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Financing of Working Capital Requirement and Profitability: Evidence from Borsa Istanbul Chemical, Petroleum, Rubber, and Plastic Sector

Burcu Dinçergök

Additional information is available at the end of the chapter

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Abstract

This study investigates the relationship between the maturity of debt used to finance working capital requirement and profitability. The firms in Borsa Istanbul chemical, petroleum, rubber, and plastic sector are analyzed using two-step generalized method of moments (GMM) method over the 2005–2015 period. The results show a concave-shaped relation between the short-term financial debt that is used to finance the working capital requirement and profitability. The ratio of short-term financial debt increases profitability up to a point, and over this point, the effect of short-term debt on profitability is found to be negative. Furthermore, for financially flexible firms, the breakpoint of the short-term financial debt and profitability relation occurs at the higher levels of the short-term financial debt-to-working capital requirement ratio.

Keywords: working capital requirement, profitability, short-term financial debt, chemical, petroleum, rubber and plastic sector, GMM method

1. Introduction

Working capital management is one of the most important issues in corporate finance due to its effects on the profitability, liquidity, and risk of firms. When the literature on working capital management is reviewed, it can be seen that many of the studies are generally focused on the investment in working capital requirement (WCR) and firm performance [1–7].¹ While studies

¹In this study working capital requirement (WCR) is defined as the difference between current assets and accounts payable.

show that investment in WCR has an important effect on the profitability of firms, another issue, at least as important as investment in WCR, is the linkage between profitability and WCR financing. Since the types and maturities of financing sources have a direct impact on the costs and the risks of firms, it is expected that how WCR is financed will also have an effect on profitability. The literature on the relationship between WCR financing and profitability is very limited (i.e., there is only one study by Banos-Caberollo, Garcia-Teruel, and Martinez-Solano [8]). To the best of our knowledge, there is no study in Turkey related with this subject.²

Financial managers consider the general economic conditions, industrial factors, legal regulations, firm-specific factors, and the reaction of the lenders when deciding on the maturity and the type of the financing instruments they choose. At the same time, appropriateness, risk, cost, the financial leverage effect, flexibility in usage, timing, and the possible claims on management are also taken into account in the selection processes [10].

There are many advantages of using short-term debt in financing WCR. The most important advantage of short-term debt is its cost advantage. Normally, short-term debt is less costly than long-term debt. In addition, compared with long-term debt, short-term debt is easier to obtain and provides more flexibility over spending. But, short-term funds are riskier than long-term funds. This risk is due to the immediate payment of the short-term obligations, the refinancing requirement, and the uncertainty in interest rates when refinancing requirement arises. It is known that firms may face bankruptcy when they have difficulties in payment of short-term funds and when these funds are not renewed [11]. Due to these risks, the cost advantage of short-term debt is not limitless.

As stated by Banos-Caberollo, Garcia-Teruel, and Martinez-Solano, usage of short-term funds provides a cost advantage to the firms when a low percentage of WCR is financed by short-term debt. However, if a high percentage of WCR is financed by short-term debt, an additional increase in short-term debt will increase the risk of repayment as well as the risk of renewing the funds and will cause the lenders to demand higher interest rates from the firms. Therefore, at lower levels of short-term debt-to-WCR ratios, the expected relationship between the proportion of short-term funds used to finance WCR and profitability is positive, but at higher levels of the short-term debt-to-WCR ratios, the expected relationship is negative [8].

The first aim of this study is to reveal the relationship between the proportion of short-term funds used in WCR financing and profitability in the Borsa Istanbul chemical, petroleum, rubber, and plastic sector. If the relationship turns out to be as expected, then the level at which the short-term debt-to-WCR ratio turns from positive to negative will also be investigated. To do this, the firms operating in the chemical, petroleum, rubber, and plastic sector in Borsa İstanbul over the 2005–2015 period are analyzed using two-step GMM method. This study finds a concave-shaped relation between the proportion of short-term financial debt that is used to finance WCR and profitability. The ratio of short-term financial debt increases profitability up to the breakpoint, but the effect of short-term debt on profitability turns to negative above this point.

