptive statistics in the structure of enterprise dimension were presented. As the data contain therein indicate, the average inventory cycle of small-sized food enterprises was 31 days and it was very inconstant in the period under study. This cycle was similar in the department of groceries production, and it was much longer in the beverage production, which may result from their longer shelf life or be a sign of difficulties in the product sale.

In the light of the first quartile (Q_1), in 25% of the food industry trades, the inventory cycle was not longer than 19 days and in 50% of trades, it was equal to or shorter than 30 days, and in 50% of trades, it was equal to or longer than 30 days (Q_2), whereas in 25% of trades, it amounted to 47 days and more (Q_3). The distribution of food industry trades by the inventory cycle in 2005-2009 was characterized by a weak right-sided asymmetry ($A_{sp} = 0.19$), which implies that trades with a shorter-than-average inventory cycle prevailed. In specific food industry trades, the inventory cycle was very varied.

The shortest cycle (until 12 days) was in the enterprises representing trades related to meat processing and preservation, manufacturing of meat products,

bread, fresh confectionery products and pastries, and ready-made dishes. The longest inventory cycle (over 2 months) was typical for the production of homogenized products and dietary food, beer, oils, vegetable

and animal fats, sugar, and in the enterprises representing the trade of other processing and fruits and vegetables preservation.

Table 3. Working capital cycles and rate of return from non-financial assets in the food industry of selected Eurozone countries and in Poland by enterprise dimension (\bar{x} – mean value, v_p – variation coefficient in % from the period of 2005-2009)

Specification	Stock cycle (days)	Receivables cycle (days)	Operating cycle (days)	Liabilities cycle (days)	Cash conversion cycle (days)	ROA (%)
Small-sized enterprises						
Food industry	31.4	42.1	73.5	48.3	25.2	14.1
Groceries production	29.1	41.2	70.3	43.5	26.8	14.4
Beverage production	53.7	51.5	105.2	96.2	9.0	12.6
xmin ± xmax	4,9–167,5	21.3–155.4	32.0–220.7	25.5–405.1	-266.1–187.6	-17.1–39.9
Quartile 1 (Q1)	17.3	37.1	61.0	39.4	6.1	7.8
Quartile 2 (Q2)	30.4	50.7	84.0	50.1	28.2	14.0
Quartile 3 (Q3)	46.8	67.3	119.8	73.4	53.3	19.0
Variation ratio v_p (%)	45.1	29.8	35.0	33.9	83.7	39.9
Asymmetry ratio Asp	0.19	0.10	0.22	0.37	0.06	-0.12
Middle-sized enterprises						
Food industry	33.9	46.1	80.1	50.1	29.9	13.3
Groceries production	35.0	43.5	78.5	46.0	32.5	13.8
Beverage production	27.1	64.6	91.7	80.0	11.7	10.1
xmin ± xmax	8.5–182.5	20.4–91.7	37.8–259.7	17.6–161.7	-31.0–206.0	-1.0–32.6
Quartile 1 (Q1)	20.0	36.1	73.6	40.1	13.9	10.5
Quartile 2 (Q2)	35.7	54.2	90.3	53.5	34.0	12.8
Quartile 3 (Q3)	54.5	64.9	121.0	64.4	67.2	17.4
Variation ratio v_p (%)	48.3	26.5	26.2	22.8	78.4	26.9
Asymmetry ratio Asp	0.09	-0.26	0.29	-0.11	0.25	0.33
Large-sized enterprises						
Food industry	29.2	46.6	75.7	53.3	22.5	18.1
Groceries production	33.8	46.9	80.7	50.3	30.3	15.7
Beverage production	13.0	45.4	58.5	63.6	-5.1	26.5
xmin ± xmax	9.3–131.2	25.0–82.7	37.8–175.1	19.1–136.1	-25.8–125.1	5.6–39.2
Quartile 1 (Q1)	17.5	37.5	55.9	39.3	11.8	13.1
Quartile 2 (Q2)	22.5	48.6	75.1	53.5	20.0	15.7
Quartile 3 (Q3)	31.6	66.9	102.7	66.8	39.8	21.0
Variation ratio v_p (%)	31.2	30.2	31.2	25.7	70.0	25.3
Asymmetry ratio Asp	0.29	0.24	0.18	-0.04	0.42	0.34

