CAPITAL STRUCTURE AS A DETERMINANT OF WORKING CAPITAL MANAGEMENT: EMPIRICAL EVIDENCE ACROSS SIZE GROUPS OF FIRMS IN THE EU COUNTRIES

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Abstract
According to the capital structure theories and empirical research, the direction of the relationship between financial leverage and working capital is usually negative. This study aims at verifying the significance and the direction of the way capital structure impacts working capital on a sample of private firms across 9 EU countries. The theoretical part of the paper contains literature review reflecting the impact of the selected factors on working capital management. In the empirical part the correlation between several capital structure ratios and working capital ratios is examined across countries and size groups of firms in order to find out how the country-specific factors and the factors related to firm size influence this relationship in the period 2000-2010. The data is provided by the BACH-ESD database published by the European Commission. Findings provide evidence that both the direction and the significance of the relationship are considerably influenced by country-specificity and firm size.

Key words: *Capital Structure, Working Capital, European Union, Firm Size, Country Factor*

1. INTRODUCTION

Capital structure and its determinants is one of the most exploited topics in corporate finance literature. The studies on potential factors affecting corporate debt choices, both theoretical and empirical, are nearly countless. Capital structure has been repeatedly proven to be influenced by an almost uncountable number of determinants (Rajan & Zingales 1995), both of an internal and external character, whose significance has been verified in many researches. This paper, although it also deals with the problem of financial leverage, is different from the majority of studies in the field in several ways. First, instead of searching for capital structure determinants and verifying their significance, it treats financial leverage itself as a determinant of another crucial corporate finance area, namely the working capital management. Second, the significance of this factor is verified on a sample of private firms, unlike the majority of studies which use mainly public company data. Finally, the correlation between a number of capital structure ratios and working capital ratios is compared across three size groups of firms in a number of European Union countries, which to the author's knowledge, is the first attempt of this kind of in-depth analysis in this region.

The problem of working capital, defined as the difference between current assets and current liabilities (Arnold 2008, Preve & Sarria-Allende 2010), and the potential determinants affecting working capital management is crucial from the point of view of corporate health (Filbeck & Krueger 2005), manifested by a balance between profitability and liquidity (Taleb, Zoued & Shubiri 2010). The efficient working capital management is a fundamental part of the overall corporate strategy to create shareholders' value (Nazir & Afza, 2008). Therefore firms try to keep an optimal level of working capital in order to maximize their value (Deloof 2003).

Working capital management, which involves monitoring each component of working capital (Gill 2011), as well as minimising deviations from the target level, is a complicated and time-consuming process (Lamberson 1995, Appuhami 2008, Kim & Srinivasan 1991). Insufficient managerial knowledge about the working capital determinants, resulting in ineffective planning and control of

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current assets and liabilities, may contribute to the insolvency or even bankruptcy of enterprises (Rafuse 1996). Despite the importance of the working capital for the corporate financial condition, the empirical evidence about its determinants is missing in the literature, especially taking into account the combined effect of the main working capital components, i.e. the inventory, accounts receivable and accounts payable (Palombini & Nakamura 2011). This study is an attempt to contribute to the corporate finance knowledge of short term decisions by exploring the relationship between financial leverage and working capital depending on the country in which a company operates and the firm size. The main research questions could be formulated as follows: What is the relationship between the capital structure and working capital? Is this relationship affected by firm size? If so, is it the same across different countries?

The aim of the study is to verify the significance and identify the direction of the way capital structure impacts working capital across 3 size groups of firms in 9 EU countries. The empirical analysis covers a sample of private firms during the period 2000-2010. The correlation between several capital structure ratios and working capital ratios is examined in the two cross-sections in order to reveal whether and how the country-specific factors and the factors related to firm size influence the relationship in question.

2. LITERATURE REVIEW

The literature review in the area of corporate finance reveals that in contrast to the capital structure and long term financial decisions, theories of working capital management are much less developed. It appears, however, that some of the capital structure theories can also provide a starting point for the discussion on corporate working capital management. According to one of the most important capital structure theories – the Pecking Order Theory – considered in the context of working capital policy, companies with higher financial leverage tend to choose more aggressive working capital strategies, which involve such practices as tightening credit conditions for customers and reducing inventory, in order to ensure the internal financing and therefore avoid the issuance of debt and equity. A significant correlation between the level of debt and the company's working capital is found e.g. by Jeng-Ren, et al. (2006), Chiou, Cheng and Wu (2006), Nazir and Afza (2008), as well as Palombini and Nakamura (2011).

The country specificity is a widely accepted factor influencing capital structure across firms operating in different countries. The most commonly recognized country-specific factors which can affect corporate financing strategies include political aspects, economic growth, capital market development (Demirgüç-Kunt, Maksimovic 1999, Booth et al. 2001, Claessens et al. 2001, Bancel, Mittoo 2004, Jõeveer 2005), and especially legal and institutional environment explored by La Porta et al. (1997). If financial leverage depends on the country-specific determinants, and the working capital policy is affected by the corporate capital structure, then national characteristics might be also attributed certain impact on the working capital policy. Surprisingly, however, it is difficult to find clear empirical confirmation of the direct relationship between the working capital and the country specificity in the hitherto financial literature. It is also likely that the national specificity might as well affect the way financial leverage impacts working capital, which is aimed to be verified in the empirical part of this study.

The other factor considered in this study is the firm size. It seems quite clear that there should be a considerable impact of the firm size on its working capital management, e.g. due to the fact that scale provides large companies more bargaining power with suppliers and customers compared to small ones. Consequently, it is easier for a large company to negotiate favourable payment terms with customers and suppliers (Valipour, Moradi & Farsi 2012). SMEs are generally considered to be more dynamic and agile than large companies, but also more vulnerable, especially in times of turbulence. This is because they are perceived as less diversified in their activities and as having fewer financing options, as well as lacking large companies' power in buying and selling, resulting in higher WC needs (Morris & Payne 2011).

