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Financial constraints and speed of working capital adjustment

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Abstract

Purpose – The study examines the existence of target level of working capital and the speed of adjustment toward the target for eight manufacturing sectors of Indian economy. In addition, this study examines the impact of financial constraints on the speed of adjustment.

Design/methodology/approach – This study is based on secondary financial data of 1936 Indian manufacturing companies from eight sectors for a period of 18 years (2000–2018). This study employs two-step GMM techniques to arrive at results.

Findings – Results of the study confirm that firms do have target working capital, but the speed of adjustment from the current level of working capital to the target working capital is slow, and the speed of adjustment varies across sub-sectors. Moreover, we found that firms that are likely to be less constrained adjust their working capital quickly compared to firms facing high financial constraints.

Originality/value – This study contributes to working capital management literature by examining the speed with which the firms move toward their target and also the impact of financial constraints on the speed of adjustment across eight manufacturing sectors of Indian economy. Further, the study examines the impact of financial constraints on the speed of adjustment.

Keywords Cash conversion cycle, Capital adjustment, Financial constraints, Panel data, India

Paper type Research paper

1. Introduction

The empirical literature on working capital management (WCM) was developed following the seminal work of Smith (1980) who suggested that firms must efficiently manage their working capital because it affects the profitability, risk and consequently value of the firm. Based on this argument, the studies on WCM largely remained focused on analysing the relationship between WCM and firm performance (see recent studies, e.g. Panda and Nanda, 2018; Altaf and Shah, 2018b, 2017; Singhania and Mehta, 2017; Bhatia and Srivastava, 2016; Baños-Caballero *et al.*, 2014). However, these scholars ignored the risk of loss of sales and also the interruptions in a production process that may happen due to the low investments in working capital (Baños-Caballero *et al.*, 2012). Similarly, they have also ignored the risk of bankruptcy that may arise on account of the increase in financing expenses due to the increase in working capital investment (Kieschnick *et al.*, 2013). Accordingly, investing more or less in working capital may have the negative effect on firm performance. Based on these arguments, it can be amplified that firms may have an optimal or a target working capital level that balances the cost and benefits. Given that firms may have target working capital, prior literature has given very little attention to examining whether such target exists and what is the speed with which they adjust to that target. A review of available literature identified only a few studies (see, e.g. Chauhan and Banerjee, 2018; Qurashi and Zahoor, 2017; Cuong and Cuong, 2016; Mathuva, 2014; Banos-Caballero *et al.*, 2013) that have examined this issue using partial adjustment model. These studies report that firms have target levels of working capital and firms adjust their current level to target level of working capital gradually. In addition, this adjustment is not quick because of adjusting costs. Further, the speed of adjustment will not be same across firms and would differ on account of the costs and benefits that seep out of a number of causes; financial constraints being one among them (Altaf and Shah, 2018a, 2019). Given the level of financial constraints, it can be argued that firms facing lesser financial constraints will adjust their working capital faster because they

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will be facing fewer adjustment costs, have better access to capital markets compared to those that face higher financial constraints (Banos-Caballero *et al.*, 2013). Further, with regard to India, a search of the available literature identifies only one study, Chauhan and Banerjee (2018) that investigated the existence of target level of working capital and speed of adjustment for the Indian manufacturing firms. Their results suggest that although Indian manufacturing firms do have target working capital the speed of adjustment toward the target is quite slow. Given the only study by Chauhan and Banerjee (2018), nothing is known about the target working capital and speed of adjustments across the sectors. It is pertinent to mention that the sector of operation plays a key role in explaining working capital cycle, and thereby it is important to find out how the speed of working capital adjustment vary across sectors and the impact of financial constraints on the adjustment speed. In addition, we also study whether the determinants of cash conversion cycle (CCC) vary across sectors. Given the only study (Chauhan and Banerjee, 2018) available in the literature, we believe that analysing the aspects mentioned above will provide an additional evidence that will enrich the theory of working capital dynamics among Indian firms. Accordingly, the key contribution of present study is to enrich the available literature by examining how the speed of working capital adjustment and determinants of CCC varying across eight manufacturing sectors of Indian economy spread across 1936 firms for the extended time period of 18 years. In addition, the study investigates the impact of financial constraints on the speed of adjustment.

The remainder of paper is organized as follows. Section 2 contains a brief literature review of theory and empirics. Section 3 is an operative part of the paper that outlines the methodology employed to arrive at the results. Section 4 reports the empirical results. Section 5 concludes the overall paper.