²In Turkey, Poyraz analyzed the effects of working capital financing strategies on a single bank using multiple regression analysis [9]. Their methodology and scope are very different from our study.

Another important point regarding this issue is whether the WCR financing and profitability relationship of financially flexible firms show differences in comparison to other firms. Compared with the other firms, financially flexible firms can obtain credit more easily and in better terms, and their refinancing risk is lower as well. Therefore, it is expected that for these types of firms, the breakpoint of WCR financing and profitability relation occurs at higher levels of short-term debt-to-WCR ratios. The second aim of this study is to determine whether the breakpoint of financially flexible firms and other firms differs or not.

The remainder of the study is organized as follows. The first part gives a review of the literature; WCR financing and profitability relationship is explained in the second part. Data and methodology are described in the third part, and the findings are explained and evaluated in the fourth part. The conclusion is presented in the last part of the paper.

2. Literature review

The literature on working capital management is generally focused on the relationship between investment in WCR and profitability.

Deelof investigated the effect of working capital management on Belgian firms' corporate profitability over the 1992–1996 period. They used fixed effects and ordinary least squares methods and found that the reduction in the number of days accounts receivable, the number of days inventories and the number of days accounts payable all have a positive effect on profitability [1].

For the small and medium enterprises in Portugal, Pais and Gama analyzed the effect of working capital management on profitability over 2002–2005 period. The results of the panel data analysis show a negative relationship with profitability for the number of days accounts receivable, the number of days inventory, and the number of days accounts payable. But when controlled for endogeneity, the relationship between the number of days accounts receivable and profitability is reversed [7].

Controlling for unobservable heterogeneity and possible endogeneity, Banos-Caberollo, Garcia-Teruel, and Martinez-Solano show a non-monotonic relationship between the level of working capital and profitability. It is also stated in the study that firms have an optimal working capital level and that deviation from that level harms profitability [12].

Using multiple regression analysis, Vahid, Elham, Mohsen, and Mohammedreza conducted an analysis on a number of companies in the medicine and cement industries in Iran over the 2006–2009 period. The results showed that an increase in the average collection period, inventory turnover in days, average payment period, or net trading cycle decreases profitability. As for the effect of cash conversion cycle on profitability, the results are found to be insignificant [2].

For Indian manufacturing companies, Singhanian, Sharma, and Rohit analyzed the effect of working capital management on profitability by taking into account the impact of macroeconomic variables on this relationship. Utilizing correlation and fixed-effects estimation methods, it is revealed that the cash conversion cycle has a negative effect on profitability. Decreasing

the number of days accounts receivable and increasing the number of days accounts payable increase the profitability ratios of Indian manufacturing companies. Also, it is stated that global macroeconomic factors should be taken into consideration in formulating working capital strategies [13].

A different study in the field of working capital management belongs to Aktas, Croci, and Petmezas in which the authors analyzed the effects of working capital management on the stock and operating performance of a large sample of firms in US between 1982 and 2011. The results of the study show that firms have an optimal working capital level and divergence from this level harms to the stock and operating performance of the firms. The authors also documented that working capital management increases corporate performance through corporate investment channel [14].

In Turkey, Öz, and Güngör, Akbulut, Coşkun, and Kök, Kendirli, and Konak and Şamiloğlu, and Demirgüneş analyzed the effect of working capital management on profitability [3–6, 15]. Öz and Güngör analyzed the effect of working capital management indicators on the profitability of a number of Turkish manufacturing firms on Borsa Istanbul over the 1992–2005 period. Using panel data analysis, it is documented that receivable turnover, payable turnover, inventory turnover, and net trade period negatively affect profitability [3].

Şamiloğlu and Demirgüneş used multiple regression analysis to determine the effect of working capital management on profitability of Turkish manufacturing firms that are listed on Borsa Istanbul over 1998–2007 period. The results show that accounts receivable, inventory period, and leverage ratios negatively affect profitability, whereas firm growth has a positive effect on it. From the other variables, cash conversion cycle, size, and fixed financial assets are found to be insignificant [15].