This intuitively obvious relationship between the company size, usually proxied by the natural logarithm of sales (Deloof 2003) or total assets (García-Teruel & Martínez-Solano 2007; Jeng-Ren, Li & Han-Wen 2006), and its working capital has also been empirically tested in a number of studies. For example Chiou, Cheng and Wu (2006) found in their study of nearly 20 thousand American companies that company size had a positive impact on working capital management. The analysis by Morris and Payne (2011) performed on the basis of the financial data reported by 1,400 companies headquartered in the US, shows that large companies tend to have lower WC requirements than small and medium-sized enterprises (SMEs) at both company and industry levels on a variety of measures. The very biggest companies were also reported to fare even better than large ones in comparison with SMEs.

Similarly, the firm size was also identified as a significant factor affecting working capital management by Jeng-Ren, Li and Han-Wen (2006) in a study of Taiwanese companies. The authors' conclusion is also in line with the findings from the research performed on large US companies by Laplante and Moussawi (2006), who suggest that the firm size has significant positive impact on working capital management. The same kind of relationship was reported by Palombini and Nakamura (2009) for Brazilian companies in a study of 2976 firms in the period 2001-2008, as well as by Zariyawati et al. (2009) in a research carried out on Malaysian companies in the period 2000-2006. The Relationship between working capital management and firm characteristics was also examined by Lotfinia, Mousavi and Jari (2012) on companies listed on Tehran Stock Exchange. The research results again indicate a positive relationship between working capital management and firm size.

In some studies aiming to identify the determinants of working capital management, the latter is represented by the popular measure of cash conversion cycle (CCC), which is the time lag between purchase of raw materials or render of services and the collection of cash from the sale of goods or services rendered. The longer the time lag, the greater financing needs due to the necessary investment to working capital components (Vural, Sökmen & Çetenak 2012). Consequently, a shorter cash conversion cycle indicates a more effective working capital management. In this context the results of studies reporting a negative relationship between the firm size and the CCC should not be surprising. Indeed, the empirical results in the field are fairly unanimous across researches. For example, Jose, Lancaster and Stevens (1996) provide evidence that company size affects cash conversion cycle as larger firms tend to have shorter cash conversion cycles. Also, a significantly negative impact of company size on cash conversion cycle resulted form a study of Pakistani companies carried out by Raheman and Nasr (2007). Similar conclusions were drawn by Uyar (2009), who examined the impact of profitability and size of companies on working capital management. The study was conducted on non-financial firms of Istanbul Stock Exchange. Again a negative correlation between the size of the company and its cash conversion cycle results from an article by Nilsson (2010), who compared the impact of various company characteristics on working capital management in Swedish companies. Another report that the larger the size of the firm, the shorter the CCC comes from the study by Moss and Stine (1993) carried out on 1,717 retailing companies for the period from 1971 to 1990.

The relationship between the size as one of the company characteristics and the working capital management was also quite recently tested by Valipour, Moradi and Farsi (2012) on Iranian listed firms in the period of 2001-2010. First, the authors found that company size significantly affects its working capital management. Then the relationship was tested separately for the three categories of firms according to their size which resulted in a conclusion that size matters as a factor of working capital only in a group of medium-sized firms. The empirical evidence on the influence of the firm-specific factors, including firm size, on the investment in operating working capital is also provided by a study of 192 Malaysian firms from year 2000 to 2007 (Wasiuzzaman & Arumugam 2013).

The only study partly contradicting the above findings is the one by Bhutto et al. (2011) performed on 157 public limited companies listed in the Karachi Stock Exchange for the year 2009. The authors conducted a cross-industry analysis and concluded that it is obvious that firm size as measured by natural log of sales has no significant relationship with CCC. However, they also found a significant negative relationship between the firm size measured by Total Assets and the length of CCC.

The above literature review of the firm size–working capital relationship clearly suggests, that the size of a company might be considered as a generally good indicator of the relative strength of its working capital performance. However, while the results of previous studies confirm that size does matter in working capital, there are many additional factors that can have an impact, which means that the relationship between firm size and working capital performance is not always direct and linear (Morris and Payne 2011). One of these factors is the capital structure. Moreover, the way capital structure affects working capital management may also depend on the firm size.

3. DATA DESCRIPTION AND METHODOLOGY

The source of the analytical data is the BACH-ESD (Bank for the Accounts of Companies Harmonised - European Sectoral references Database). The database (as of 2012) contains 28 financial ratios for non-financial incorporated European companies for nine EU countries: Austria, Belgium, France, Germany, Italy, the Netherlands, Poland, Portugal and Spain.

The ratios used in this study are weighted means and they are differentiated by firm sizes, countries and years. The analysis covers the eleven-year period 2000-2010. The data from more recent years were not included due to a significant number of missing items at the time of the analysis. The analysis involves the capital structure and working capital ratios in three groups of enterprises: small companies (with a turnover of less than 10 million euro), medium-size companies (with a turnover between 10 million euro and 50 million euro) and large companies (with a turnover in excess of 50 million euro) in the nine countries.

The variables involved in the research are financial ratios based on book values (due to the fact that the firms are non-public companies, for which the market values are unavailable), which can be categorised into two groups: capital structure ratios and working capital ratios. The most commonly used capital structure ratio in empirical research is the debt to assets ratio. Apart from using this variable, the range of capital structure characteristics was extended to several other ratios measuring other forms of debt, such as short-term and long-term liabilities as well as provisions. As for the working capital, the commonly used standard measure is the ratio of working capital to total assets. However, in order to perform a more complete analysis of the corporate working capital, it is desirable to examine not only the basic working capital ratio, but also various compounds of the working capital. With this in mind, and taking into account the data availability, the analysis involves the ratios listed in Table 1.