2. Literature review

2.1 Target cash conversion cycle

Firms may either maintain large investment in working capital, i.e. longer cash conversion cycle (CCC) or lesser investment in working capital, i.e. short CCC. However, the level of investments in working capital has its own cost and benefits. Prior literature on WCM suggests that larger CCC may have the positive impact on firm profitability for a number of reasons. First, larger CCC will result in having larger inventories in stock that would prevent production interruptions, reduce supply costs, control price fluctuations and loss in business due to unavailability of products (Altaf and Shah, 2018a; Ukaegbu, 2014; Gill *et al.*, 2010). Second, increasing CCC will release more funds that will help a firm to extend trade credit that further increases the sales. Extending trade credit gives ample time to consumers to check the quality and quantity of the product before paying (Gill *et al.*, 2010; Deloof, 2003; Deloof and Jegers, 1996; Smith, 1987). Further, extending trade credit builds the confidence in the minds of consumers, thus strengthening the long-term relationship with customers (Singhania *et al.*, 2014; Ukaegbu, 2014; Garcia-Turuel and Martininez-Solano, 2007; Deloof, 2003). Contrary to the above, maintaining longer CCC requires additional finances which might raise the opportunity cost, if a firm forgoes other productive investments to maintain higher working capital levels and also raises financial expenses since new finances are not free of cost (Altaf and Shah, 2018a; Banos-Caballero *et al.*, 2013). In addition, maintaining larger investments in inventories can increase various expenses like warehouse rent, warehouse security expenses etc. (Altaf and Shah, 2018b). Since there are costs and benefits attached to maintaining working capital investments, there are prior reasons to believe that firms may have target working capital requirement that balances the costs and benefits.

2.2 Speed of adjustment toward target

It is asserted that firms' current level of working capital may never be equal to the desired level of working capital because of following reasons; for instance, there is no certainty and

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accuracy in firms' estimate for their sales and hence cannot estimate purchases accurately. In addition, firms cannot correctly anticipate bad debts or the rates of default, and the collection of delinquent accounts takes time and involves costs, which may be distributed over time (Nadiri, 1969). Further, firms deviate from their target working capital requirement because of random or temporary shocks, changes in the costs of production factors or due to improvements in technology. Thus, a firm may follow an adjustment process to reach the target working capital requirement. The quicker the adjustment process the greater will be the speed of adjustment and vice versa. The available literature examining this issue document that firms remain deviated from the target because the speed at which they adjust toward target is not quick enough to converge the current level of CCC toward the target. For instance, Chauhan and Banerjee (2018) on a sample of Indian manufacturing firms revealed that firms have target working capital but the speed of adjustment is slow; Cuong and Cuong (2016) on a sample of 112 firms from Vietnam conclude that Vietnamese firms have a target CCC and they adjust only 48% of working capital as compared to the target. In addition, Mathuva (2014) also found that Kenyan firms maintain a target CCC and they adjust toward their target at a speed of 0.44. These studies, Chauhan and Banerjee (2018), Cuong and Cuong (2016) and Mathuva (2014) maintained that speed of adjustment toward the target CCC is quite slow. Contrary to this, Banos-Caballero *et al.* (2013) while working on Spanish data asserted that Spanish firms have a target CCC and they adjust toward the target quickly at a speed of 0.87. The literature mentioned above highlights only one study Chauhan and Banerjee (2018) that examined the speed of working capital adjustment in Indian firms. Therefore, there is a need to enrich the existing debate on working capital adjustment in Indian context. By these means, this study examines the speed of working capital adjustment among the key manufacturing sectors of Indian economy. The outcomes of this study will help to build a robust theory for explaining working capital dynamics in Indian context.

2.3 Financial constraints and the speed of working capital adjustment

Firms will adjust their working capital requirement only when the benefits of doing so are more than the offset costs of reducing the firm's deviation from target working capital requirement. Thus, a faster adjustment can be thought of in firms that have better access to capital markets (Baños-Caballero *et al.*, 2013; Wilner, 2000). As asserted by finance theory that under perfect capital markets, investing and financing decisions are independent and hence investments decisions are only dependent on the investment opportunities that carry a positive net present value (NPV) (Modigliani and Miller, 1958). In such situations, companies have unlimited access to external finance, making it a perfect substitute for internal finance. Further, this situation will bring the opportunity cost of having the larger investment in working capital or longer CCC down to zero since firms are able to obtain external funds without any friction and also at reasonable prices. However, in practice, internal and external finance are not perfect substitutes (Baños-Caballero *et al.*, 2013). It is widely recognized in the finance literature that external finance, such as new share issues or debt issues etc. are more expensive because of asymmetric information (Myers and Majluf, 1984), agency problems (Jensen and Meckling, 1979) and transaction costs. Accordingly, we expect that speed of adjustment will also not be equal across all firms and may depend on the finance constraints of a firm (Fazzari and Petersen, 1993). The speed at which firms adjust their target working capital depends on the relative costs of being off their targets compared to the cost of adjustment, so firms with lower adjustment costs adjust more rapidly. Since changes in working capital may be associated with changes in a firm's external finance, we expect the faster speed of adjustment for firms with a better access to external capital markets. To test the effect of financial constraints on the speed of adjustment, we classify firms into various subsamples (the likelihood of being financially constrained), classified on the basis of Whited and Wu index and interest coverage ratio.

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2.3.1 Whited and Wu index. Following Whited and Wu (2006), firms are classified according to their Whited and Wu index score. Whited and Wu index (2006) is measured as a linear combination of six factors as follows: cash flow, a dividend payer dummy, leverage, firm size, industry sales growth and firm sales growth [1]. According to (Whited and Wu, 2006), firms with Whited and Wu index score below (above), the sample median is considered as less (more) financially constrained.

2.3.2 Interest coverage ratio. This ratio is actually a proxy of the degree of bankruptcy risk and hence financial constraints. Interest coverage ratio is measured as the ratio of earnings before interest and tax to financial expenses, where greater the ratio, fewer would it be difficult for a firm to repay its debt (Baños-Caballero *et al.*, 2014). Accordingly, firms having interest coverage ratio above (below) the sample medians are likely to be less (more) financially constrained.