Using regression and ANOVA, Akbulut analyzed the effect of cash conversion cycle on profitability on Turkish manufacturing firms that are quoted on Borsa Istanbul over 2000–2008 period. As a result of the study, it is found that there is a negative relationship between cash conversion cycle and profitability [4].

Using dynamic panel data analysis, Coşkun and Kök analyzed the effects of cash conversion cycle, inventory period, accounts receivable period, and accounts payable period on profitability of a number of Turkish manufacturing firms over the period of 1991–2005. The results show a negative relationship between cash conversion cycle, inventory period, and accounts receivable period on profitability. But the relationship between accounts payable period and profitability is found to be positive [5].

Using multiple regression analysis, Kendirli and Konak analyzed the working capital management and profitability relationship for the firms that are quoted on Borsa Istanbul Tourism Index. The study covers the 2010–2014 period. The study finds that although cash conversion cycle has a positive effect on profitability, the coefficients of the components of cash conversion cycle such as the accounts receivable period and accounts payable period are found to be insignificant. Looking at the control variables, we observe that the sign of the relationship between leverage and profitability is negative, whereas the effect is positive for the total assets ratio [6].

The only study that investigates the relationship between WCR financing and profitability belongs to Banos-Caberollo, Garcia-Teruel, and Martinez-Solano. Banos-Caberollo, Garcia-Teruel, and Martinez-Solano analyzed the WCR financing-profitability relationship using a two-step GMM method for small and medium enterprises over the 1997–2012 period in Spain. The results show that there is a concave relationship between short-term WCR financing and profitability [8].

In Turkey, Poyraz analyzed the effects of working capital financing strategies on a single bank using multiple regression analysis. In the study, current ratio, long-term debt ratios, short-term debt ratio, and permanent capital ratios were used as independent variables. As a result it is found that there is a significant relationship between current ratio and profitability. As for the other variables, the relationship was found to be insignificant [9].

As can be seen from the literature review, although there is a large number of studies on the relationship between WCR investment and profitability, the studies on the effects of WCR financing on profitability is very limited. Therefore, the aim of this study is to extend the literature on this subject by conducting an analysis for an emerging country, namely, Turkey. The results of this study will help managers increase the profitability of their firms by shedding light on the degree of short-term financing they use to increase the profits of the firms.

3. The relationship between short-term debt usage in WCR financing and profitability

Working capital financing strategies depends on the extent of utilization of short-term or long-term financing sources in funding working capital. Under an aggressive financing strategy, the firm funds its temporary working capital and a part of its permanent working capital with short-term debt, whereas under a conservative financing strategy, the firm funds its permanent working capital and a part of temporary working capital with long-term debt. The hedging approach, on the other hand, lies in the middle of these two approaches in which the firm funds its permanent working capital with long-term debt and temporary working capital with short-term debt. The effects of these approaches on profitability and risk are different. While aggressive approaches provide the highest profitability with the highest risk, the conservative approaches provide the lowest profit with the lowest risk. As for the profitability and risk, hedging approach lies in the middle [16].

When the working capital requirement is heavily financed through short-term debt, it provides various cost advantages to firms. The first advantage comes from the fact that the nominal interest rates on short-term debt are generally lower than the interest rates on long-term debt. The difference is called as the term premium. The term premium, which is the total of inflation and default premiums, increases as debt maturity lengthens. Since the inflation uncertainty rises with maturity, the inflation premium of short-term debt is lower than the inflation premium of long-term debt. The default premium of short-term debt is also lower than the default premium of long-term debt, because it is charged for one period. The shareholder-creditor conflict is limited in this short period of time. These types of agency conflicts

can be immediately compensated by charging higher interest rates at the end of short maturities. For all of these reasons, the default premium on short-term debt is less than the default premium on long-term debt [17].³

Another cost advantage of short-term debt is that firms that use short-term funds only borrow the amount that they need. So, the interest that is paid on short-term funds is the interest cost of the money that is actually used. This is especially important for the firms that have seasonal fluctuations in their current assets. However, in terms of long-term debt, firms may borrow more than their needs.