Ratio character	Ratio structure	Symbol	Ratio number in BACH-ESD
Working capital	Inventories / Net turnover	INV/S	R17
	Trade accounts receivable / Net turnover	TAR/S	R18
	Trade accounts payable / Net turnover	TAP/S	R19
	Operating working capital / Net turnover	OWC/S	R20
	Current assets / Assets	CUR/A	R15
	Current investment and cash in hand or at bank / Assets	CSH/A	R21
Capital structure	Total debt / Assets	D/A	1–R22
	Provisions / Assets	P/A	R23
	Credits / Assets	C/A	R24
	Long-term credits / Assets	LC/A	R25

	Short-term credits / Assets	SC/A	R26
	Long-term liabilities / Assets	LL/A	R27
	Short-term liabilities / Assets	SL/A	R28

Table 1. Capital structure and working capital ratios used in the analysis

The variables are ratios of means and not means of ratios, as the data available is aggregated. This means that the ratios are calculated with the use of the balance sheet data averaged for all companies in a given category of size and country.

The methodology of the study is based on the Pearson's correlation coefficient between the two lists of variables: the capital structure ratios and the working capital ratios. The coefficient was computed for the whole data set, as well as for each country and size group separately. This is supposed to reveal whether there are any national or size-related differences between the capital structure – working capital relation, either in terms of its sign or significance.

Then, the relationship is further examined for the binominal objects treated as size groups in countries. The obtained results are meant to allow for identifying some regularities concerning the way country-specific features, as well as firm-specific factors related to size affect the way capital structure impacts short-term financing strategies.

4. RESULTS AND DISCUSSION

The ratios used in the analysis are continuous variables, which is why they may analysed with the use of descriptive statistics, including mean value, minimum, maximum and standard deviation. The descriptive statistics for the total sample are presented in Table 2.

Ratio	N	Mean value	Median	Minimum value	Maximum value	Standard deviation
INV/S	175	0,142	0,112	0,044	0,570	0,099
TAR/S	175	0,261	0,263	0,073	0,572	0,094
TAP/S	175	0,182	0,170	0,000	0,305	0,064
OWC/S	175	0,195	0,170	-0,014	0,623	0,119
CUR/A	175	0,454	0,440	0,306	0,595	0,062
CSH/A	175	0,077	0,072	0,031	0,156	0,027
D/A	175	0,655	0,673	0,502	0,772	0,062
P/A	175	0,051	0,044	0,006	0,230	0,041
C/A	175	0,180	0,173	0,094	0,379	0,050
LC/A	175	0,111	0,108	0,051	0,225	0,030
SC/A	175	0,069	0,070	0,010	0,164	0,036
LL/A	175	0,214	0,211	0,119	0,337	0,046
SL/A	175	0,361	0,345	0,249	0,514	0,057

Table 2. Descriptive statistics for all years, countries and size groups

Source: author's calculations based on BACH-ESD database.

It is also relevant and informative to demonstrate mean values of the variables by year, and particularly by country and company size, as shown in Tables 3 and 4. Apart from the average level of ratios for each category, the tables also indicates major data gaps.

Year, country, size	INV/S	TAR/S	TAP/S	OWC/S	CUR/A	CSH/A
2000	0,120	0,233	0,176	0,172	0,470	0,073
2001	0,120	0,235	0,178	0,182	0,471	0,075
2002	0,123	0,237	0,176	0,193	0,460	0,074
2003	0,125	0,234	0,177	0,192	0,454	0,076
2004	0,119	0,230	0,176	0,184	0,456	0,079
2005	0,116	0,216	0,184	0,178	0,452	0,086
2006	0,114	0,221	0,182	0,183	0,452	0,087
2007	0,123	0,225	0,185	0,200	0,448	0,086
2008	0,141	0,229	0,191	0,223	0,440	0,083
2009	0,146	0,231	0,159	0,201	0,419	0,083
AT	0,101	0,116	0,094	0,090	0,417	0,067
BE	0,097	0,296	0,190	0,172	0,423	0,098
DE	0,119	0,094	0,000	0,000	0,486	0,089
ES	0,206	0,282	0,203	0,258	0,418	0,079
FR	0,091	0,214	0,156	0,125	0,488	0,094
IT	0,120	0,401	0,272	0,230	0,539	0,064
NL	0,057	.	.	.	0,468	.
PL	0,071	0,142	.	.	0,350	0,111
PT	0,230	0,240	0,172	0,289	0,421	0,056
S	0,157	0,244	0,187	0,244	0,471	0,101
M	0,123	0,232	0,175	0,192	0,470	0,080
L	0,095	0,210	0,172	0,136	0,413	0,061

Table 3. Mean values of working capital ratios by year, country and size group (. missing data)

Source: author's calculations based on BACH-ESD database.

Year, country, size	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
2000	0,690	0,073	0,186	0,107	0,083	0,206	0,386
2001	0,683	0,071	0,186	0,108	0,082	0,207	0,381
2002	0,682	0,074	0,187	0,109	0,081	0,212	0,373
2003	0,675	0,071	0,181	0,111	0,074	0,216	0,364
2004	0,670	0,070	0,175	0,109	0,070	0,213	0,363
2005	0,639	0,063	0,167	0,107	0,064	0,205	0,346
2006	0,635	0,065	0,165	0,105	0,064	0,203	0,341
2007	0,631	0,060	0,163	0,106	0,060	0,208	0,337
2008	0,638	0,059	0,185	0,118	0,067	0,216	0,337
2009	0,620	0,056	0,185	0,120	0,065	0,220	0,321
AT	0,708	0,114	0,213	0,110	0,116	0,221	0,374
BE	0,589	0,035	0,139	0,101	0,039	0,198	0,339
DE	0,728	0,170	0,197	0,128	0,069	0,180	0,356
ES	0,582	0,028	0,202	0,125	0,077	0,217	0,333
FR	0,669	0,050	0,134	0,113	0,022	0,274	0,325
IT	0,698	0,060	0,193	0,090	0,104	0,155	0,462
NL	0,651	0,068	.	.	.	0,244	0,339
PL	0,463	0,035	0,120	0,075	0,045	0,135	0,245
PT	0,705	0,016	0,203	0,123	0,080	0,239	0,352
S	0,658	0,050	0,209	0,133	0,084	0,226	0,361
M	0,647	0,058	0,189	0,114	0,075	0,206	0,357
L	0,659	0,089	0,138	0,086	0,052	0,200	0,342

Table 4. Mean values of capital structure ratios by year, country and size group (. missing data)

Source: author's calculations based on BACH-ESD database.