3. Research methodology

3.1 Data and data sources

We employ a panel data set of 1936 Indian manufacturing companies from eight industries for a period of 18 years (2000–2018). The industries include, food and agro-based products (FAP); textile (TEX); chemical and petrochemical (CPC); consumer goods (CG); construction material (CM); machinery (MAC), metal and metal products (MMP) and transport equipment (TE) [2]. Further, we use an electronic database, the Center for Monitoring Indian Economy database, to extract the firm-level information of all the variables used in the study. In addition, the data for macroeconomic variables have been taken from the database of the Indian economy, Reserve Bank of India. The firms within the sectors are selected from all the major manufacturing sectors of Indian economy thus giving due representation to all the industries and sectors of Indian economy.

3.2 Model and variables [3]

To analyse the impact of financial constraints on the speed of working capital adjustment, we use the following general partial adjustment model:

$$\mathrm{CCC}_{i,t} - \mathrm{CCC}_{i,t-1} = \delta\left(\mathrm{CCC}^{*}_{i,t} - \mathrm{CCC}_{i,t-1}\right);\ 0 < \delta < 1 \tag{1}$$

where $\mathrm{CCC}_{i,t}$ is the firm i's cash conversion cycle in the end of year t; $\mathrm{CCC}^{*}_{i,t}$ is the firm i's target cash conversion cycle at the end of year t; $(\mathrm{CCC}^{*}_{i,t} - \mathrm{CCC}_{i,t-1})$ is the adjustment required to reach the target working capital and δ takes the value between 0 and 1 and measures the speed of adjustment. If $\delta = 1$, then $\mathrm{CCC}_{i,t} = \mathrm{CCC}^{*}_{i,t}$, implying that adjustment costs are so low that firm immediately adjusts their current level of working capital to reach the target level. However, if $\delta = 0$, then $\mathrm{CCC}_{i,t} = \mathrm{CCC}_{i,t-1}$, implying that adjustment costs are so high that firm chooses to remain at the same level in spite of adjusting.

Target CCC is modelled as a linear function of a set of variables that appear regularly in the literature as the determinants of working capital (Mathuva, 2014; Hill *et al.*, 2010). More specifically the firm target CCC is estimated by the following expression:

$$\begin{aligned}\mathrm{CCC}^{*}_{i,t} = {} & \beta_0 + \beta_1 \mathrm{CFLOW}_{i,t} + \beta_2 \mathrm{Size}_{i,t} + \beta_3 \mathrm{Growth}_{i,t} + \beta_4 \mathrm{AT}_{i,t} + \beta_5 \mathrm{Age}_{i,t} + \beta_6 \mathrm{Lev}_{i,t} \\ & + \beta_7 \mathrm{ROA}_{i,t} + \beta_8 \mathrm{GDPGR}_{t} + \varepsilon_{i,t}\end{aligned} \tag{2}$$

where cash flow (CFLOW) is defined as the ratio of earnings before interest and tax plus depreciation to total assets; Firm size (size) is defined as the natural logarithm of total assets; growth is defined as the percentage change in the sales of the firm from the previous year;

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asset tangibility (AT) is defined as the ratio of fixed financial assets to total assets; firm age (age) is defined as the number of years from the time the company was incorporated; leverage (lev) is defined as the ratio of total debt to total assets; profitability-(ROA) return on assets (ROA) is used as a proxy for measuring profitability. ROA is measured as the ratio of net profits to total assets and macroeconomic conditions-gross domestic product growth rate (GDPGR) is used as a proxy for controlling macroeconomic conditions.

Incorporating Eq. (2) in the partial adjustment specification, i.e. Eq.(1), the current CCC is determined by

$$\begin{aligned} CCC_{i,t} = {} & \alpha + \varphi CCC_{i,t-1} + \gamma_1 CFLOW_{i,t} + \gamma_2 Size_{i,t} + \gamma_3 Growth_{i,t} + \gamma_4 AT_{i,t} + \gamma_5 Age_{i,t} \\ & + \gamma_6 Lev_{i,t} + \gamma_7 ROA_{i,t} + \gamma_8 GDPGR_t + \eta_i + \nu_t + \lambda_{i,t} \end{aligned} \tag{3}$$

where, $\alpha = \delta\beta_0$; $\varphi = (1-\delta)$; $\gamma_n = \delta\beta_n$; $\lambda_{i,t} = \delta\varepsilon_{i,t}$ represents random disturbances; η_i represents the firms unobservable effects and ν_t represents time-specific effects that are time-variant and common to all companies, such as the effects of market fluctuations etc.

However, Eq. (3) does not test whether or not the speed of adjustments changes with the level of financial constraints faced by the firm. Accordingly, we classify firms into the likelihood of being financially constrained on the basis according to two proxies, i.e. Whited and Wu Index and interest coverage ratio as mentioned in section (2.2). It is worth to note that firms with Whited and Wu index score below (above), the sample median is considered as less (more) financially constrained and firms having interest coverage ratio above (below) the sample medians are likely to be less (more) financially constrained. This exercise helps us to classify firms into the likeness of facing financial constraints.