The third cost advantage of short-term debt is related to agency costs. Short-term debt requires making periodical payments and declaring periodical information about the main operations of the firms. Myers stated that short-term debt usage decreases underinvestment and asset substitution problems [18]. Also, Stulz noted that short-term debt is a strong device in the monitoring of management [19]. In a theoretical model developed by Rajan and Winton, it is shown that management can be monitored with minimum effort using short-term funds [20]. As a result, it can be said that short-term debt usage decreases agency costs.

In addition to all of the cost advantages stated above, there are refinancing and interest rate risks of using short-term funds. At the end of short-term debt maturity, the firms that use short-term funds may need new funds and can obtain new funds from the current interest rates that exist on the market. Refinancing may be more difficult for the firms that currently have high short-term debt-to-WCR ratios. Since the default risk is higher for these firms, the lenders may charge higher interest rates for bearing that risk. Short-term borrowing can negatively affect profitability in such cases.

To sum up, the cost advantage of using short-term funds depends on the current proportion of WCR that is financed with short-term debt. If a firm currently has a low short-term debt-to-WCR ratio, additional short-term borrowing will decrease costs and increase profitability. However, if the stated ratio is high, additional borrowing will increase the costs of the firm—due to the increased financial risk—and therefore hamper profitability. Based on these reasons, we expect a concave-shaped relation (reversed U-shaped relation) between the proportion of short-term funds in WCR financing and profitability. The first aim of this study is to reveal whether the expected relationship exists in chemical, petroleum, rubber, and plastic sector of Istanbul Stock Exchange in the period analyzed. The results obtained from the analysis show the peak point up to which short-term debt-to-WCR ratios increase profitability.

Financial flexibility is defined as the ability to react to the unexpected changes of cash flows and investment opportunities by obtaining and using the minimum cost funds [21]. When compared to other firms, financially flexible firms can utilize the minimum cost funds whenever they need. Due to the difference of such firms in obtaining short-term funds, it is expected that the cost advantage of short-term debt prevails up to higher short-term debt-to-WCR ratios. In another saying, it is expected that the breakpoint occurs at higher levels of short-term debt-to-WCR ratios for that type of firms [8].

³The default premium on long-term debt is higher especially for the financially weak firms. Since the shareholder-creditor conflict is higher in these types of firms, this increases the default premium [17].

3.1. Data and methodology

In this study, 25 manufacturing firms that were quoted to Borsa Istanbul over the 2005–2016 period are analyzed. The balance sheets and income statements are obtained from the “Data Stream” database. The observations with negative WCF are excluded from the analysis.

The study is conducted using panel data analysis. As explained by Kennedy, there are four main advantages of using this method. One advantage is that panel data analysis controls for heterogeneity among firms. Uncontrolled heterogeneity may lead to omitted variable problems. Secondly, the time series dimension of panel data reduces the problems associated with multicollinearity. Thirdly, panel data analysis permits the testing of hypotheses that cannot be solely tested by time series or cross-sectional analysis alone. Finally, since panel data analysis takes into account dynamic adaptation processes, it has advantages over both time series and cross-sectional analyses [22].

Due to the endogeneity problem, the two-step generalized method of moments (GMM) method based on the study of Arellano-Bond is utilized in this study [23]. The endogeneity problem arises when the correlation between the independent variables and the error term is different than zero. The best way to solve this problem is to use instrumental variables [24]. Since the least squares method leads to biased results when instrumental variables are used, two-step least squares or GMM methods are generally preferred. The models that are used in this study are estimated using the Arellano-Bond estimator.⁴

Following the study of Banos-Caberollo, Garcia-Teruel, and Martinez-Solano, the following model is constructed (Model 1) [8]:

$$ROE_{i,t} = \beta_0 + \beta_1 WCF_{i,t-1} + \beta_2 WCF_{i,t-1}^2 + \beta_3 SIZE_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \beta_5 LEV_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