A glance at the descriptive statistics by year, country and size reveals that most ratios from both categories, i.e. the capital structure ratios and working capital ratios, are quite stable in time, whereas when the other two grouping factors – country and size – are considered, they are much more varied. This suggests that it is particularly purposeful to analyse the correlation results for these two cross-sections, as it is more likely that the major differences in the capital structure–working capital relationship appear between countries and (or) size groups than between years.

The most general results concern the correlation coefficient between the pairs of variables for the whole dataset, i.e. for all countries, size groups and years. They are shown in table 5.

Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
INV/S	-0,017	-0,367*	0,415*	0,368*	0,269*	0,186*	-0,038
TAR/S	-0,134	-0,448*	0,082	-0,123	0,217*	-0,369*	0,477*

TAP/S	-0,079	-0,443*	0,029	-0,140	0,157*	-0,286*	0,472*
OWC/S	-0,070	-0,533*	0,399*	0,284*	0,318*	0,052	0,108
CUR/A	0,331*	0,012	0,046	-0,132	0,175*	-0,290*	0,671*
CSH/A	-0,436*	-0,288*	-0,007	0,349*	-0,302*	0,169*	-0,189*

Table 5. Correlation matrix for all countries, size groups and years (* significant at p<0,05)

Source: author's calculations based on BACH-ESD database.

Most of the coefficient values are statistically significant, although the direction of the relationship varies across pairs of ratios. As for the main debt ratio (D/A), its relation with most working capital ratios is usually negative, although mostly insignificant. Such a negative relationship suggests that the higher the leverage, the lower the working capital and its various compounds. It might be interpreted on the grounds of the earlier mentioned Pecking Order Theory applied for explaining working capital management: companies with higher debt prefer more aggressive working capital strategies because firms with high debt ratio tend to need more cash flow from operations in order to repay their debt or to renew it (Nwaeze et al. 2006).

However, the inverse relationship may also mean that when companies have low working capital, they tend to finance their operations with external funds which increase their debt ratio (Jeng-Ren et al. 2006). Regardless whether the reason for low working capital is the high leverage or vice versa, the relationship does not appear to be significant for the entire population tested. However, a clearly negative significance can be observed in the case of provisions ratio (P/A) in relation to most working capital ratios, suggesting that the higher the share of provisions, the lower the working capital. It is also remarkable that the relation between short-term credits and most working capital ratios is significantly positive, which is fairly easy to explain as natural for firms trying to maintain balance between current liabilities and current assets.

To make the analysis more detailed and to detect certain country patterns in the examined relationships, the correlation analysis was also performed for individual countries, as shown in Tables 6 and 7. Due to the missing data for Germany, the Netherlands and Poland, some coefficients are not available for these countries.

Country	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
AT	INV/S	0,174	0,009	0,379	0,132	0,595*	-0,274	0,420
	TAR/S	0,530*	0,162	0,403	0,112	0,673*	-0,390	0,701*
	TAP/S	0,200	-0,181	0,062	0,009	0,114	-0,041	0,342
	OWC/S	0,069	0,192	0,258	0,111	0,376	-0,200	0,115
	CUR/A	0,316	0,357	-0,018	-0,342	0,441*	-0,573*	0,574*
	CSH/A	0,398	-0,591*	0,695*	0,536*	0,680*	0,142	0,626*
BE	INV/S	-0,489*	-0,768*	0,706*	0,721*	-0,019	0,358	-0,159
	TAR/S	0,188	0,442*	-0,403*	-0,404*	-0,016	-0,248	0,020
	TAP/S	-0,367*	-0,458*	0,378*	0,396*	-0,049	0,099	-0,125
	OWC/S	-0,060	0,076	-0,026	0,014	-0,147	0,141	-0,191
	CUR/A	0,452*	-0,214	0,228	0,162	0,255	0,108	0,611*
	CSH/A	-0,538*	-0,485*	0,524*	0,619*	-0,323	0,223	-0,351

Country	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
DE	INV/S	-0,128	-0,885	0,962	0,994	0,913	0,880	0,917
	TAR/S	-0,646	-0,996	0,956	0,895	0,988	0,481	0,987
	CUR/A	-0,597	-1,000*	0,972	0,921	0,996	0,535	0,995
	CSH/A	-0,656	-0,995	0,952	0,889	0,986	0,471	0,984
ES	INV/S	0,199	-0,059	0,223	0,421*	-0,101	0,713*	-0,474*
	TAR/S	-0,176	-0,272	0,384*	0,420*	0,206	0,345	-0,481*
	TAP/S	0,283	0,506*	-0,521*	-0,307	-0,611*	0,441*	-0,535*
	OWC/S	-0,059	-0,411*	0,601*	0,673*	0,305	0,524*	-0,360
	CUR/A	-0,534*	-0,842*	0,664*	0,578*	0,543*	-0,491*	0,464*
	CSH/A	-0,475*	-0,850*	0,831*	0,800*	0,583*	-0,240	0,279

Table 6. Correlation matrix for individual countries: Austria, Belgium, Germany and Spain
(. missing data, * significant at p<0,05)

Source: author's calculations based on BACH-ESD database.

The results indicate the following regularities:

- the relation between the debt ratio and most working capital ratios is mainly negative, but usually statistically insignificant;
- the relation between the provisions ratio and most working capital ratios is usually negative and statistically significant;
- a usually positive and often significant relation is observed between all the credit ratios and working capital ratios, with the exception of Belgium where the relation between short-term credits and working capital ratios is usually negative, though insignificant;
- the relation between the long-term liabilities ratio and most working capital ratios is usually positive but insignificant, with the exception of Italy, where it is positive and significant and Austria, where it is negative but insignificant;
- the relation between the short-term liabilities ratio and most working capital ratios is positive though mainly insignificant in Austria, Germany, France, Poland and Portugal and negative in Belgium (insignificant), Spain and Italy;
- most of the deficiencies of significance are observed in Germany.

