Working capital management effects on investment-cash flow sensitivity

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Abstract: This study investigated whether working capital management (WCM) affects the investment-cash flow sensitivity in Pakistan Stock Exchange (PSX). For this, both types of WC (fixed capital and current working capital) are used to examine the impact of WC on the cash flow sensitivity of firms. The data comprises of 357 manufacturing firms listed at PSX for the period 2000–2014 by applying the two-step system GMM approach. The results reveal that firms having a high level of WC exhibit the high value of the current WC to cash flow ratio. However, despite the financial obstacles, firms having a low value of fixed capital to cash flow ratio and high value of WC to cash flow ratio have a high level of fixed investment rate. These results reveal that the aggressive WC policy effectively works on the PSX. Particularly, where financial markets are under-developed and access to external finance is limited.

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1 Introduction

Prior studies concentrate on investment decisions along with the decisions of dividends, capital structure, and company valuation. Work on WC decisions or short-term financing tends, however, to be largely neglected. WC management (hereafter; WCM) is a very significant part of corporate finance theories dealing with investment management and the firm's short-term financing decisions (Sharma and Kumar, 2011). Funds invested in the WC can be considered as hidden sources in this regard that can help the business to improve its profitability (AlShubiri, 2011). WCM thus has a clear and immediate effect on a company's liquidity and competitiveness and consequently on its net worth (Smith, 1980). Large corporations discovered in recent years have substantial cash flow opportunities if they monitor their WC accounts effectively. Hence, WC gives businesses a strategic edge (Boisjoly et al., 2020).

Maintaining an optimal level of WC is important for corporations and managers are prone to attain this level (Lamberson, 1995). Aktas et al. (2015) documented that those firms that converge to the optimal level of WC policy lead to improve their performance. By comparison, Almeida and Eid (2014) found that investing in WC is less desirable because sustaining high levels of WC can easily lead to lower returns and lower value of the business. Their results are consistent and support the studies of (Shin and Soenen, 1998; Deloof, 2003). Nazir and Afza (2009) state that WC must be in a sound position. Too much WC contributes to difficulties with industries such as the expense of an employee, and so little WC forces a firm to raise money from outside lenders or even firms go bankrupt. Most of the studies done in Pakistan merely examine the link between WCM and corporate profitability and they found an inverse relationship (Raheman and Nasr, 2007; Raheman et al., 2010). However, there is very limited literature on Pakistan, regarding the relationship between WC investment and investment-cash flow sensitivity. Further, limited literature is available on financing constraints and corporate investment in Pakistan. For example, Rashid and Ashfaq (2017) studied the vulnerability of the cash holding to its firm-specific determinants for financially constrained (FC) and

unconstrained firms (UFC). Their findings indicate that FC firms raise their cash with market-to-book valuation and volatility of the cash flow. Bhutto et al. (2019) examined that Pakistani manufacturing firms' financial performance is consistent with WCM. This study suggests that in managing the requirements of WC to generally improve firm efficiency.

This paper fills this gap by examining whether WC is a useful variable for mitigating the impact on the firm's fixed investment of internally generated cash. In Pakistan, the vulnerability of investment to cash flow is still not being examined. In this paper, this study explores both the separate and the joint effect of fixed and WC investment on the responsiveness of investment-cash flow by proposing that the responsiveness of WC to CF investment is high. Also, the use of WC as a mediator makes our study interesting because no research on this topic has been done before. There are two goals to this study generally: firstly, to explore the role of WC to mitigate the impact of cash flow on investment policy. Secondly, the study aims to examine the sensitivity of investment in fixed and current WC to cash flow.

The cash flow of the firm is relying on the appropriate judgment concerning the WC (Ukaegbu, 2014). Azam and Haider (2011) explored the impact of external and internal constraints on corporate investment. Hence, literature concludes that WCM ensures a business has adequate cash flow to cover its short-term obligations and operating expenses. Implementing an effective system for the management of WC is an excellent way for many businesses to increase their profits. An appropriate WC policy can substantially help such firms to manage their financial resources more prudently for sustainable growth. In sum, it has been observed that appropriate and prompt WCM can influence the overall financial output of firm's .managers should be actively concerned.

The rest of the paper is arranged as follows. Section 2 documented the literature review and Section 3 explains the data and methodologies used in this study. The findings and explanations are discussed in Section 4. Several findings follow in Section 5.