The dependent variable $ROE_{i,t}$ is the return on equity and is calculated by dividing net profit by total equity. $WCF_{i,t-1}$ is a variable that shows the proportion of WCR that is financed with short-term financial debt. Working capital requirement is calculated by subtracting accounts payable from current assets. Since the expected theoretical relationship between $ROE_{i,t}$ and $WCF_{i,t-1}$ is nonlinear, the square of $WCF_{i,t-1}$ is added to the model. The positive and negative effects of short-term financing can be determined by using $WCF_{i,t-1}$ and the square of $WCF_{i,t-1}$. The $SIZE_{i,t-1}$ variable measures the natural logarithm of total assets, and it is added to the model in order to control the firm size. $GROWTH_{i,t-1}$ shows the growth in sales and is calculated by dividing the difference between sales in year t and in year $t-1$ to the sales in year $t-1$. $GROWTH_{i,t-1}$ is added to the model to control for the growth rates of the firms. The last control variable is $LEV_{i,t-1}$, and it is calculated by dividing total debt by total assets. $\varepsilon_{i,t}$ is the error term. All of the independent variables are used in their 1-year lagged forms (Table 1).

The negative $WCF_{i,t-1}$ values are excluded from the analysis. The breakpoint is mathematically calculated by $\frac{-\beta_1}{2\beta_2}$ equation. If there exist a concave relation between the proportion of WCR

⁴See Greene for details about the Arellano-Bond estimator [25].

Variable	Definition	Calculation
$ROE_{i,t-1}$	Return on equity	$\text{Net Profit}_{i,t-1} / \text{Total Equity}_{i,t-1}$
$WCF_{i,t-1}$	Working capital financing	$\text{Short Term Financial Debt}_{i,t-1} / \text{Working Capital requirement}_{i,t-1}$
$WCF^2_{i,t-1}$	The square of working capital financing	$\text{Short Term Financial Debt}_{i,t-1} / \text{Working Capital Requirement}_{i,t-1})^2$
$SIZE_{i,t-1}$	Size	$\text{Ln}(\text{Total Assets}_{i,t-1})$
$GROWTH_{i,t-1}$	Growth	$(\text{Sales}_t - \text{Sales}_{t-1}) / \text{Sales}_{t-1}$
$LEV_{i,t-1}$	Leverage	$\text{Total Debt}_{t-1} / \text{Total Asset}_{t-1}$

Datasource: Datastream.

Table 1. Variable definitions.

that is financed with short-term debt and profitability, β_1 is expected to be positive, whereas β_2 is expected to be negative.

After the calculation of breakpoint using Model 1, dummy variables $WCFL_{i,t-1}$ and $WCFH_{i,t-1}$ are added to the Model 1 for the firms that have low and high $WCF_{i,t-1}$ values. If the value of $WCF_{i,t-1}$ is between zero and the breakpoint, the dummy variable $WCFL_{i,t-1}$ takes the value of $WCF_{i,t-1}$; otherwise, $WCFL_{i,t-1}$ takes the value of the breakpoint. The other dummy variable $WCFH_{i,t-1}$ takes the value of the difference between $WCF_{i,t-1}$ and breakpoint if $WCF_{i,t-1}$ is greater than the breakpoint; otherwise, $WCFH_{i,t-1}$ takes the value of zero.

Following Ghosh and Moon, Banos-Caballero, Garcia-Teruel, and Martinez-Solano, the robustness of the findings in Model 1 is checked by utilizing the following model [8, 26]:

$$ROE_{i,t} = \beta_0 + \beta_1 WCFL_{i,t-1} + \beta_2 WCFH_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \beta_5 LEV_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

Many studies pointed out the importance of low leverage ratios in providing financial flexibility (see [27–29]), while many others stated the importance of holding medium or high levels of cash [30–32]. Some studies showed that both leverage and cash ratios have a role in providing financial flexibility ([21, 33, 34]). In this study firstly firms are grouped according to their cash ratios. The firms that have cash ratio above the median value are accepted as “financially flexible.” Secondly, the firms are grouped based on their leverage ratios. The firms that have leverage ratios below the median value are accepted as “financially flexible.” In the third categorization, we combined the cash and leverage ratios. The firms that have leverage ratios in the bottom 75% of all firms and cash ratios in the top 75% of all firms are accepted as financially flexible. The dummy variables take the value of 1 if a firm is financially flexible; otherwise, they take the value of zero:

$$ROE_{i,t} = \beta_0 + (\beta_1 + \delta_1 DUM_{i,t-1})WCF_{i,t} + (\beta_2 + \delta_2 DUM_{i,t-1})WCF^2_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 GROWTH_{i,t-1} + \beta_5 LEV_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

The breakpoint is determined by using the equation $-(\beta_1 + \delta_1) / 2(\beta_2 + \delta_2)$.