The same procedure was followed with respect to individual size groups, as shown in table 8.

Country	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
FR	INV/S	0,217	-0,765*	0,912*	0,936*	0,263	0,668*	0,122
	TAR/S	0,462*	-0,585*	0,536*	0,393*	0,787*	0,025	0,798*
	TAP/S	0,254	-0,475*	0,367*	0,232	0,693*	-0,219	0,730*
	OWC/S	0,329	-0,849*	0,936*	0,914*	0,458*	0,601*	0,338
	CUR/A	0,444*	-0,726*	0,727*	0,612*	0,752*	0,133	0,764*
	CSH/A	0,120	-0,926*	0,867*	0,859*	0,374*	0,438*	0,307

Country	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
IT	INV/S	-0,459*	-0,707*	0,715*	0,661*	0,606*	0,517*	-0,571*
	TAR/S	-0,616*	-0,583*	0,804*	0,703*	0,716*	0,495*	-0,666*
	TAP/S	-0,238	-0,131	0,368*	0,545*	0,137	0,643*	-0,614*
	OWC/S	-0,602*	-0,714*	0,825*	0,698*	0,753*	0,456*	-0,610*
	CUR/A	0,531*	-0,149	-0,033	-0,275	0,180	-0,473*	0,721*
	CSH/A	0,004	-0,680*	0,444*	0,205	0,550*	-0,039	0,135
NL	INV/S	-0,320	-0,010	.	.	.	-0,014	-0,453*
	CUR/A	0,838*	0,501*	.	.	.	0,567*	0,320
PL	INV/S	0,244	-0,907*	0,582*	0,669*	0,058	0,330	0,827*
	TAR/S	0,487	-0,690*	0,277	0,419	-0,183	0,438	0,745*
	CUR/A	0,335	-0,882*	0,407	0,551*	-0,136	0,326	0,892*
	CSH/A	0,040	-0,899*	0,250	0,420	-0,253	0,042	0,857*
PT	INV/S	-0,127	-0,746*	0,481*	0,376*	0,430*	0,195	0,348
	TAR/S	-0,091	-0,772*	0,658*	0,462*	0,658*	0,163	0,287
	TAP/S	-0,006	-0,716*	0,480*	0,387*	0,414*	0,176	0,466*
	OWC/S	-0,144	-0,768*	0,535*	0,402*	0,498*	0,192	0,308
	CUR/A	-0,280	-0,546*	0,244	0,073	0,374*	-0,355	0,456*
	CSH/A	-0,146	-0,784*	0,201	0,193	0,131	0,101	0,393*

Table 7. Correlation matrix for all individual countries: France, Italy, the Netherlands, Poland and Portugal (. missing data, * significant at p<0,05)

Source: author's calculations based on BACH-ESD database.

Size	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
S	INV/S	0,342*	-0,407*	0,183	0,006	0,219	0,124	0,121
	TAR/S	0,036	0,033	0,016	-0,632*	0,412*	-0,613*	0,506*
	TAP/S	0,038	-0,107	-0,193	-0,642*	0,163	-0,456*	0,365*
	OWC/S	0,296*	-0,419*	0,211	-0,170	0,362*	-0,060	0,261
	CUR/A	0,449*	0,504*	-0,231	-0,313*	-0,086	0,134	0,359*
	CSH/A	-0,598*	-0,196	-0,530*	0,225	-0,784*	0,329*	-0,781*
M	INV/S	-0,372*	-0,281*	0,403*	0,209	0,325*	-0,044	-0,306*
	TAR/S	-0,147	-0,571*	-0,189	-0,446*	0,060	-0,416*	0,477*
	TAP/S	-0,148	-0,527*	-0,135	-0,406*	0,097	-0,365*	0,456*
	OWC/S	-0,300*	-0,612*	0,203	-0,012	0,235	-0,136	-0,038
	CUR/A	0,435*	0,129	-0,341*	-0,693*	0,041	-0,417*	0,739*
	CSH/A	-0,256*	0,129	-0,598*	-0,305*	-0,486*	-0,032	0,036

L	INV/S	-0,125	-0,163	0,446*	0,508*	0,125*	0,319*	-0,083
	TAR/S	-0,196	-0,451*	-0,001	-0,041	0,038	-0,306*	0,487*
	TAP/S	-0,060	-0,497*	0,180	0,059	0,190	-0,215	0,566*
	OWC/S	-0,211	-0,388*	0,315*	0,360*	0,088	0,140	0,076
	CUR/A	0,478*	0,204	-0,011	-0,384*	0,352*	-0,619*	0,846*
	CSH/A	-0,405*	0,105	-0,515*	-0,285*	-0,433*	-0,096	-0,193

Table 8. Correlation matrix for individual size groups (* significant at p<0,05)

Source: author's calculations based on BACH-ESD database.

The correlation coefficient values computed for this cross-section reveal that:

- the relation between the debt ratio and most working capital ratios is usually positive and significant for small firms, but negative though insignificant for medium and large companies;
- the relation between the debt ratio and current assets ratio is positive and significant across all size groups;
- the relation between the provisions ratio and most working capital ratios is usually negative and statistically significant across all size groups - similarly to all the credit ratio, long-term credit ratio and long-term liabilities ratio;
- the relation between the ratio of short-term credits and short-term liabilities and most working capital ratios is usually positive and more often significant for the liabilities ratio almost evenly across all size groups.