2   Literature review

Previously, researchers have focused on the separate effect of WCM on corporate profitability, risk, corporate governance, and firm performance (Petersen and Rajan, 1997, Faulkender and Wang, 2006). For example, Afrifa and Tingbani (2018) and In considering the possible impact of cash flow on British firms, Prasad et al. (2019) found a significant negative relationship between WCM and SME performance. A substantially positive relationship was found, however, with the cash flow available. Sharif and Islam (2018) attempted to demonstrate the relationship between WC and Bangladesh's pharmaceutical industry profitability process. Tran et al. (2017) have reported that well-designed and applied WCM generates positive market returns and increases the profitability of businesses. The results suggested that managers can increase their firms' profitability by reducing inventory, account receivable, and account payable turnover. Similarly, Singh et al. (2017) did the same exercise through meta-analysis and concludes that WCM is negatively related to the firm's profitability this implies that aggressive WCM policy leads to high profitability. In similar lines, Lyngstadaas and Berg (2016) showed that WCM affects the profitability of Norwegian firms.

Stakeholders such as managers, investors, and policymakers have a great concern about WCM and its impact on firms' performance. For instance, in 2015, the top leading companies in the US and Europe had over US$1.2 trillion of cash unnecessarily investment tied up in WC (Ernst & Young, 2016). Further, Aktas et al. (2015) also found that investment in WC in the USA has increased at the end of 2011. The increase and decreases in WC depend on the policies of firms (García-Teruel and Martinez-Solano, 2007). For example, if a firm wants to decrease in the investment in WC then it adopts an aggressive WCM policy. In contrast, if a firm wants to increase its investment in WC, then it adopts a conservative policy (Banos-Caballero et al., 2012). The study of Ding et al. (2013) revealed the intuitive role of WCM. According to their findings, all firms show a high level of investment sensitivity towards cash flow, which reveals that they face liquidity constraints. During adverse shock of cash flow, only those firms are capable to maintain their investment, which has a higher level of WC investment. Hence, firms with a high ratio of WC are capable to optimise their spending and remove the shock of cash flow in fixed capital. Further, Almeida and Campello (2002) showed that when firms are less constrained they borrow more and their investment spending is highly sensitive to internal funds.

3 Data and methodology

3.1 Data and sample

The unbalanced panel data set of 357 manufacturing firms is taken listed on the Pakistan Stock Exchange (PSX) covering the period time from 2001 to 2014. The firm-specific variables were taken from the State Bank of Pakistan released 'Balance Sheet Analysis for Non-Financial Firms'. This study used the two-step system GMM approach proposed by Blundell and Bond (1998). For this work, the methodology is suitable as it enables the use of different instruments and lag structure for both the rates and the first differential equations.

The system GMM method removes the time-invariant non-observable firm-specific effects by successfully monitoring the first difference of each underlying variable for correlation between the repressors and the residuals and mitigates the endogeneity problem. The Hansen test is used in the validation of instruments (Hansen and Singleton, 1982). The variables description and concise statistics are provided in the appendix in Tables A1 and A2.

3.2 Empirical models

3.2.1 Empirical model for fixed investment-cash flow sensitivity

Our first objective is to examine the impact of internally generated cash in the corporate fixed investment. To achieve this objective we estimate the following equation:

$$\left(I\!/\!K\right)_{it} = \alpha + \alpha_1 \left(I\!/\!K\right)_{it-1} + \alpha_2 \left(CF\!/\!K\right)_{it} + X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it} \tag{1}$$

where $(I/K)_{it}$ represent the percentage of fixed investment to fixed capital for the current period, where i and t denotes firms and years respectively, I represent plant and

equipment investment for the firm, K represents opening period's stock of capital and CF represents cash flow (Fazzari and Petersen, 1993). X_{it} is a vector of firm-specific control variables including firm size, sales growth, leverage, and tangibility. υ_i represents the firm-specific, time-invariant component and υ_t the time-specific factor for possible business cycle effects. ε_{it} represent the error term.