Source: Own study based on the unpublished data of the Central Statistical Office

Small-sized food industry enterprises in 2005-2009 collected accounts receivables, on average, after 42 days. A similar period of accounts receivables inflow was characteristic for enterprises producing groceries, whereas for enterprises producing beverages, it was longer by almost 10 days. The average accounts receivables cycle in specific trades ranged 21 to 155 days, although it has been emphasized that in a majority of trades (60%), it did not exceed 2 months. In a short-term – up to 1 month – sales revenues of enterprises manufacturing meat products or processing meat were collected. In turn, the accounts receivables inflow in enterprises producing beer, ready-made animal feed, processing tea and coffee, and producing soft drinks and mineral water was 3 months or more.

The length of the inventory and accounts receivables cycle is defined by the length of the enterprise operating cycle, partly financed by the deferment of current liabilities payment, and in the long run, these cycles determine the length of the cash conversion cycle. An analysis of data presented in Table 1 may lead to a conclusion that small-sized enterprises both in the food industry altogether, and in the groceries production financed the operating cycle on average in 60% with current liabilities. It caused that they needed additional funds for financing of current assets only for less than a month. The enterprises producing beverages had a most aggressive strategy of financing the operating cycle. They covered the operating cycle with current liabilities on average in 90%, which meant that they needed additional external funds on average for 9 days.

In specific trades of the food industry, the length of the current liabilities cycle, and as a consequence, the cash conversion cycle was diverse. However, it has to be emphasized that in a majority of trades, the period of engagement of additional (except for current liabilities) funds did not exceed 2 months, although it varied strongly ($vp=83.7\%$). A long current liabilities cycle, which significantly exceeded the operating cycle, was characteristic for the enterprises producing soft drinks and mineral water (191 days) and ice cream (119 days). The cash conversion cycle in these enterprises was negative (-60 and -43 days). It means that not only the operating cycle, but also a part of fixed assets was financed with trade current liabilities. A long current liabilities cycle was also present in small-sized

enterprises producing: beer - 130 days; sugar - 103 days, and processing tea and coffee - 91 days. Yet, with a relatively long operating cycle, it was not sufficient to cover it.

In turn, a relatively short current liabilities cycle in connection with the length of the operating cycle was present in the enterprises producing oils, oils, vegetable and animal fats, sugar, ready-made animal feed and the enterprises dealing with processing and fruits and vegetables. The cash conversion cycle in these enterprises amounted to 70 days or more.

The management of specific elements of the current assets influences a possibility of profit generation, and as a consequence, the return on non-financial assets (ROA). The obtained profitability was moderately correlated both with the length of the operating cycle ($R=-0.51$), and the current liabilities cycle ($R=-0.47$). It implies that the longer they were, the more significant profitability they generated. The length of the average inventory cycle in the middle-sized food industry enterprises altogether, and enterprises producing groceries was similar, although it was slightly longer than in the small-sized enterprises. The period of inventory maintenance in the middle-sized enterprises producing beverages was shorter by half than in the small-sized enterprises. This fact indicates that they had fewer difficulties locating their products on the market and they managed better their inventory of raw materials and products.

The inventory cycle in the middle-sized enterprises was very variable ($vp=48.3\%$). In the first quartile (Q_1) in 25% trades, the inventory cycle was shorter or at least equaled 20 days, in 50% of trades, it equaled or was shorter than 36 days, and in 50% of trades, it amounted to 36 days or more (Q_2), whereas in 25% of trades, it was 54 days or more (Q_3). The distribution of food industry trades by the inventory cycle in 2005-2009 was characterized by a weak right-sided asymmetry ($A_{sp}=0.09$), which implies that trades with a shorter than the average inventory cycle prevailed.