The most remarkable difference between firms of different sizes refers to the relation between the two key ratios, i.e. the main debt ratio (D/A) and the working capital ratio (OWC/S), which is positive for small firms only. This suggests that small companies with high financial leverage tend to compensate their financial risk with more conservative short-term financial strategies and maintain more working capital. This kind of prudence is not characteristic for medium and large companies, where the relationship remains inverse.

When comparing the correlation results between the above two cross-sections, it seems that the way the capital structure affects working capital in terms of correlation sign and significance is more differentiated across size groups. In most cases the direction of the influence is similar across countries and it is therefore difficult to distinguish any outstanding country. However, when the size cross-section is considered, there were some obvious differences noticeable between small firms and medium and large enterprises.

It might be interesting, whether the same kind of difference between small firms and their medium and large counterparts is present in all countries, or whether this pattern is only true for all countries considered as a total. For instance, the way financial structure affects working capital may differ not only across size groups, but also across countries. Analysing the capital structure – working capital correlation for the binominal objects, namely the size groups in countries, is supposed to answer this question. Due to the amount of results, they are presented in Annex 1.

The results show, surprisingly perhaps, that the previously discovered pattern concerning the difference between small companies and larger ones is not confirmed when the relation between the main debt ratio (D/A) and the working capital ratio (OWC/S), is analysed for individual countries separately. Similar regularity is only the case for Austria, where the correlation is positive for all size groups, but significant only for small firms. Comparison of the correlation results across countries indicates, however, that the capital structure – working capital relationship is far from homogeneous. Moreover, there is no common pattern characteristic for at least two of the countries. This suggests,

that the way financial leverage affects working capital across size groups of companies is determined by country factors. Unfortunately due to the missing data, this impact cannot be identified for all countries.

As for the results concerning the correlation of other pairs of ratios, it is striking that in most cases the relation is statistically insignificant. The few countries departing from this general rule include Germany, Spain (large firms) and France. In other countries statistically significant correlation is occasional rather than regular. In view of such a large number of insignificancies, the question of the correlation sign seems to be of secondary importance. However, in those fewer cases where the relation is significant, it is more often positive than negative, with the main exceptions including small and medium firms in Germany, where the cash ratio is negatively correlated with most debt ratios, small firms in Spain and several pairs of ratios for small firms in France and Italy.

5. CONCLUSIONS

Capital structure is recognized by corporate finance literature as a determinant of working capital management. As indicated in the theoretical part of the study, the relationship between financial leverage and working capital management is mostly reported to be negative. The empirical analysis of the correlation between capital structure ratios and working capital ratios confirms that the relationship between the debt ratio and most working capital ratios is mainly negative, although often statistically insignificant. This regularity was observed for the whole population in total as well as for the majority of countries considered individually. A mainly positive correlation between leverage and working capital ratios was found for Austria, Poland and France though significant only for the latter country.

As for the correlation analysis performed for the other cross-section, i.e. across size groups of firms, it indicated that the relation between the debt ratio and most working capital ratios is usually positive and significant for small firms, but negative though insignificant for medium and large companies. This suggests that high-leveraged small companies are characterized with more prudence in terms of working capital management compared to medium and large firms. However, the pattern concerning the difference between small companies and larger ones was not found when the relation was examined for individual countries separately. Moreover, comparison of the correlation results across size groups in countries clearly shows that the relationship between capital structure and working capital is far from homogeneous, which indicates that the way financial leverage affects working capital across size groups of companies is determined by country-specificity.

As for the statistical significance of the examined relationships, it should be noted that the higher the data aggregation, the greater the share of the significant correlation coefficients. Detailing the analysis across countries or size groups, and especially across size groups in countries results in a decrease of the relative share of statistically significant correlations.

In summary, the empirical result of the analysis contributes to the existing knowledge in the field by showing that the way capital structure affects working capital is not always straightforward, as the relationship is both country-dependent as well as firm size-dependent.

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Annex 1. Correlation matrix for size groups in countries

Country	Size	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
AT	S	INV/S	0,773*	0,090	.	.	0,318	0,457	0,628
		TAR/S	0,736*	-0,074	.	.	0,538	-0,026	0,915*
		TAP/S	0,146	0,716*	.	.	-0,443	0,187	-0,216
		OWC/S	0,688*	-0,252	.	.	0,439	0,196	0,807*
		CUR/A	0,811*	-0,313	.	.	0,645*	0,395	0,868*
		CSH/A	-0,209	-0,121	.	.	0,151	0,209	-0,314
	M	INV/S	0,337	0,806*	-0,030	-0,643*	0,639*	-0,640*	0,496
		TAR/S	0,381	0,900*	-0,082	-0,833*	0,793*	-0,875*	0,749*
		TAP/S	0,126	-0,018	-0,272	-0,268	0,062	-0,205	0,348
		OWC/S	0,115	0,628	0,074	-0,296	0,363	-0,339	0,088
		CUR/A	0,238	0,671*	0,025	-0,787*	0,830*	-0,869*	0,780*
		CSH/A	-0,158	0,007	-0,053	-0,603	0,580	-0,613	0,602
	L	INV/S	-0,136	0,280	-0,287	-0,112	-0,298	-0,339	0,073
		TAR/S	0,595	0,596	0,466	0,264	0,440	-0,530	0,541
		TAP/S	0,212	-0,350	-0,211	-0,402	-0,047	-0,002	0,296
		OWC/S	0,149	0,625	0,343	0,454	0,183	-0,200	-0,029
		CUR/A	0,904*	0,298	-0,046	-0,408	0,164	-0,164	0,560
		CSH/A	0,426	-0,048	-0,086	0,027	-0,123	-0,036	0,317
BE	S	INV/S	-0,847*	0,832*	-0,591	-0,325	-0,822*	-0,306	-0,923*
		TAR/S	-0,325	0,227	0,317	0,431	0,013	0,047	-0,428
		TAP/S	-0,037	-0,133	-0,560	-0,702*	-0,123	-0,493	0,216
		OWC/S	-0,338	0,397	0,320	0,518	-0,123	0,232	-0,552
		CUR/A	-0,299	0,425	-0,361	-0,193	-0,512	-0,229	-0,266
		CSH/A	-0,294	0,413	-0,440	-0,302	-0,511	-0,278	-0,235
	M	INV/S	0,619	-0,629	0,045	-0,555	0,731*	-0,044	0,627
		TAR/S	0,884*	-0,738*	-0,337	-0,781*	0,661*	0,193	0,787*
		TAP/S	0,725*	-0,624	-0,665*	-0,799*	0,382	0,227	0,625
		OWC/S	0,470	-0,346	-0,144	-0,339	0,289	0,482	0,302
		CUR/A	0,766*	-0,345	-0,196	-0,588	0,550	0,023	0,689*
		CSH/A	-0,660*	0,845*	0,240	0,680*	-0,624	0,096	-0,691*
	L	INV/S	0,093	0,462	-0,098	-0,512	0,535	-0,698*	0,364
		TAR/S	0,141	-0,280	-0,071	0,193	-0,380	0,404	0,008
		TAP/S	0,568	0,753*	-0,266	-0,613	0,395	-0,559	0,723*