3.2.2 Empirical model for sensitivity in WC investment to cashflow

To achieve the second objective, that is, whether fluctuations of cash flow play a significant impact on WC investment or not, we estimate the following model:

$$\left(IWK\!\!\Big/\!K\right)_{it} = \beta_0 + \beta_1 \left(IWK\!\!\Big/\!K\right)_{it-1} + \beta_2 \left(CF\!\!\Big/\!K\right)_{it} + X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it} \tag{2}$$

where $(IWK/K)_{it}$ is an investment in WC called capital stock in the current period. $CF = $ cash flow.

The model also includes lagged dependent variable (first lag of WC investment to capital stock) to see the impact of previous year WC investment on the current investment. The rest of the control variables are the same as equation (1). As we are interested to get the high ratio of WC investment and cash flow, hence the β_2 coefficient should be larger than α_2 of equation (1). This implies that firms are competent to diminish the negative shocks of cash flow on fixed capital by decreasing the WC stock.

3.2.3 Empirical models for investment-cash flow sensitivity with different levels of WC

If the level of WC is high, the impact of cash flow is high on investment for those firms and hence, they can smooth out the shocks produced by cash flow on fixed investment through changing the amount of WC (Carpenter et al., 1994). To check this, we generate two sets of dummies that allow separating firms' utilising a low level of WC and firms utilising a high level of WC. '1' is represented for D_i^{LWK} dummy and '0' otherwise.

$$\begin{aligned}\left(I\!\!\Big/\!K\right)_{it} = {}& \delta_0 + \delta_1 \left(I\!\!\Big/\!K\right)_{it-1} \times D_{it}^{LWK} + \delta_2 \left(I\!\!\Big/\!K\right)_{it-1} \times D_{it}^{HWK} + \delta_3 \left(CF\!\!\Big/\!K\right)_{it} \times D_{it}^{LWK} \\ & + \delta_4 \left(CF\!\!\Big/\!K\right)_{it} \times D_{it}^{HWK} \times X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it}\end{aligned} \tag{3}$$

Then we enter a high WC (HWK), dummy (D_i^{HWK}) equals to '1', if the ratio between WC and fixed capital is positive and '0' otherwise.

$$\begin{aligned}\left(IWK\!\!\Big/\!K\right)_{it} = {}& \gamma_0 + \gamma_1 \left(IWK\!\!\Big/\!K\right)_{it-1} \times D_{it}^{LWK} + \gamma_2 \left(IWK\!\!\Big/\!K\right)_{it-1} \times D_{it}^{HWK} \\ & + \gamma_3 \left(CF\!\!\Big/\!K\right)_{it} \times D_{it}^{LWK} + \gamma_4 \left(CF\!\!\Big/\!K\right)_{it} \times D_{it}^{HWK} + X_{it}\beta + \upsilon_i + \upsilon_t + \varepsilon_{it}\end{aligned} \tag{4}$$

In equation (3), δ_3 should be greater than δ_4 while in equation (4) γ_4 should be greater than γ_3 only then we can conclude that negative cash flow shocks could be eliminated through adjustment in WC.

4 Empirical results

4.1 The result of fixed investment model

To examine the cash flow impact on firms' fixed investment, the estimated results of equation (1) are presented in Table 1. The coefficient values of control variables are positive and significant at any acceptable level of significance. For instance, the positive sign of tangibility indicates that the level of fixed investment increases as the firm has more tangible assets.

Table 1 Estimation results for the cash flow impact on fixed investment model

Variables	Coef.
Panel A: Estimation results	
Lag (fixed investment/fixed capital stock)	0.261 ***
Cash flow/fixed capital stock	0.027***
Tangibility	1.970***
Leverage	0.104***
Total assets	0.002***
Sales growth	0.004***
Inventories/sales	0.056***
Panel B: Diagnostic tests	
Firm – Years	2,808
Firms	341
AR (2)	-0.95
p-value	0.341
J-statistics	307.76
p-value	0.131

Note: *** denotes statistically significant at the 1% level of significance.

The study of Almeida and Campello (2007) shows the importance of tangibility for the decisions of financially constrained firms. According to them, tangible assets support a firm's borrowing because tangible assets are used as collateral to get credit and enhance future investment. The positive sign of leverage indicates that firms utilising credit facilities to boost investment. The study of Whited (1992) indicates that the sensitivity of corporate investment towards cash flow is higher for high levered firms, whereas, low levered firms are less sensitive. Firm size also exhibits a significant and positive impact on investment. While according to Fazzari and Petersen (1993), sales growth reduces the quantitative effect of WC and cash flow. The impact of sales growth on cash flow is two ways:

1   growth effect

2   effect on management decisions to handle sales.