4. Findings

Table 2 presents the descriptive statistics on profitability, the proportion of short-term financial debt in WCF financing, size, growth, and leverage ratios.

As seen in **Table 2**, the average return on equity (ROE) of the chemical, petroleum, rubber, and plastic sector firms over the period of analysis is 6.6%. The mean value of WCF is 0.29, which means that 29% of the working capital requirement is financed by short-term financial debt. The average size of the firms is 13.15, and the average sales growth is 22%. Leverage, which shows the proportion of total debt in total assets, is 19% on average. The standard deviations of ROE, WCF, GROWTH, and LEV ratios are 0.21, 0.23, 1.14, and 0.14, respectively.

The first column of **Table 3** shows the estimation results of Model 1. The coefficient of $WCF_{i,t-1}$ variable is positive and statistically significant at the 1% significance level. The coefficient of $WCF_{i,t-1}^2$ is negative and is also statistically significant but at the 5% significance level. Utilizing equation $\frac{-\beta_1}{2\beta_2}$, the breakpoint is found to be 0.52. With the control variables, only the result of the growth variable is found to be statistically significant, but the coefficient of this variable is negative.

The breakpoint of 0.52, which is found by utilizing Model 1, is used for classifying the firms as WCRL and WCRH. In Model 2, if $WCR_{i,t-1}$ is between 0 and 0.52, $WCRL_{i,t-1}$ takes the value of $WCR_{i,t-1}$; otherwise, if $WCR_{i,t-1}$ is greater than 0.52, it takes the value of 0.52. $WCRH_{i,t-1}$ variable takes the value of the difference between $WCF_{i,t-1}$ and 0.52 when $WCF_{i,t-1}$ is greater than 0.52; otherwise, it takes the value of zero. The estimation results of Model 2 show that the coefficients of $WCFL_{i,t-1}$ and $WCFH_{i,t-1}$ are positive and negative, respectively. Both are statistically significant. The concave-shaped relationship between WCF and profitability is also supported by the findings of Model 2.

Table 3 presents the results of Model 1 and Model 2.

In **Table 4**, firms are categorized according to their leverage ratios in column 1, cash ratios in column 2, and leverage and cash ratios in column 3. In the first column, the firms which have cash ratios (cash/total assets) are above the median value and are accepted as “financially flexible.” In the second column, the firms that have leverage ratios (total debt/total assets) under

	Number of observation	Mean	Standard deviation	10. centile	Median	90. centile
ROE	222	0.066	0.211	−0.145	0.099	0.237
WCF	222	0.291	0.226	0.005	0.260	0.604
SIZE	222	13.155	1.502	10.838	13.219	14.879
GROWTH	205	0.215	1.138	−0.091	0.119	0.417
LEV	222	0.193	0.136	0.033	0.185	0.399

Table 2. Descriptive statistics.

Variables	ROE	
	(1)	(2)
$ROE_{i,t}$	-0.205*** (0.00777)	-0.208*** (0.0103)
$WCF_{i,t-1}$	0.376*** (0.138)	
$WCF_{i,t-1}^2$	-0.363** (0.149)	
$WCFL_{i,t-1}$		0.232*** (0.0725)
$WCFH_{i,t-1}$		-0.344*** (0.0819)
$SIZE_{i,t-1}$	0.00835 (0.0104)	0.00164 (0.0146)
$GROWTH_{i,t-1}$	-0.00260*** (0.000615)	-0.00281*** (0.000566)
$LEV_{i,t-1}$	-0.150 (0.0946)	-0.125 (0.101)
$OROE_{i,t}$	-0.364*** (0.0143)	-0.369*** (0.0130)
Constant	-0.00410 (0.129)	0.0883 (0.185)
Observation	161	161
Number of firms	25	25

The results of Model 1 estimation are presented in the first column. The results of Model 2 estimation are presented in the second column. Standard errors are presented in parentheses. ***p < 0.01, **p < 0.05.