Given that the objective of the study is to test the impact of financial constraints on the speed of adjustment, we therefore extend Eq. (3) by incorporating a dummy variable that distinguishes between firms more likely to face financing constraints and those that are less likely, according to the above-mentioned classifications. More specifically, degree of financial constraints ($DFC_{i,t}$) is a dummy variable that takes a value of 1 for firms less financially constrained (and 0 otherwise). This approach has also been followed by (Altaf and Shah, 2018, 2019; Chauhan and Banerjee, 2018; Baños-Caballero *et al.*, 2012, 2013). After incorporating dummies, Eq. (4) can be rewritten as follows:

$$\begin{aligned} CCC_{i,t} = {} & \alpha + (\varphi_0 + \varphi_1 DFC_{i,t}) CCC_{i,t-1} + \gamma_1 CFLOW_{i,t} + \gamma_2 Size_{i,t} + \gamma_3 Growth_{i,t} + \gamma_4 AT_{i,t} \\ & + \gamma_5 Age_{i,t} + \gamma_6 Lev_{i,t} + \gamma_7 ROA_{i,t} + \gamma_8 GDPGR_t + \eta_i + \nu_t + \lambda_{i,t} \end{aligned} \tag{4}$$

The interaction of DFC with lagged CCC variable helps us to dissect the impact of financial constraints on the speed of working capital adjustment (Baños-Caballero *et al.*, 2012, 2013; Altaf and Shah, 2018). Therefore, in Eq. (4), φ_0 and $(\varphi_0 + \varphi_1)$ measure the speed of adjustment when firms are classified according to the likelihood of being financially constrained. The smaller the coefficient on the lagged CCC ($CCC_{i,t-1}$), the faster will be the speed of adjustment. Thus, in order to prove that firms with lesser financial constraints or better access to capital markets will adjust quickly compared to firms likely to be more financially constrained, we expect φ_0 to be greater than $(\varphi_0 + \varphi_1)$.

3.3 Estimation approach

The models specified above were tested using panel data methodology because of the advantages it offers. Firstly, it helps to control for unobservable heterogeneity (Hsiao, 2003; Klevmarken, 1989; Moulton, 1986, 1987). Secondly, it gives more information, produces more variability, more efficiency and less collinearity among variables (Hsiao, 2003). Lastly, it helps

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to model technical efficiency in a better way by allowing to construct complicated models (Koop and Steel, 2001). Further, to deal with the possible problems of endogeneity that may arise on account of the persistence and the use of lagged CCC variable as independent variable in the model and also due to the inconsistency of other panel data models, generalized method of moments (GMM) has been suggested by the econometric literature. Accordingly, we perform Arellano and Bond (AB) two-step GMM as an estimation technique for all the models.

4. Empirical results

4.1 Descriptive statistics

Table 2 reports the descriptive statistics of all the variables used in the study. With regard to CCC variable, the study finds that *food and agro-based products*; *consumer goods*; *chemicals and petrochemicals; construction materials; machinery and metals and metal Products* sectors take approximately similar time (80 days) to complete cash conversion cycle. However, *textiles* sector represents the longest CCC of 105 days in the industry as a whole. On the other hand, *transport equipment* sector complete their conversion cycle quickly as compared to other sectors. In fact, *transport equipment* sector has the fastest CCC of 45 days. Further, except few, all the variables have positive skewness and for this reason mean is greater than median for these variables [4].

4.2 Determinants of CCC and speed of adjustment towards target CCC

Table 3 reports the results after estimating Eq. (3) by Arellano and Bond (AB) two-step GMM estimation. Column (2) reports the results of food and agro-based products (FAP); column (3) reports the results of textiles (TEX); column (4) reports the results of chemicals and petrochemicals (CPC); column (5) reports the results of consumer goods (CG) followed by the results of construction material (CM), machinery (MAC), metal and metal products (MMP) and transport equipment (TE) in columns (6), (7), (8) and (9), respectively. Perusing Table 3 further, it can be construed that the p values for the m_2 statistics as presented in columns (2) to (9) is a test for the absence of AR(2) process serial correlation in the first difference residuals. These p values of m_2 statistics are non-significant, implying that there is no second-order serial correlation. In addition, the results of the Sargan test are also presented in columns (2) to (9). The Sargan test is the test for correlation between instruments and error term. Since the p values of Sargan test are non-significant, it implies the absence of correlation between instruments and error term.

The results reveal that the coefficient on lagged CCC is positive and significant across sub-sectors and alternate specifications, implying that all the firms in sub-sectors have a target CCC. In addition, *food and agro-based products; machinery; metal and metal products; consumer goods and chemicals and petrochemicals* sectors adjust their CCC at an approximate speed of 0.25. However, *transport equipment, textiles and construction material* sectors

S.no	Sector name	Total firms in sector
1	Food and agro-based products (FAP)	174
2	Textiles (TEX)	288
3	Chemicals and petrochemical (CPC)	297
4	Consumer goods (CG)	272
5	Construction materials (CM)	293
6	Machinery (MAC)	164
7	Metals and metal products(MMP)	291
8	Transport equipment (TE)	157
	Total firms in sample	1936