The inventory cycle differentiation by trades is similar as in the case of small-sized enterprises. The differences are clear in enterprises producing beer, where an inventory cycle is significantly shorter – by 35 days in respect of small-sized enterprises of this class. The middle-sized enterprises producing ready-made dishes had a inventory cycle, which was longer by 30 days.

The average length of the accounts receivables cycle in the sector of middle-sized food industry enterprises altogether, and enterprises producing groceries and beverages was similar, although it was slightly longer than in the small-sized enterprises. It means that they had a more liberal receiver-crediting policy. The average variability ($vp=26.5\%$) and a weak left-sided asymmetry was characteristic for the accounts receivables cycle in small-sized enterprises. It means that trades with a slightly longer-than-average accounts receivables cycle prevailed. In 25% of trades, the accounts receivables flowed in after over 2 months (Q_3). The shortest accounts receivables cycle was typical for the same trades as in the case of small-sized enterprises. Also the longest cycles were characteristic for the same trades as in the small-sized enterprises, except for the ones producing soft drinks and mineral water that collected sales revenue in a period that was shorter by half.

The accounts receivables cycle of the middle-sized food industry enterprises, and the ones producing groceries was slightly longer than in the small-sized enterprises. However, it did not contribute to reaching a shorter cash conversion cycle than in the small-sized enterprises due to a relatively longer operating cycle. The accounts receivables cycle of the middle-sized enterprises producing beverages was shorter by 16 days in respect of the small-sized enterprises. This fact meant that the middle-sized enterprises had searched for additional financing sources only for about 12 days, whereas the other ones for about a month. Both small- and middle-sized food industry enterprises altogether and the ones producing groceries financed in 60% their operating cycle with current liabilities, whereas the enterprises producing beverages used this source of financing in 90%.

Moderate variability and a weak left-sided asymmetry were characteristic for the current liabilities cycle of the middle-sized enterprises (trades with a longer than average current liabilities cycle slightly prevailed). The enterprises producing oils and liquid fats, cereal milling products, representing trades related to meat processing and preservation, and manufacture of meat products, and the ones producing milk, bread, and fresh confectionery products and pastries settled their current liabilities within no longer than 40 days.

The current liabilities cycle exceeded three months in the enterprises representing the trades of: distilleries, alcohol rectification and mixing, and production of sugar.

A strategy of financing the operating cycle with current liabilities adopted by the enterprises translates into the length of the cash conversion cycle. The distribution of food industry trades by the cash conversion cycle was characterized by significant variability and weak right-sided asymmetry ($vp=78.4\%$), which implies that trades with a shorter than average inventory cycle prevailed. In specific food industry trades, the inventory cycle was very varied. In the first quartile (Q_1), in 25% of trades, the cash conversion cycle was shorter or at least equaled 14 days, in 50% of trades, it equaled or was shorter than 34 days, and in 50% of trades, it amounted to 34 days or more (Q_2), whereas in 25% of trades, it was 67 days or more (Q_3).

Enterprises representing the trades of: distilleries, alcohol rectification and mixing did not need external funds for financing their operating cycle (conversion period - minus 10 days). A short-term need (up to one month) was characteristic for the trades of: production of bread, fresh confectionery products and pastries (1 day), processing and preservation of poultry (2 days), production of soft drinks, mineral water and other bottled water (3 days), manufacture of meat products, and processing and preservation of meat (5 days), milk processing and cheese production (14 days), production of crackers and biscuits, production of preserved confectionery products and pastries (15 days), production of ice-cream (15 days), production of beer (22 days), and processing and preservation of fish, crustaceans, and mollusks (30 days). A long conversion cycle, which exceeded 2 months, was characteristic for enterprises processing and preserving potatoes, fruits and vegetables, producing spices, sugar, fruit and vegetable juices, processing tea and coffee, and the ones manufacturing cereal milling products, starch, and starchy products.