Country	Size	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
		OWC/S	-0,206	-0,625	0,074	0,436	-0,472	0,592	-0,374
		CUR/A	0,818*	0,827*	0,217	-0,027	0,397	-0,497	0,877*
		CSH/A	0,554	0,513	-0,124	0,016	-0,226	-0,144	0,483
DE	S	INV/S	0,802*	-0,777*	0,904*	0,638*	0,929*	0,628	0,883*
		TAR/S	0,900*	-0,141	0,823*	0,779*	0,719*	0,827*	0,775*
		CUR/A	-0,006	0,189	-0,040	0,086	-0,114	0,066	-0,065
		CSH/A	-0,918*	0,607	-0,961*	-0,885*	-0,855*	-0,878*	-0,851*
	M	INV/S	0,737*	-0,639*	0,739*	0,686*	0,715*	0,752*	0,569
		TAR/S	0,934*	-0,805*	0,871*	0,841*	0,800*	0,873*	0,776*
		CUR/A	-0,137	0,054	-0,230	-0,186	-0,257	-0,242	0,211
		CSH/A	-0,937*	0,826*	-0,948*	-0,899*	-0,894*	-0,955*	-0,719*
	L	INV/S	0,688*	0,559	0,435	-0,045	0,601	0,114	0,070
		TAR/S	0,817*	0,816*	-0,013	-0,536	0,638*	-0,219	0,100
		CUR/A	-0,675*	-0,679*	-0,215	0,341	-0,687*	-0,024	0,064
		CSH/A	-0,317	-0,133	-0,247	0,384	-0,780*	0,281	-0,336
ES	S	INV/S	-0,917*	0,435	-0,773*	0,697*	-0,931*	0,753*	-0,988*
		TAR/S	-0,490	0,278	-0,390	0,292	-0,441	0,676*	-0,688*
		TAP/S	-0,846*	0,337	-0,835*	0,657*	-0,960*	0,684*	-0,900*
		OWC/S	-0,418	0,317	-0,231	0,196	-0,272	0,544	-0,575
		CUR/A	0,168	-0,106	-0,009	-0,267	0,122	-0,478	0,377
		CSH/A	-0,906*	0,726*	-0,461	0,458	-0,576	0,129	-0,648*
	M	INV/S	0,623	0,438	0,162	0,556	-0,431	0,794*	-0,788*
		TAR/S	0,085	-0,329	-0,509	0,077	-0,661*	0,177	-0,061
		TAP/S	0,068	0,000	-0,548	-0,106	-0,504	0,033	0,024
		OWC/S	0,644*	0,331	0,205	0,657*	-0,494	0,875*	-0,853*
		CUR/A	-0,341	-0,582	-0,441	-0,395	-0,062	-0,420	0,531
		CSH/A	0,187	0,149	0,245	0,099	0,168	0,102	-0,049
	L	INV/S	0,914*	-0,757*	0,962*	0,967*	0,761*	0,974*	-0,114
		TAR/S	0,809*	-0,449	0,866*	0,859*	0,715*	0,933*	-0,373
		TAP/S	0,921*	-0,646*	0,940*	0,950*	0,729*	0,921*	-0,085
		OWC/S	0,875*	-0,653*	0,937*	0,937*	0,754*	0,978*	-0,236
		CUR/A	-0,004	-0,422	-0,150	-0,088	-0,296	-0,345	0,878*
		CSH/A	0,926*	-0,664*	0,935*	0,952*	0,704*	0,899*	-0,035