Table 1.
Sector-wise breakup of firms

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Variable	Observation	Mean	Median	Standard deviation	Skewness	Kurtosis
Food and agro-based products (FAP)						
CCC	3,132	87.39	67.46	86.77	1.27	1.56
CFLOW	3,132	0.0617	0.0969	0.365	−0.367	−0.281
Size	3,132	3.785	3.767	0.604	0.250	−0.131
Growth	3,132	0.329	0.108	0.797	3.610	19.921
AT	3,132	0.934	0.685	0.842	0.828	−0.433
Age	3,132	40.5	26	31.456	1.662	2.439
Lev	3,132	0.427	0.411	0.244	0.514	−0.294
ROA	3,132	0.15765	0.119	0.330	0.097	−0.534
GDPGR	3,132	13.421	8.206	17.446	2.620	5.024
Textiles (TEX)						
CCC	5,184	105.420	89.342	57.897	1.267	2.123
CFLOW	5,184	0.1121	0.1168	0.198	0.658	1.861
Size	5,184	3.805	3.876	0.7417	−1.281	4.470
Growth	5,184	0.2308	0.0948	0.566	7.316	85.626
AT	5,184	1.345	1.295	0.837	0.1631	−1.079
Age	5,184	35.02	27	24.41	2.147	5.387
Lev	5,184	0.4934	0.493	0.198	0.231	3.255
ROA	5,184	0.039	0.056	0.247	−0.949	3.050
Chemicals and petrochemical (CPC)						
CCC	5,346	89.033	75.781	61.522	1.355	3.264
CFLOW	5,346	0.2087	0.205	0.2402	−0.654	2.702
Size	5,346	3.822	3.777	0.7467	0.408	0.4364
Growth	5,346	0.437	0.253	0.9701	3.6485	24.581
AT	5,346	0.7315	0.654	0.6169	0.8206	0.0411
Age	5,346	35.602	31	16.721	1.000	0.6109
Lev	5,346	0.4158	0.407	0.1965	0.264	0.0306
ROA	5,346	0.1003	0.133	0.5901	0.440	5.105
Consumer goods (CG)						
CCC	4,896	80.101	75.105	65.185	0.526	0.025
CFLOW	4,896	0.1790	0.2454	0.3891	−0.742	0.226
Size	4,896	3.711	3.717	0.4975	0.0261	−0.2639
Growth	4,896	0.5268	0.1565	1.373	3.943	20.781
AT	4,896	0.6638	0.565	0.5711	1.492	3.125
Age	4,896	39.312	30	20.086	0.7894	−0.783
Lev	4,896	0.3838	0.355	0.230	0.4919	−0.0700
ROA	4,896	0.1790	0.2505	0.3253	−1.824	4.304
Construction materials (CM)						
CCC	5,274	79.847	68.727	54.652	1.627	3.779
CFLOW	5,274	0.3214	0.2704	0.1953	0.8148	0.0662
Size	5,274	3.910	0.88153	0.5814	0.2881	0.4189
Growth	5,274	0.1277	0.2046	0.6645	0.9008	2.440
AT	5,274	0.8510	0.805	0.5755	0.5683	−0.2166
Age	5,274	49.13	47	27.042	0.4266	−0.8053
Lev	5,274	0.4883	0.484	0.1954	0.0831	−0.6053
ROA	5,274	0.1409	0.128	0.2533	−0.7587	2.481
Machinery (MAC)						
CCC	2,952	82.779	75.958	80.592	0.5365	1.6670
CFLOW	2,952	0.121	0.1765	0.4456	−0.3993	−0.7252
Size	2,952	3.765	3.728	0.655	−0.0246	2.360

(*continued*)

Table 2.
Descriptive statistics

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Variable	Observation	Mean	Median	Standard deviation	Skewness	Kurtosis
Growth	2,952	0.235	0.1258	1.028	9.007	118.40
AT	2,952	0.552	0.37	0.5859	1.315	1.349
Age	2,952	33.546	28	18.5857	1.1126	1.153
Lev	2,952	0.2900	0.2482	0.2162	1.379	3.826
ROA	2,952	0.0586	0.146	0.4483	−1.341	5.883
Metals and metal products(MMP)						
CCC	5,238	77.739	69.026	52.412	0.774	0.2663
CFLOW	5,238	0.1309	0.1472	0.2727	−0.4200	1.701
Size	5,238	4.215	4.067	0.7864	0.2895	0.0874
Growth	5,238	0.3221	0.1588	0.7623	2.873	17.971
AT	5,238	0.9053	0.79	0.733	0.7635	−0.0568
Age	5,238	34.402	29	20.83	1.633	2.776
Lev	5,238	0.4371	0.432	0.210	0.4769	−0.2873
ROA	5,238	0.0019	−0.0058	0.272	−0.4766	2.115
Transport equipment (TE)						
CCC	2,826	45.291	37.668	44.490	1.821	5.897
CFLOW	2,826	0.1510	0.2344	0.4010	−0.3170	−0.8431
Size	2,826	3.749	3.593	0.6247	0.6393	1.689
Growth	2,826	0.1596	0.0742	0.3906	7.3703	69.862
AT	2,826	0.8140	0.76	0.6110	0.6748	0.0323
Age	2,826	34.585	30	15.24	0.649	−0.2606
Lev	2,826	0.5302	0.51120	0.2012	0.1675	−0.0107
ROA	2,826	0.2314	0.27041	0.2397	−1.311	3.947

Table 2.

converge to target CCC quicker than other sectors since the adjustment speed of these sectors tends to be approximately 0.40. These results confirm that firms have a target working capital that balances the costs and benefits. However, the speed of adjustment is not quick implying that working capital decisions are not actively taken in Indian firms. In addition, these findings cast a doubt on working capital management practices followed in Indian manufacturing companies. Further, these results suggest the lack of interest by management for managing working capital optimally. In addition, other reasons for the slow speed of adjustment maybe lack of the developed capital markets in India, forcing firms to rely heavily on banks for their financing. In addition, the lack of formal channels of financing may also result in slower adjustment.