The inventory to sales ratio indicates the external liquidity needs and is positive and significant in the sample. In sum, our key findings related to firm-specific control variables are according to the existing literature.

4.2   Results for working capital investment model

The results of the relationship between cash flow and WC investment are reported in Table 2. First, this study examines the role of the lag dependent variables. The changes in WC items depict the cash flow fluctuations. Increment in current assets shows that more cash is utilised however, increment in current liabilities depicts that utilisation of cash is reduced. The lag value of WC is significant and has a negative sign (–0.692) which shows that WC is increasing and the firm grows more capital. The cash flow coefficient is significant and positive which shows a positive relationship between investment in WC and cash flow. Another important finding is that the cash flow coefficient of the WC investment model is higher (0.11, approximately) than the cash flow coefficient of fixed capital investment 0.027.

Table 2   Results for impact of cash flow of working capital investment model

	Coef.
Panel A: Estimation results	
Lag of WC investment/fixed capital stock	–0.692***
Cash flow/fixed capital stock	0.111***
WC stock/fixed capital stock	0.042***
Inventory/fixed capital stock	–0.003***
WC	0.040***
Financial WC/fixed capital stock	–0.028***
Constant	–0.022***
Panel B: Diagnostic tests	
Firm – years	3,808
Firms	356
AR (2)	–1.00
p-value	0.317
J-statistics	36.24
p-value	0.807

Note: *** denotes statistically significant at the 1% level of significance.

It is observed a positive and significant value of WC/fixed capital and also in WC investment. This shows that the value of the current assets is greater than the value of current liabilities' WC efficiently. Financial WC has a negative and significant value

which may show that due to the financing constraints firms may employ WC as a financing source efficiently. It implies that due to easily reversible property and cheap cost, adjusting WC is a better option as compared to fixed capital. The results also support the analysis that firms do adjustment of cash flow distress on fixed investment by utilising the optimal level of working (Ding et al., 2013). The value of the Hansen test shows that the instruments are valid and the model is well specified.

4.3 Results for fixed investment model differentiating on the level of working capital

In Table 3, the result of the impact of high/low and the positive/negative ratio of WC and fixed capital on investment-cash flow sensitivity are given. Table 3 indicates that the sensitivity of fixed investment towards cash flow is greater for those firms that have low levels of WC. The coefficient of cash flow for low and high WC is 0.003 and –0.013, respectively. Similar findings are given in Table 4 when firms were divided into having negative and positive WC. The cash flow coefficient for firms with negative WC is higher as compared to firms with positive WC.

Table 3   Estimates for fixed investment model: differentiating firms on the level of working capital

	Coef.
Panel A: Estimation results	
(Lag of fixed investment/fixed capital stock) × D^{LWK}	0.134***
(Lag of fixed investment/fixed capital stock) × D^{HWK}	0.510***
(Cash flow/fixed capital stock) × D^{LWK}	0.003***
(Cash flow/fixed capital stock) × D^{HWK}	–0.013***
Tangibility	0.074***
Leverage	0.032***
Total assets	0.006***
Sales growth	0.002***
Constant	–0.068***
Panel B: Diagnostic tests	
Firm – Years	3,532
Firms	355
AR (2)	–1.05
p-value	0.294
J-statistics	351.83
p-value	0.508

Note: *** denotes statistically significant at the 1% level of significance.

Table 4   Estimation results for fixed investment model: differentiating firms on the level of working capital

	Coef.
Panel A: Estimation results	
(Lag of fixed investment/fixed capital stock) × D^{NEGWK}	0.080***
(Lag of fixed investment/fixed capital stock) × D^{POSWK}	0.350***
(Cash flow/fixed capital stock) × D^{NEGWK}	0.099***
(Cash flow/fixed capital stock) × D^{POSWK}	0.048***
Tangibility	0.065***
Leverage	0.034***
Total assets	0.003***
Sales growth	0.002***
Constant	–0.060***
Panel B: Diagnostic tests	
Firm – Years	3,532
Firms	355
AR (2)	–1.23
p-value	0.218
J-statistics	350.82
p-value	0.523

Note: *** denotes statistically significant at the 1% level of significance.