The return on assets (ROA) in the middle-sized food industry enterprises was on the same level as in the small-sized companies. Similarly as in the small-sized enterprises, the profitability was negatively correlated with the cycles of inventory, accounts receivables, and current liabilities in a moderate manner. It means that longer cycles were characterized by a lower profitability.

The inventory cycle in the large-sized food industry enterprises in Poland in the period of 2005–2009 was shorter than in the small- and middle-sized enterpris-

es. This fact indicates that the scale of activity translates into a higher efficiency of inventory management. Reducing the inventory cycle was the most visible in the enterprises producing soft drinks, where the average cycle was 13 days and was shorter by 50 days in respect of the small-sized enterprises.

The inventory cycle in the large-sized enterprises was characterized by the average variability and a weak right-sided asymmetry, which means that trades with a shorter than average inventory cycle slightly prevailed. In the first quartile (Q^1), in 25% of food industry trades, the inventory cycle was shorter or at least equaled 17 days, in 50% of trades, it equaled to or was shorter than 22 days (Q^2), and in 50% of trades, it amounted to or was longer than 22 days or more (Q^2), whereas in 25% of trades, it was 32 days or more (Q^3).

The shortest inventory cycle was characteristic for the following trades: production of beer (10 days), distilling, rectification and mixing of alcohol (12 days). It has to be underlined that in the small-sized enterprises, these cycles amounted to 76 and 46 days and in the middle-sized ones, 31 and 20 days, respectively. It may indicate that large-sized enterprises have a higher competitive advantage and fewer difficulties locating their products on the market.

The longest inventory cycles in the large-sized enterprises were present in the trades of: processing and preservation of fruits and vegetables (85 days), production of oils and vegetable and animal fats (108 days), and production of sugar (131 days), which is clearly related to technological characteristics of these enterprises.

The inventory cycle in the large-sized food industry enterprises in 2005-2009 was marginally extended in respect of the small- and middle-sized enterprises. A similar tendency was observed in the enterprises producing groceries. This fact indicates that they may have a more liberal policy towards their receivers and, thus, have the faster inventory turnover. The large-sized enterprises producing beverages differs in this respect due to a shorter period of recovery of the engaged financial funds, in respect of the small- and middle-sized enterprises.

In the period under study, the trade distribution by the accounts receivables cycle in the large-sized enterprises was characterized by the average variability ($vp=30.2\%$) and a weak right-sided asymmetry. In the third quartile (Q_3), in 75% of trades, this cycle equaled

67 days or shorter. A short accounts receivables cycle (a month or slightly longer) was typical for the large-sized enterprises manufacturing cereal milling products and starch, producing, processing and preserving meat products, producing beer, and producing oils and animal and vegetable fats. In turn, accounts receivables flowed in after 70 days in the enterprises producing cacao, chocolate, confectionery products and spices, and processing tea and coffee.

The cycles of inventory and accounts receivables determines the length of the operating cycle. In the large-sized food industry enterprises altogether and the ones producing groceries, it was similar to the cycle in the small- and middle-sized enterprises. This cycle shortened remarkably in the enterprises producing beverages, which was a result of a significant reduction of the accounts receivables and inventory cycles.

The current liabilities cycle in the large-sized food industry enterprises and the ones producing groceries was slightly longer in respect of the small- and middle-sized companies equaled on average 53 days. It means that a growing dimension of the enterprise entails a change in the strategy of financing the operating cycle. It becomes more aggressive and it is aimed at limiting the costs of financing. In the enterprises producing beverages, the current liabilities cycle was slightly shorter in respect of the small- and middle-sized enterprises. In their case, however, significant reduction of the operating cycle resulted in the current liabilities financing the cycle in its entirety. Large-sized food industry enterprises altogether and the ones producing groceries financed 60-70% of the operating cycle with the current liabilities. The enterprises producing beverages financed 100% of their current assets with this source.