Furthermore, the results obtained in Table 3 suggest that the determinants of CCC vary across sub-sectors. The results reveal that firm age, cash flow and growth significantly determine the CCC in *food and agro-based products* sector. In case of *textiles* sector, firm size, firm age, leverage, cash flow, growth and profitability turn out to be significant determinants of CCC. The results further reveal that asset tangibility, firm size, firm age, leverage, cash flow and profitability are the significant determinants of CCC in the *chemicals and petrochemicals* sector. In case of *consumer goods* sector, the results show that asset tangibility and profitability significantly determine CCC, while asset tangibility and cash flow are significant determinants of CCC in the *construction materials* sector. In addition, cash flow, growth and profitability significantly determine the CCC in the *machinery* sub-sector, and firm size, firm age and profitability are the significant determinants of CCC for the *transport equipment* and *metal and metal products* sectors. The difference in the results of the determinants of CCC is in line with the finance theory that argues that the factors that determine the CCC vary with the nature and characteristics of the business.

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Table 3.
Target CCC, speed of adjustment and its determinants across sub-sectors

Dependent variable: CCC								
(1)	(2) (FAP)	(3) (TEX)	(4) (CPC)	(5) (CG)	(6) (CM)	(7) (MAC)	(8) (MMP)	(9) (TE)
CCC_{t-1}	0.764*	0.614*	0.787*	0.720*	0.609*	0.725*	0.791	0.607*
	(6.21)	(4.47)	(12.91)	(6.13)	(2.49)	(10.58)	(8.00)	(2.58)
CFLOW	−19.40**	−28.68*	−14.09**	−1.57	−34.24*	−8.27***	−9.14	4.58
	(−2.14)	(−2.38)	(−2.18)	(−0.26)	(−2.77)	(−1.61)	(−0.98)	(0.64)
Size	10.56	14.69***	34.89*	−1.15	−1.78	0.424	18.03**	14.79*
	(0.83)	(1.84)	(5.47)	(−0.12)	(−0.16)	(0.06)	(2.24)	(2.72)
Growth	9.19*	7.93*	−0.107	1.12	−1.84	−3.35**	0.554	3.11
	(3.34)	(2.65)	(−0.10)	(1.15)	(−0.71)	(−2.16)	(0.32)	(1.04)
AT	3.77	6.16	−3.49***	6.53***	6.81**	−3.95	−0.303	−1.34
	(1.01)	(1.43)	(−1.62)	(1.86)	(1.97)	(−1.08)	(−0.12)	(−0.51)
Age	−2.26**	−1.44***	−3.47*	−0.176	−1.02	−0.632	−1.75*	−2.02*
	(−1.99)	(−1.88)	(−7.48)	(−0.24)	(−1.41)	(−0.95)	(−2.67)	(−4.21)
LEV	1.30	−27.65**	−13.17***	6.24	−4.40	2.35	−3.96	−1.11
	(0.09)	(−2.06)	(−1.77)	(0.62)	(−0.42)	(0.22)	(−0.50)	(−0.13)
ROA	5.04	−48.65*	−5.37**	−0.008***	−0.008***	−12.46*	−16.33*	−40.40*
	(0.38)	(−4.54)	(−2.40)	(1.66)	(1.66)	(−2.37)	(−2.52)	(−4.32)
GDPGR	0.097	0.043	0.004	12.99	−0.0005	−0.077	0.031	−0.029
	(0.90)	(0.49)	(0.09)	(−0.13)	(−0.01)	(−1.00)	(0.51)	(−0.60)
m_2	0.1484	0.1342	0.2439	0.1734	0.3592	0.1843	0.1821	0.1587
Sargan	0.1719	0.2342	0.3256	0.2487	0.4563	0.2481	0.2298	0.2223
Observations	3132	5184	5346	4896	5274	2952	5238	2826

Note(s): This table reports empirical results after estimating Eq. (3) across sub-sectors. The results presented in this table are obtained from the two-step GMM approach. Asterisks indicate significance at 1% (*) 5% (**) and 10% (***). *Z*-statistics of two-step GMM model are reported in parentheses and based on robust standard errors. m_2 refer to p values of serial correlation test of second order using residuals of first differences, asymptotically distributed as $N(0,1)$ under the null hypothesis of no serial correlation. Sargan refers to *p* values for over-identifying restrictions distributed asymptotically under the null hypothesis of the validity of instruments. (FAP) means food and agro-based products; (TEX) textiles; (CPC) chemicals and petrochemicals; (CG); consumer goods; (CM) construction material; (MAC) machinery (MMP) metal and metal products and (TE) transport equipment

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The above-mentioned results provide evidence that the working capital policy must vary according to the nature and characteristics of the business since we found different speed of adjustment and also difference in the determinants of CCC across sectors. Further, our results imply that even if the industry level data can be a starting point in framing working capital policies, yet a manager must evaluate the unique set of characteristics and circumstances of the particular sub-sector the firm is operating in. Thus, a manager needs to frame a working capital policy that suits the unique needs of the sector and sub-sector. This may further help the firms to reach the intended target working capital more quickly and thus reduce the gap of convergence.