When the level of WC is low, firms have greater marginal value and during adverse cash flow shock, they are unable to adjust their fixed investment. The results suggest that those firms that have a positive and high value of WC show that investment is less sensitive to cash flow than firms with low/negative WC. In sum, the firms operating under a negative and low level of WC fail to manage their WC investment during financial distress, and ultimately they are forced to make adjustments in fixed capital investment.

4.4   Results for working capital investment differentiating based on working capital (high/low) levels

In Table 5, the results for WC Investment differentiating based on WC (high/low) levels are presented. The result reveals that this sensitivity is higher for the firms that have high WC as compared to those with low WC. The coefficient of cash flow for low WC has a negative value (–0.077) while for high WC the value is positive (0.027) as well as significant (at the 1% level of significance). The findings suggest that during a negative cash flow shock, only those firms operating under the high level of WC may experience an adjustment in WC investment. These firms can remove negative cash flow shock due to low marginal value (Ding et al., 2013; Carpenter et al., 1994).

Table 5 Results of working capital investment model: differentiating firms on the level of working capital

	Coef.
Panel A: Estimation results	
(Lag of working capital investment/fixed capital stock) × D^{LWK}	0.108***
(Lag of WC investment/fixed capital stock) × D^{HWK}	−0.153***
(Cash flow/fixed capital stock) × D^{LWK}	−0.077***
(Cash flow/fixed capital stock) × D^{HWK}	0.027***
WC	0.044***
WC stock/fixed capital stock	0.677***
Inventory/fixed capital stock	0.053***
Financial WC	−0.08***
Constant	−0.551***
Panel B: Diagnostic tests	
Firm – Years	3,750
Firms	356
AR (2)	0.020
p-value	0.987
J-statistics	203.65
p-value	0.155

Note: *** denotes statistically significant at the 1% level of significance.

Table 6 Estimates for working capital investment model: differentiating firms on the level of working capital

	Coef.
Panel A: Estimation results	
(Lag of WC investment/fixed capital stock) × D^{NEGWK}	−1.714***
(Lag of WC investment/fixed capital stock) × D^{POSWK}	0.089***
(Cash flow/fixed capital stock) × D^{NEGWK}	−0.060***
(Cash flow/fixed capital stock) × D^{POSWK}	0.080***
WC	0.116***
WC stock/fixed capital stock	4.164***
Inventory/fixed capital stock	−0.060***
Financial WC	−0.090***
Constant	−4.911***
Panel B: Diagnostic tests	
Firm – Years	4,494
Firms	357
AR (2)	1.16
p-value	0.246
J-statistics	50.89
p-value	0.138

Note: *** denotes statistically significant at the 1% level of significance.

4.5   Results for working capital investment differentiating on the level of working capital (positive/negative)

Table 6 shows the results that how a positive or negative WC/fixed capital affects the WC investment sensitivity towards cash flow. The results support the above-given findings because the cash flow coefficient of firms operating under negative WC has a negative value (–0.06) while the coefficient has a positive value (0.08) for firms operating under positive WC. The results imply that during the adverse shock of cash flow firms operating under negative WC may not be able to maintain their WC and shock can be offset only by the firms operating under positive WC. Hence, positive and high WC stocks enable firms to shrink the sensitivity of fixed investment towards cash flow and also maintain the fixed investment on a high level.

4.6   Analysis of firm-level sensitivities

Previously, this study analyses a single coefficient for investment sensitivity of cash flow. The data comprise outsized heterogeneous firms and to account for that problem, this study incorporates another methodology established by Hovakimian and Hovakimian (2009). These firm-level sensitivities are useful in two aspects. First, we recognise the characteristics of a firm with low and high FKS and a firm with low and high WKS. Secondly, we use different combinations of these two types of sensitivities (FKS/WKS) and analyse the investment behaviours due to cash flow fluctuations. The objective of this analysis is to investigate whether these two sensitivities (FKS/WKS) are satisfactory measures of financing constraints or not. Furthermore, we analyse the degree to which, firms are managing their WC to alleviate the adverse cash flow shock and also moderate the consequences of financing constraints. The formula through which we calculate both FKS and WKS sensitivities is given below respectively:

$$FKS_i = \sum_{t=1}^{n} \left(\frac{(cash\ flow/K)_{it}}{\sum_{t=1}^{n} (cash\ flow/K)_{it}} * \left(\frac{I}{K} \right)_{it} \right) - \frac{1}{n} \sum_{t=1}^{n} \left(\frac{I}{K} \right)_{it} \tag{5}$$

$$WKS_i = \sum_{t=1}^{n} \left(\frac{(cash\ flow/K)_{it}}{\sum_{t=1}^{n} (cash\ flow/K)_{it}} * \left(\frac{IWK}{K} \right)_{it} \right) - \frac{1}{n} \sum_{t=1}^{n} \left(\frac{IWK}{K} \right)_{it} \tag{6}$$