Country	Size	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
FR	S	INV/S	-0,463	-0,708*	0,886*	0,931*	-0,600	0,743*	-0,845*
		TAR/S	0,636*	0,484	-0,390	-0,492	0,673*	-0,315	0,641*
		TAP/S	0,702*	0,898*	-0,609	-0,732*	0,875*	-0,727*	0,943*
		OWC/S	-0,501	-0,921*	0,791*	0,878*	-0,773*	0,897*	-0,939*
		CUR/A	0,388	0,855*	-0,418	-0,566	0,913*	-0,787*	0,780*
		CSH/A	-0,632	-0,828*	0,365	0,507	-0,859*	0,676*	-0,778*
	M	INV/S	-0,585	-0,533	0,387	0,686*	-0,553	0,443	-0,760*
		TAR/S	0,660*	0,454	-0,268	-0,678*	0,736*	-0,187	0,815*
		TAP/S	0,667*	0,400	-0,266	-0,635*	0,664*	-0,181	0,828*
		OWC/S	-0,017	-0,077	0,174	0,090	0,131	0,317	-0,085
		CUR/A	0,385	0,117	-0,313	-0,551	0,442	-0,370	0,635*
		CSH/A	-0,849*	-0,865*	-0,080	0,396	-0,820*	0,125	-0,851*
	L	INV/S	0,286	0,253	0,270	0,355	0,024	0,206	0,197
		TAR/S	0,763*	0,826*	0,420	0,002	0,716*	-0,043	0,865*
		TAP/S	-0,227	-0,048	-0,513	-0,771*	0,075	-0,738*	0,219
		OWC/S	0,697*	0,677*	0,581	0,365	0,544	0,185	0,657*
		CUR/A	0,871*	0,856*	0,602	0,100	0,908*	-0,024	0,976*
		CSH/A	-0,109	0,320	-0,344	-0,516	0,049	-0,521	0,164
IT	S	INV/S	-0,627	0,341	0,025	-0,113	0,092	-0,247	-0,561
		TAR/S	-0,664*	0,472	0,708*	0,298	0,636*	-0,144	-0,601
		TAP/S	-0,664*	0,395	0,361	0,327	0,226	-0,203	-0,587
		OWC/S	-0,702*	0,438	0,541	0,152	0,529	-0,210	-0,620
		CUR/A	0,630	-0,764*	-0,422	-0,485	-0,206	-0,214	0,797*
		CSH/A	0,515	-0,553	-0,679*	-0,410	-0,540	0,212	0,421
	M	INV/S	0,163	-0,105	-0,538	-0,630	0,395	-0,646*	0,581
		TAR/S	-0,349	-0,144	0,759*	0,736*	-0,060	0,709*	-0,685*
		TAP/S	-0,114	-0,358	0,816*	0,836*	-0,212	0,837*	-0,646*
		OWC/S	-0,254	0,012	-0,152	-0,225	0,266	-0,277	0,073
		CUR/A	0,597	0,558	-0,622	-0,648*	0,195	-0,608	0,739*
		CSH/A	-0,007	0,155	-0,690*	-0,702*	0,163	-0,787*	0,517
	L	INV/S	0,244	-0,184	0,143	0,516	-0,382	0,628	-0,344
		TAR/S	-0,007	0,425	0,269	0,546	-0,289	0,504	-0,562
		TAP/S	0,747*	0,130	0,443	0,472	-0,044	0,648*	-0,020

Country	Size	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
		OWC/S	-0,126	-0,129	0,043	0,650*	-0,615	0,667*	-0,690*
		CUR/A	0,652*	-0,145	0,261	-0,138	0,395	-0,036	0,589
		CSH/A	0,564	-0,284	-0,194	-0,426	0,241	0,086	0,424
NL	S	INV/S	-0,776*	-0,779*	.	.	.	-0,113	-0,575
		CUR/A	0,839*	0,815*	.	.	.	0,314	0,537
	M	INV/S	-0,149	0,106	.	.	.	0,334	-0,473
		CUR/A	0,492	0,305	.	.	.	-0,630	0,761*
	L	INV/S	-0,450	-0,417	.	.	.	-0,573	-0,025
		CUR/A	0,763*	0,466	.	.	.	0,267	0,593
PL	S	INV/S	0,556	-0,538	0,903*	0,670	0,961*	0,846	-0,178
		TAR/S	0,078	0,420	-0,636	-0,412	-0,775	-0,461	0,371
		CUR/A	-0,268	0,768	0,254	0,554	-0,327	0,256	-0,848
		CSH/A	-0,410	0,712	0,066	0,367	-0,450	0,052	-0,736
	M	INV/S	0,164	-0,306	0,299	0,367	-0,236	0,397	-0,632
		TAR/S	-0,429	-0,229	-0,525	-0,595	0,214	-0,377	-0,576
		CUR/A	-0,734	-0,845	-0,567	-0,536	-0,232	-0,649	-0,479
		CSH/A	-0,669	-0,211	-0,818	-0,890*	0,166	-0,734	-0,215
	L	INV/S	-0,518	-0,659	0,328	-0,231	0,679	-0,303	-0,427
		TAR/S	0,640	0,980*	-0,846	-0,547	-0,884*	0,378	0,215
		CUR/A	0,699	0,995*	-0,818	-0,501	-0,876	0,433	0,308
		CSH/A	0,023	0,557	-0,813	-0,832	-0,616	-0,120	-0,509
PT	S	INV/S	-0,012	0,115	0,150	0,587	-0,482	0,612	-0,222
		TAR/S	0,731*	0,800*	0,750*	0,849	0,325	0,875*	-0,564
		TAP/S	-0,183	-0,027	-0,061	0,375	-0,609	0,473	-0,123
		OWC/S	0,161	0,274	0,311	0,704	-0,327	0,716*	-0,311
		CUR/A	-0,521	-0,601	-0,735*	-0,422	-0,855*	-0,345	0,737*
		CSH/A	-0,436	-0,490	-0,549	-0,209	-0,777*	-0,218	0,648*
	M	INV/S	0,521	-0,259	0,442	0,605	-0,609	0,697*	-0,672*
		TAR/S	0,089	0,005	-0,078	0,139	-0,406	0,200	-0,357
		TAP/S	0,672*	0,000	0,291	0,468	-0,546	0,524	-0,334
		OWC/S	0,216	-0,258	0,251	0,397	-0,457	0,467	-0,571
		CUR/A	-0,740*	0,269	-0,476	-0,673*	0,700*	-0,755*	0,614
		CSH/A	0,348	-0,744*	0,282	0,513	-0,654*	0,346	-0,173

Country	Size	Ratio	D/A	P/A	C/A	LC/A	SC/A	LL/A	SL/A
	L	INV/S	-0,530	-0,148	-0,451	-0,504	-0,341	-0,235	-0,246
		TAR/S	0,424	0,376	0,265	0,250	0,277	-0,394	0,674*
		TAP/S	0,361	0,119	0,273	0,285	0,240	-0,364	0,570
		OWC/S	-0,442	-0,044	-0,391	-0,446	-0,280	-0,225	-0,175
		CUR/A	0,044	0,088	0,038	-0,012	0,122	-0,693*	0,502
		CSH/A	-0,550	-0,668*	-0,632	-0,608	-0,643*	-0,261	-0,360

. missing data, * significant at p<0,05