4.3 The impact of financial constraints on speed of adjustment

Verified that firms have a target working capital that brings trade-off between the costs and benefits, but the speed of adjustment towards the target is slow. Now, based on the literature mentioned in section (2.2), we assume that the speed of adjustment of CCC to the target CCC will depend on a firm's likelihood of being financially constrained. Accordingly, we estimate Eq. (4) for the possible effects of financial constraints on the speed of adjustment. Columns (2) to (9) of Table 4 report the results of such possible effects. Specifically, panel A reports the results from Whited and Wu index grouping, and panel B reports the results from interest coverage grouping. It must be noted that Table 4 reports only the results of (CCC_{t-1}) and ($CCC_{i,t-1}$*DFC), however all other independent variables were also incorporated in the model. (The results have not been reported because of space limitation but are available on request).

Perusing Table 4, it can be inferred that the p values for the m_2 statistics and Sargan test as presented in columns (2) to (9) for both panel A and B are non-significant, implying that there is no second-order serial correlation and also an absence of correlation between instruments and error term. The results obtained after estimating Eq. (4), are consistent with the proposition that speed of adjustment varies with the likelihood of firm being financially constrained. More specifically, we find that the adjustment speed for firms that are likely to face lower financial constraints is greater compared to those with high financial constraints since the coefficient on (φ_0) is higher than the coefficient on $(\varphi_0 + \varphi_1)$ for both Whited and Wu Index grouping and interest coverage grouping and also across sub-sectors. For instance, the coefficient of (φ_0) for food and agro-based products underWhited and Wu Index grouping is (0.756) which is more than the coefficient of $(\varphi_0 + \varphi_1)$, (0.756–0.306 = 0.45). This phenomenon as noted above remains robust across all the sectors under study and also across Whited and Wu Index grouping and interest coverage grouping. These results provide an important indication to the management of working capital that if financial constraints are lowered the firms would be able to adjust their CCC towards target quickly and hence perusing an effective working capital management policy. Hence, given the robust results, we can infer that Indian manufacturing firms facing lower financial constraints are in a position to quickly adjust their current level of working capital to target working capital.

5. Conclusions

The study attempted to investigate the existence of target working capital and the speed with which firms adjust towards this target. In addition, this study investigated the impact of financial constraints on the speed of working capital adjustment. We employed a panel data set of 1936 Indian manufacturing companies from 8 industries for a period of 18 years (2000–2018). Contrary to the previous results of quick adjustment of working capital from developed economies, the results in this paper suggest that although there seems to be target behaviour exhibited by firms in key manufacturing sectors of emerging markets like India, their speed of adjustment is quite slow and also varying speed of reversion for different sectors. Further, the results suggests that firms that are less likely to be financially constrained adjusted their working capital quickly towards the target. These findings, therefore, warrant managers to

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Table 4.
Impact of financial constraints on speed of adjustment

Dependent variable: CCC (1)	(2) (FAP)	(3) (TEX)	(4) (CPC)	(5) (CG)	(6) (CM)	(7) (MAC)	(8) (MMP)	(9) (TE)
Panel A: Whited and Wu index grouping								
CCC_{t-1}	0.756*	0.684*	0.779*	0.638*	0.628*	0.747*	0.631*	0.787*
	(6.21)	(4.47)	(12.91)	(6.13)	(2.49)	(10.58)	(8.00)	(2.58)
$CCC_{i,t-1}$*DFC	−0.306*	−0.294*	−0.318*	−0.303**	−0.233*	−0.227*	−0.221***	−0.202***
	(−3.21)	(−2.87)	(−8.91)	(−1.98)	(−2.56)	(−6.58)	(−1.87)	(−1.68)
m_2	0.214	0.1642	0.2889	0.2831	0.2392	0.2843	0.1928	0.1237
Sargan	0.1832	0.2342	0.3776	0.2877	0.4193	0.2567	0.3287	0.3457
Observations	3132	5184	5346	4896	5274	2952	5238	2826
Panel B: interest coverage grouping								
CCC_{t-1}	0.712*	0.664*	0.729*	0.667*	0.638*	0.757*	0.621*	0.777*
	(6.21)	(4.47)	(12.91)	(6.13)	(2.49)		(8.00)	(2.58)
						(10.58)		
$CCC_{i,t-1}$*DFC	−0.202*	−0.387**	−0.305*	−0.218*	−0.328**	−0.2.98*	−0.302*	−0.294***
	(−2.82)	(−1.99)	(−5.94)	(−3.08)	(−2.06)	(−4.74)	(−3.33)	(−1.83)
m_2	0.340	0.192	0.396	0.271	0.298	0.367	0.1812	0.179
Sargan	0.272	0.386	0.421	0.329	0.428	0.237	0.397	0.372
Observations	3132	5184	5346	4896	5274	2952	5238	2826