These sensitivities (FKS/WKS) are the difference between cash flow weighted average investment in fixed capital to fixed capital and WC to fixed capital ratio of a firm and its simple arithmetic time-series ratio. The number of annual observations is given as '*n*' for the firm '*i*', and '*t*' indicates time. According to the findings of (Ding et al., 2013), firms demonstrating a higher level of internal cash and corporate investment display a higher level of these differences. But these differences are low for the firms with low-level investment and cash flow in the year. Hence, firms with similar patterns of investment and cash flow expected to tolerate a higher level of financing constraints. When these firms experience an unfavourable shock of cash flow they reduce their investment due to costly external finance.

4.6.1 Explanatory statistics for FKS

Table 7 depicts the descriptive analysis for firms with low and high FKS. These statistics are relative to those variables which are previously used in our regression analysis, those about general firm-level variables, WC related variables, and financial variables. The Table 7 shows that firms having a low sensitivity of fixed capital (FKS) exhibit high ratio of fixed investment and WC investment and fixed capital stock, at the same time these firms also show a high ratio of cash flow and fixed capital, and high growth in sales as compared to firms with high FKS.

The results of leverage and inventory to the sales ratio are lower for low FKS which shows that these firms have lower financing needs externally while firms with high FKS coupled with the low level of cash flow exhibit the higher need of external funds and leverage. The variables related to WC have a higher value for firms characterised by low FKS. These figures lead to the fact that firms with low sensitivity of fixed capital (FKS) are financially healthier as compared to those firms which exhibit high sensitivity of fixed capital (FKS).

Table 7 Descriptive analysis with low and high FKS

	Low FKS		High FKS	
	Mean	*Std. err.*	*Mean*	*Std. err.*
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.041	0.021	0.04	0.021
Assets	6,430.26	21,349.82	4,605.75	16,170.37
Sales growth (SG)	0.132	0.501	0.120	0.43
Financial variables				
Cash flow/fixed capital (CF/K)	0.071	2.54	0.046	2.101
Leverage	0.67	0.41	0.75	0.53
Tangibility	1.143	0.144	1.15	0.152
Inventories/Sales (I/S)	0.16	0.525	0.375	6.3
WC related variables				
WC investment/fixed capital (WI/K)	0.014	0.777	–0.013	0.82
WC/fixed capital stock (W/K)	2.35	17.68	2.19	4.28
Inventories/fixed capital stock (Inv/K)	748.19	1,426.396	702.87	1,536.7
Financial WC/fixed capital stock (FWK/K)	–745.840	1,425.847	–700.68	1,536.53
Observations	3,216	3,216	1,018	1,018

4.6.2 Descriptive statistics for WKS

Table 8 shows descriptive statistics of firms that have low and high WKS. These statistics contain variables used in the previous regression section, general characteristics of the firm, variables relating to WC, and the firm's financial variables. According to figures reported in Table 8 forms with high sensitivity of WC shows the high ratio of investment

in WC (WI/K) and also a high ratio of WC (W/K) as compared to firms that show low sensitivity of WC WKS. These firms also exhibit a higher ratio of cash flow than a low level of WKS. The high WKS firms have a higher ratio of fixed investment as compared to firms operating under low WKS. These firms characterised small in size and they entail high leverage and lower level of tangibility which may designate that these firms are financially constrained.