Table 3. WCF and profitability relation.

Variables	LEV (1)	CASH (2)	LEV + CASH (3)
$ROE_{i,t}$	-0.182*** (0.0254)	-0.222*** (0.0184)	-0.185*** (0.0205)
$WCF_{i,t-1}$	0.604*** (0.132)	0.623*** (0.121)	0.528*** (0.127)
$WCF_{i,t-1} * D$	-0.306*** (0.0824)	-0.190** (0.0938)	-0.260** (0.116)
$WCF_{i,t-1}^2$	-0.739*** (0.125)	-0.604*** (0.107)	-0.520*** (0.145)
$WCF_{i,t-1}^2 * D$	0.536*** (0.113)	0.226 (0.152)	0.314* (0.175)
$SIZE_{i,t-1}$	-0.0285 (0.0244)	0.0285* (0.0150)	-0.000461 (0.00971)
$GROWTH_{i,t-1}$	-0.00342*** (0.000774)	-0.00336*** (0.000590)	-0.00153** (0.000654)
$LEV_{i,t-1}$	-0.159 (0.123)	-0.264** (0.118)	-0.143* (0.0760)
$OROE_{i,t}$	-0.333***	-0.381***	-0.392***
Constant	0.463	-0.270	0.119
	0.308	0.185	0.12

***p < 0.01, **p < 0.05, *p < 0.1.

Table 4. Financial flexibility, WCF and profitability.

the median are accepted as “financially flexible.” In the third column, the firms that have cash ratios in the top of 75% of all firms and have leverage ratios in the bottom 75% of all firms are accepted as financially flexible. Dummy variables are used to discriminate the financially flexible firms. The dummy variable takes the value of 1 if the firm is financially flexible; otherwise,

it takes the value of zero. For the firms that are financially flexible, the breakpoint is found by the equation of $-(\beta_1 + \delta_2)/2(\beta_2 + \delta_2)$, whereas the breakpoint is calculated by utilizing $\frac{-\beta_1}{2\beta_2}$ equation for the other firms. When the firms are categorized according to their leverage ratios, the breakpoint of financially flexible firms is found to be 0.74, and it is 0.41 for the others. When the categorization is based on cash ratios, the breakpoint for financially flexible firms is found to be 0.57, while it is 0.52 for the other firms. As for the last classification, which is based on cash and leverage ratios, the results show that the breakpoint for financially flexible firms is 0.65, while it is 0.51 for the other firms. These results show that financially flexible firms can finance a greater portion of WCR to increase their profitability, WCF.

The results of financial flexibility, WCF, and profitability are presented in **Table 4**.

5. Conclusion

In this study, the relationship between the proportion of short-term financial debt used to finance WCR and profitability is investigated. To do this the firms that are quoted on Borsa Istanbul chemical, petroleum, rubber, and plastic sector over 2005–2015 period are analyzed using a two-step GMM method. The results showed that WCR financed with short-term financial debt has a positive effect on profitability up to a breakpoint. Above this point the effect on profitability is found to be negative. In other words, the relationship between short-term financial debt used to finance WCR and profitability is a concave-shaped relationship. The firms with low short-term financial debt-to-WCR ratios can increase their profitability by increasing the proportion of WCR that is financed with short-term financial debt, whereas the firms with high short-term financial debt-to-WCR ratios will harm their profitability by increasing the proportion of short-term financial debt in WCR financing. Further analysis also revealed that the breakpoint for financially flexible firms occurs at higher levels of short-term financial debt-to-working capital requirement ratios.

In the working capital literature, studies are generally focused on the relationship between investment in WCR and profitability. But the results of this study revealed that the financing of WCR is at least as important as the investment in WCR in terms of profitability. This study also sheds light about the benefits and limits of using short-term financial debt in WCR financing for managers.

Since there may be sectoral differences among different sectors that may affect the results, further research may be conducted on other sectors to reveal these differences.

Author details

Burcu Dinçergök

Address all correspondence to: burcu.dincergok@atilim.edu.tr

Atılım University Management Department, Ankara, Turkey

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