In the first quartile (Q_1), in 25% of trades of the large-sized food industry enterprises, the current liabilities cycle was shorter or at least equaled 39 days, in 50% of trades, it equaled 53 days or less, and in 50% of trades, it amounted to 53 days (Q_2) or more, whereas in 25% of trades, it equaled 67 days or more (Q_3). The distribution of food industry trades by the current liabilities cycle in the entire period of 2005-2009 was characterized by a weak left-sided asymmetry ($A_{sp}=0.04$), which implies that trades with a longer-than-average current liabilities cycle prevailed.

The large-sized enterprises representing the trades of: manufacturing cereal milling products, producing ice

cream, meat products, and processing and preserving meat products, processing milk, producing sugar, and producing ready-made animal feed paid their current liabilities within 50 days. In turn, the current liabilities cycle in the enterprises producing ready-made dishes, and the ones producing oils and fats was longer than 3 months.

Prolonging of the current liabilities cycle in the large-sized food industry enterprises reduced the number, on average to 22 days, when they needed additional external financing. The distribution of food industry trades by the cash conversion cycle was characterized by very significant variability ($v_p=70\%$), and a weak right-sided asymmetry, which implies that trades with a shorter than average inventory cycle prevailed.

Enterprises representing the trades of: production of beer, production of crackers and biscuits, production of ready-made dishes did not need external funds for financing their operating cycle. A short-term need (up to one month) was characteristic for the trades of: manufacture of meat products, and processing and preservation of meat, production of bread, production of soft drinks and mineral water, milk processing and cheese production, processing of tea and coffee, production and preservation of potatoes. A long cash conversion cycle of over 2 months was present only in the enterprises producing sugar, and the ones processing and preserving fruits and vegetables.

In 2005-2009, large-sized food industry enterprises obtained a higher return on non-financial assets (ROA) by about 5 percentage points than the small- and middle-sized food industry enterprises. Nonetheless, similarly as in the small- and middle-sized companies, the profitability was negatively correlated with the cycles of inventory, accounts receivables and current liabilities, which means that a decrease in the profitability was typical for longer cycles.

4. Quantitative Analysis of the Influence of Working Capital Cycles on Rates of Return in the Food Industry in Poland in Years 2005-2009

Table 4 presents coefficients of linear regression equations between the value of the coefficient of return on non-financial assets (F_{ROA}) and statistically significant explanatory variable (on the significance level of $p=0.05$), and determination coefficient (R^2) in the sector of small-, middle-, and large-sized food industry

enterprises estimate on the basis of the trade sectional and dynamic data⁶. In order to identify the force and direction of the influence of specific partial cycles (of inventory, accounts receivables, and current liabilities) and the synthetic cycle (of cash conversion) on this category of return, Table 4 presents four separate regression functions ($Y_{ROA(L-4)}$). Such a procedure results, on the one hand, from a strong correlation between specific cycles and, on the other hand, it allows verification of hypotheses on the influence of each of the cycle on the return.

The analysis of regression models estimated for specific dimensions of the food industry enterprises allows the following conclusions to be drawn:

1. The independent variables adopted in the model explained, to a different but satisfying extent, the variability of return on non-financial assets (ROA), in the largest sector of the small-sized food companies ($R^2=50-61\%$), to a lower extent in the middle- ($R^2=26-40\%$) and large-sized enterprises ($R^2=29-34\%$).
2. Negative values of regression coefficients with the variables of: inventory cycle (X_1), accounts receivables cycle (X_2), current liabilities cycle (X_3) and cash conversion cycle (X_4) indicate unequivocally that prolonging of these cycles has a negative influence on the return of assets in the small-, middle-, and large-sized food industry enterprises.
3. The analysis of regression coefficients with the variables describing the length of cycles indicates that in the sector of small-sized food industry enterprises, prolonging the inventory and current liabilities cycles negatively influenced the profitability in the strongest manner. In the period under study, prolonging these cycles on average by 10 days translated into a decrease in the profitability by about 1.4 percentage point, whereas the similar prolonging of other cycles (of current liabilities and cash conversion) reduced this return by 0.5-0.7 percentage point.
4. The analysis of regression function parameters with the variables describing the length of cycles indicates that in the sector of small-sized food industry enterprises, prolonging the current liabilities cycle negatively influenced the profitability in the strongest manner. In the period under study, prolonging these cycles on average by 10 days translated into a decrease in the profitability by about 1.1 percentage