Table 8   Descriptive analysis with low and high WKS

	Low WKS		High WKS	
	Mean	*Std. error*	*Mean*	*Std. error*
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.04	0.021	0.045	0.022
Assets	6,573.07	21,984.80	4,145.05	13,089.24
Sales growth (SG)	0.133	0.52	0.12	0.34
Financial variables				
Cash flow/fixed capital (CF/K)	0.051	2.71	0.11	1.23
Leverage	0.71	0.45	0.84	0.42
Tangibility	1.14	0.141	1.10	0.16
Inventories/Sales (I/S)	0.22	3.6	0.19	0.462
WC related variables				
WC investment/fixed capital (WI/K)	0.010	0.68	–0.001	1.06
WC/fixed capital stock (W/K)	1.72	2.99	4.19	31.26
Inventories/fixed capital stock (Inv/K)	709.48	1,420.98	825.62	1,550.17
Financial WC/fixed capital stock (FWK/K)	–707.76	1,420.64	–821.44	1,549.52
Observations	3,220	3,220	1,014	1,014

To summarise, these figures confirm that only those firms that have higher levels of WC are only able to manage their WC investment in the existence of cash flow distress. The immense difference is also notable in the ratio of inventories while FWC is lower for high WKS firms as compared to low WKS firms. It is also notable that firms' experienced high levels of WKS have higher cash flow /fixed capital value, it shows that high WKS firms faceless internal financing constraints.

4.6.3   Combining FKS and WKS

Table 9 represents the descriptive statistics for different groups of firms. Panel A shows high FKS and high WKS (HH) firms and low FKS and low WKS (LL) firms. Panel B refers to the firms operating under high FKS and low WKS (Porta et al., 2002) and firms operating under low FKS and high WKS (LH). For all firms with low FKS and high FKS, combine with high WKS mostly have a higher ratio of fixed investment to fixed capital (I/K) as compared to low WKS. The statistics also confirm our analysis that during cash flow distress the firms differentiating through the high levels of WC are competent to maintain fixed investment properly. Hence it provides the evidence that good management of WC, allows firms to lessen the adverse outcomes of financing constraints.

Table 9 Estimates for combining fixed and working capital sensitivity (FKS and WKS) types

Panel A	High FKS mean	High WKS std. err.	Low FKS mean	Low WKS std. err.
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.034	0.020	0.04	0.021
Assets	3,150.11	7,452.54	6,862.2	22,585.50
Sales growth (SG)	0.122	0.353	0.137	0.54
Financial variables				
Cash flow/fixed capital (CF/K)	0.164	0.672	0.07	2.742
Leverage	0.73	0.544	0.70	0.432
Tangibility	1.166	0.159	1.14	0.14
Inventories/sales (I/S)	0.212	0.65	0.154	0.57
Working capital related variables				
WC investment/fixed capital (WI/K)	−0.0014	0.83	0.018	0.641
WC/fixed capital stock (W/K)	2.351	3.960145	1.62	2.50
Inventories/fixed capital stock (Inv/K)	664.35	1,539.30	705.63	13,90.70
Financial WC/fixed capital stock (FWK/K)	−661.99	1,539.23	−704.01	1,390.311
Observations	368	368	250	2,570

Panel B	High FKS mean	Low WKS std. err.	Low FKS mean	High WKS std. err.
General firm characteristics				
Fixed investment/fixed capital stock (I/K)	0.041	0.021	0.043	0.022
Assets	5,429.87	19,402.54	4,711.84	15,381.50
Sales growth (SG)	0.12	0.50	0.116	0.33
Financial variables				
Cash flow/fixed capital (CF/K)	−0.020	2.58	0.075	1.50
Leverage	0.76	0.52	0.584	0.314
Tangibility	1.14	0.1471602	1.16	0.16
Inventories/Sales (I/S)	0.47	4.402	0.176	0.31
WC related variables				
WC investment/fixed capital (WI/K)	−0.02	0.81	−0.001	1.17
WC/fixed capital stock (W/K)	2.10	4.45	5.23	39.02
Inventories/fixed capital stock (Inv/K)	724.68	1,536	917.50	1,550.03
Financial WC/fixed capital stock (FWK/K)	−722.60	1,535.75	−912.30	1,549.22
Observations	650	650	646	646

It is also interesting to note that among all four groups (HH, LL, HL, and LH) the fixed investment and fixed capital ratio (I/K) is high for the firms that display higher WKS. Furthermore, HH and LH firms exhibit a high ratio of WC and fixed capital (WK/K) and WC investment in fixed capital (WIK/K). Moving towards leverage and tangibility, results show that among all four groups when low FKS combined with the high WKS level of leverage is low while tangibility is high as compared to the combination where

the level of WKS is low. The level of financial WC (FWK) is also at its lowest level. Furthermore, the results also depict the high ratio of inventories to fixed capital (Inv/K) and the highest cash flow (CF/K) ratio while LH firms have a much higher sales growth rate.