Note(s): This table reports empirical results after estimating Eq. (4) across sub-sectors. The results presented in this table are obtained from the two-step GMM approach. Asterisks indicate significance at 1% (*) 5% (**) and 10% (***). *Z*-statistics of two-step GMM model are reported in parentheses and based on robust standard errors. ($DFC_{i,t}$) is a dummy variable that takes a value of 1 for firms less financially constrained (and 0 otherwise) in both Whited and Wu Index and interest coverage grouping. m_2 refer to p values of serial correlation test of second-order using residuals of first differences, asymptotically distributed as $N(0,1)$ under the null hypothesis of no serial correlation. Sargan refers to p values for over-identifying restrictions distributed asymptotically under the null hypothesis of the validity of instruments. (FAP) means food and agro-based products; (TEX) textiles; (CPC) chemicals and petrochemicals; (CG); consumer goods; (CM) construction material; (MAC) machinery (MMP) metal and metal products and (TE) transport equipment

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visualise and evaluate the sector-specific attributes that affect working capital and thereby focus on them with a view to enhance working capital efficiency. Further, it is imperative for managers to reconcile the gap between the target and the actual working capital by regularly revising the mix of funds for working capital in order to reach the target. In this endeavour, managers must keep in mind the peculiar characteristics of their sector of operation and the industry as a whole. Further, for reconciling the gap between the target and the actual working capital, finance managers in India need to understand the importance of market imperfections in the Indian finance markets that not only hamper the firms' ability to procure funds from the external financial market but also tend to make external funds costlier than those from the internal source. It, therefore, implies that finance managers in Indian firms can reduce the cost of borrowing by giving preference to internal funds in financing working capital. Moreover, financing by internal funds would tend to make it easier for firms to adjust their accounts receivable, inventories and accounts payable. In addition, as the likelihood of financial distress increases due to imperfections in markets, the risk of bankruptcy for firms also increases. Under such conditions, any finance manager would give priority to financial flexibility and accordingly try to reduce costs by exploiting the internal finance to the fullest. This, in the long run, would tend to bring more funds under the control of managers which if utilized efficiently can assure better prospects to the investors.

The above findings have some implications for the investors as well. Specifically, they have a bearing on investors who are interested in the short-term prospects of the company. The speed of adjustment towards target working capital aids the managers in anticipating the risk and accordingly help them in taking future trade credit decisions rationally. It is well acknowledged that low speed of adjustment signals higher risk for firms and reflects their inefficiency in managing the working capital. Conversely, a high speed of adjustment should be acknowledged as a better value of their investment in the company. In addition, high speed of adjustment implies the quick flow of information between a firm and the customer and accordingly low cost of information asymmetry between them.

The findings vis-à-vis the target working and the speed of its adjustment offer an implication for the regulators as well. Regulators like Reserve Bank of India (RBI) and Securities Exchange Board of India (SEBI) must frame policies that help in the smooth functioning of financial markets and also encourage firms to invest retained earnings. For instance, regulators can develop financial markets by promoting innovative financial products and ensuring easy access to financial products for dynamic investments like working capital.

It must be noted that financial constraint is not the only factor that determines the movements in CCC of the firm. There could be many other firm-specific factors that would determine the movement in CCC. These factors need to be given due consideration and would be a subject of future research. Further, it is desirable for further research to seek to understand these relationships across countries with different institutional characteristics and financial systems.

Furthermore, no study is without limitation, and this study is no exception. Although much care has been while designing and executing this study, still some limitations exist. This study has used a sample from Indian economy, and Indian economy is a typical example of developing or emerging economy; our findings are, to some extent, generalizable to markets owning similar characteristics. Further, the intensity of financial constraints may be subject to nature of industry, firm-specific characteristics etc. Hence, measuring financial constraints for all the eight sectors using two measure criteria may not be that much effective.

Notes

1. The Whited and Wu (2006) index is given by:-0.091CFi, $t-0.062$DIVPOSi, $t + 0.021$TLTDi, $t-0.044$LNTAi, $t + 0.102$ISGi, $t-0.035$SGi, t CF is the ratio of cash flow to total assets; DIVPOS is a dummy variable that takes the value of one if the firm pays cash dividends; TLTD is the ratio of the long-term debt to total assets; LNTA is the natural logarithm of total assets; ISG is the firm's industry sales growth and SG is firm sales growth.

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2. Sector-level breakup of firms is presented in Table 1.
3. The measurement of variables is given in Appendix.
4. GDPGR has been reported only once because GDP is a macro-economic variable remaining same for all sectors.

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Appendix

Variables	Acronym	Definition
Cash conversion cycle	CCC	ARP + ICP-APP
Lagged cash conversion cycle	$CCC_{i,t-1}$	One-year lagged CCC
Accounts receivable period	ARP	365 days × [account receivable/sales]
Accounts payable period	APP	365 days × [account payable/sales]
Inventory conversion period	ICP	365 × [inventories/cost of goods sold]
Cash flow	CFLOW	Earnings before interest and tax plus depreciation / total assets
Firm size	Size	Natural logarithm of total assets
Growth	Growth	(Current year sales/ previous year sales) – 1
Asset tangibility	AT	Fixed financial assets/total assets
Firm age	Age	The number of years from the time the company was incorporated
Leverage	Lev	The ratio of total debt to total assets
Return on assets	ROA	Net profit/total assets
Macroeconomic conditions	GRPGR	(Current year gross domestic product/ previous year gross domestic product) – 1

Table A1. Variable measurement and specification

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