Table 4. Linear regression and beta (p) coefficients between the ratio of the return on non-financial assets Y_{ROA} and statistically significant independent variables X , by the food industry enterprise dimension

Independent variable X_1	Dependant variable Y_{ROA}			
	$Y_{ROA(1)}$	$Y_{ROA(2)}$	$Y_{ROA(3)}$	$Y_{ROA(4)}$
Regression coefficients ²				
Small-sized enterprises sector (N=112)				
X_1	-0.1415 (0.0000)			
X_2		-0.1468 (0.0000)		
X_3			-0.0532 (0.0013)	
X_4				-0.0771 (0.0001)
X_7	-2.7902 (0.0405)	-3.7521 (0.0003)	-6.9604 (0.0000)	-4.1608 (0.0004)
X_8	8.2169 (0.0000)		7.8347 (0.0000)	9.4927 (0.0000)
X_9		11.2103 (0.0000)		
X_{12}	-0.1494 (0.0055)	-0.1695 (0.0003)		-0.2923 (0.0000)
X_{14}	-0.1878 (0.0374)		-0.2997 (0.0006)	
Equation constant	42.39 (0.0004)	53.39 (0.0000)	68.64 (0.0000)	55.77 (0.0000)
R ² (%)	58.69	61.05	50.85	57.78
Middle-sized enterprises sector (N=116)				
X_1	-0.0523 (0.0000)			
X_2		-0.1108 (0.0007)		
X_3			-0.0512 (0.0400)	
X_4				-0.0549 (0.0000)
X_{12}	-0.2383 (0.0000)	-0.2735 (0.0000)	-0.1618 (0.0009)	-0.2907 (0.0000)
X_{14}	0.3496 (0.0011)	0.3109 (0.0072)		0.3684 (0.0003)
X_{16}	-0.3159 (0.0234)	-0.3573 (0.0114)	-0.4366 (0.0057)	-0.2989 (0.0264)
Equation constant	27.54 (0.0000)	33.30 (0.0000)	26.68 (0.0000)	30.20 (0.0000)
R ² (%)	36.44	33.92	26.53	40.54
Large-sized enterprises sector (N=94)				
X_1	-0.1017 (0.0003)			
X_2		-0.1304 (0.0092)		
X_3			-0.0933 (0.0305)	
X_4				-0.1218 (0.0000)
X_{10}		-0.1272 (0,0455)	-0,1597 (0,0111)	
X_{12}	-0,2536 (0,0028)	-0,2873 (0,0002)	-0,1849 (0,0395)	-0,4262 (0,0000)
X_{13}		-0,2003 (0,0260)	-0,2812 (0,0144)	
X_{14}	-0,2996 (0,0436)			
Equation constant	36,04 (0,0000)	48,49 (0,0000)	44,35 (0,0000)	43,51 (0,0000)
R ² (%)	30,58	30,81	29,15	33,99

Source: Own study

X_1 – inventory cycle (days), X_2 – accounts receivables cycle (days), X_3 – current liabilities cycle (days), X_4 – cash conversion cycle (days), X_7 – enterprise dimension (natural logarithm of assets value), X_8 – current ratio (current assets/current current liabilities), X_9 – quick ratio (current assets - inventory)/current current liabilities, X_{10} – share of current assets in total assets (current assets x 100/ total assets), X_{12} – total debit (current liabilities and reserves x 100)/total assets, X_{13} – financial debit (long- and short-term credits and loans x 100/ total assets), X_{14} – short-term financial debit (total assets x 100)/total assets, X_{16} – share of financial fixed assets in total assets in %.