5   Conclusions

WC management has a vital role to mitigate or eliminate the investment-cash flow sensitivity. Particularly, this paper studied whether the investment-cash flow sensitivity exists and how firms eliminate the cash flow distress from a fixed investment with the help of WC. The outcome of this study shows that the precise value of cash flow leads to an increase in the fixed investment which suggests the positive relationship between firms' fixed investment and internally generated cash. The results show that due to the unavailability of external fund firms are forced to utilise their internally generally funds which make corporate investment sensitive to cash flow. This paper also discovers that the coefficient of cash flow for WC investment is also positive and has a higher value as compared to fixed capital investment. These findings lead to the fact that WC is easy to adjust and reverse because of lower adjustment costs as compared to fixed capital investment.

This analysis provides useful implications for all private and public sector firms which may face financial constraints and are compelled to utilise their internally generated funds for investment purpose. These findings would help out firms' managers for effective strategies to eliminate the adverse cash flow shock while financing constraints on how wisely they can manage their internally generated funds without any loss. The results are also useful from an investor's point of view to design their investment plans efficiently and give foresight to them that firms operating under the high level of WC can survive during adverse shocks as well because they can handle their financial problem internally. There is some limitation of this study that this study only investigates different levels of WC and their effect on the sensitivity of investment-cash flow. This could be useful in expanding the study by researching the approaches and strategies that are useful to businesses to properly manage WC.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix

Table A1   Descriptive statistics

	Mean	Std. Dev	Median
Panel A			
General firm characteristics			
Fixed investment/fixed capital stock (I/K)	0.06	2.11	0.04
Assets	6890.24	23191.42	1244.30
Sales growth (SG)	0.06	0.83	0.08
Financial variables			
Cash flow/fixed capital (CF/K)	1.54	22.06	0.11
Leverage	0.70	0.50	0.64
Tangibility	1.15	0.30	1.11
Inventories/sales (I/S)	0.38	6.17	0.10
Panel B			
Working capital related variables			
Working capital investment/fixed capital (WI/K)	0.94	54.50	0
Working capital/fixed capital stock (W/K)	1.35	1.73	1.01
Working capital (W)	7.52	176.94	1.28
Inventories/fixed capital stock (Inv/K)	9484.37	470610.70	141.76
Financial working capital/fixed capital stock (FWK/K)	-9476.85	470445.80	-139.30
Indicators of efficient working capital management			
ITO ratio: CGS / inventories	24.79	247.47	5.34
DSO ratio: (account receivable/sales) * 365	43.37	352.51	1.59
DSI ratio: (inventories/CGS) * 365	95.1539	19091.77	44.09
Observations	4885	4885	4885

Table A2   Variables definitions and expected signs

Variable name	Abbreviations	Expected signs	Definitions
Dependent variables			
Fixed investment	$(I/K)_{it}$	+ve	Book value of tangible asset in current period – book value of tangible asset in previous period + depreciation of current period.
			While book value of tangible asset is total assets – intangible assets – liabilities.
Working capital investment	$(IW/K)_{it}$	+ve	Working capital investment is defined as the difference between working capital stock in current period and working capital stock in previous period.
Independent variables			
Lag of fixed investment	$(I/K)_{it-1}$	+ve	The previous year fixed investment.
Lag of working capital investment	$(IWK/K)_{it-1}$	–ve	The previous year working capital investment.
Cash flow	(CF/K)	+ve	Cash flow is defined as the ratio of net income plus depreciation of the year to total assets.
Control variables			
Tangibility	Tang	+ve	The ratio of plant, property and equipment to total assets.
Leverage	Lev	+ve	Leverage is the ratio of current and non-current liabilities to total assets.
Sales growth	SG	+ve	The difference between the natural log of sales in current and previous year is a measure of sales growth.
Firm size	LTA	+ve	Natural log of total assets.
Inventories	Inv	+ve/–ve	Inventory is the raw material, work in process goods or finished goods that are ready for sale.
Working capital stock	WCS	+ve	Working capital stock is the difference between current assets and current liabilities.
Financial working capital	FWK	–ve	Financial working capital is defined as the working capital stock net of inventories.