2 Parameters describing the influence of the cycles of inventory, accounts receivables, current liabilities, and cash conversion on the return were written in bold; values in brackets at regression coefficients inform about the significance level of independent variables X .

point, whereas the similar prolonging of other cycles (of inventory, current liabilities and cash conversion) reduced this return by 0.5 percentage point.

5. In the sector of large-sized enterprises, a negative influence of all the cycles under study on the profitability was very similar. In the period under study, prolonging these cycles on average by 10 days translated into a decrease in the profitability by about 0.9-1.3 percentage point.
6. An increase in the assets value (X_7) and debt (X_{12}, X_{14}) also negatively influenced the return on non-financial assets in the sector of small-sized enterprises. These variables influence the return in a manner indicating that in a part of small-sized enterprises, the assets are used inefficiently, and a high level of debt may cause difficulties maintaining financial liquidity. It appears that in this case, the problem of liquidity is particularly important and it is reflected in the impact of X_8 and X_9 variables. The data presented in Table 4 shows that the increase in liquidity measured by the current (X_8) and quick (X_9) ratio corresponded to the positive growth of the profitability.
7. In the sector of middle- and large-sized enterprises, no statistically significant relationship between the profitability and the level of current and quick ratios was observed. Nonetheless, in these dimension classes, variables reflected different debt categories were usually negatively correlated with the rate of the profitability. It appears that this condition may result from constantly decreasing efficiency of investment in operating assets.

Conclusion

The efficiency of working capital management may be assessed by means of the cycles of inventory, accounts receivables, current liabilities, and cash as well as through their reference to the obtained rate of the profitability. This efficiency varied both in specific Eurozone countries and in the enterprises of different dimension. In the national food industry, the large-sized enterprises presented the highest efficiency measured by the cash conversion cycle and the profitability. It should be underlined, however, that both large-sized enterprises and the small- and middle-sized ones, the profitability was negatively correlated with the cycles of inventory, accounts receivables and current liabilities, which means

that prolonging these cycles translated into a decrease in the profitability. These types of relationships were confirmed by the created regression models.

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Notes

1. Data is presented by economy sectors, according to the Classification of Economic Activities in the European Community (NACE Revision 1.1 i 2). Yet, they do not concern all the Eurozone countries, and they are often incomplete and incomparable in time, and a division of companies by dimension does not conform to the Classification adopted by the EU. Poland has participated in the Bank for Accounts of Companies Harmonised program for two years.
2. Simplified formulas of calculation of the length of specific cycles were applied in the analysis. However, it is important to emphasize that the reference books contain various calculation formulas of these cycles, which significantly diverge from the primary idea of Richards and Laughlin (1980).
3. Yet, some authors undertake to determine them. In Poland, it is estimated that the length of average collection period in the industry enterprises should amount to about 60 days (Sierpińska and Jachna, 2004). Wędzki (2009), in turn, states that receivables are collected after 45 days, although the suppliers indicate the payment period of 7 to 21 days.
4. $ROA = (\text{operating profit} + \text{amortization}) \times 100\% / (\text{assets total} - \text{long-term investments, long-term receivables, short-term investments} + \text{cash})$.
5. Significant differences in specific years.
6. In the analysis of quantitative relationships of working capital cycles with the return of non-financial assets, there was applied a set of variables that was verified in the studies and previously quoted in the literature research. In these studies, variability of the profitability in reference to the length of working capital partial cycles was also analyzed in connection with the structure of current assets, the level and structure of current liabilities, financial liquidity ratios, the enterprise dimension measured by the value of revenues and assets, and the level of long-term financial assets.