# “The effect of working capital management on profitability: a case of listed manufacturing firms in South Africa”


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# THE EFFECT OF WORKING CAPITAL MANAGEMENT ON PROFITABILITY: A CASE OF LISTED MANUFACTURING FIRMS IN SOUTH AFRICA

## Abstract

Working capital management plays a pivotal role in enhancing the operational efficiency of firms and their ultimate profitability. Therefore, the purpose of this study was to examine the trends in working capital management and its impact on the financial performance of listed manufacturing firms on the Johannesburg Securities Exchange (JSE). A panel data methodology was used with different regression estimators to analyze this relationship based on an unbalanced panel of 69 manufacturing firms listed during the period 2007–2016.

The findings revealed that the average collection period and the average payment period are negative and statistically significant for profitability, implying that firms which efficiently manage their accounts receivable and those that pay their creditors on time perform better than those that do not. Additionally, a positive statistically significant relationship between the number of days in inventory and profitability was supported suggesting that firms which stock-up and maintain their inventory levels suffer less from stock-outs and avoid challenges of securing financing when needed. This increases their operational efficiency and ensures profitability in the long run. It could not be ascertained whether a shorter or longer cash conversion cycle enhances firm profitability, since findings to support this premise were weak. However, it was observed that manufacturing firms are on average, carrying lot of debt in their capital structures.

The present study contributes to existing literature by presenting one of the very recent findings on this topic while simultaneously testing the validity of recent local and international methodologies, in order to inform policy change.

**Keywords** working capital management, cash conversion cycle, accounts receivable, profitability, manufacturing firms, return on assets

**JEL Classification** G31, G32

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## INTRODUCTION

Corporate finance traditionally focuses on the role that long-term financing decisions play in the functioning of a business. In fact, researchers have particularly offered empirical findings analyzing capital investments, capital structure, dividend policies or company value, among other topics. Yet, a significant portion of a firm's capital structure is represented by short-term assets and other resources that mature in less than a year (Garcia-Teruel & Martinez-Solano, 2007). This implies that the financial management of a business hinges on the management of its short-term operations which then drive to the long-term goals.

The management of working capital and the role it plays in advancing financial performance continues to steer debate among scholars and practitioners alike. Several authors agree that this process manages

the firm's short-term assets and liabilities in a manner that creates an asset-liability imbalance, which inherently increases profitability, at the risk of possible insolvency (Dalayeen, 2017; Ngwenya, 2010; Padachi, 2006). Others believe that it is the optimal mix of the firm's current-to-total assets which determines the firm's willingness towards risk (Sharma & Kumar, 2011; Nazir & Afza, 2009). In both instances, the firm has to manage the amount of liquidity since the latter impairs its chances of sustained profitability and growth (Beaumont-Smith & Fletcher, 2009).

The current thrust of empirical study on the relationship between working capital management (WCM) and financial performance is directed towards informing policy on the appropriate current asset-liability mix which maximizes a firm's profitability while minimizing its risk (Jajongo & Makori, 2013). Yet, no general consensus currently exists on this issue because firms exist in unique economic environments that influence their working capital management decisions differently. Further, it is notable that a significant portion of the existing research concentrates on developed rather than on developing economies (Qurashi & Zahoor, 2017; Samiloglu & Akgun, 2016; Garcia-Teruel & Martinez-Solano, 2007; Deloof, 2003). It is then debatable whether the working capital methodologies used on firms in the developed economies apply to firms within the developing economies whose contrasting economic conditions affect them in distinct ways.

In Africa, recent literature on working capital focuses on West and East African countries with scanty studies on Southern Africa (Ayako, Kungu, & Githui, 2015; Akoto et al., 2013; Mathuva, 2010). South Africa is one of the emerging economies on the continent and boasts a high growth trend among medium to small business enterprises. Yet, most of its studies on working capital management appear to be either out dated or focused on an aspect of working capital that does not directly relate to financial performance. Notable works in this regard include studies by Enow and Brijlal (2014), Ngwenya (2010), Erasmus (2010), Beaumont-Smith and Fletcher (2009).

While the contributions made by these authors cannot be ignored, an investigation into the current working capital management (WCM) practices is necessary to capture the latest developments in this vital aspect of business operations. Such knowledge will help to inform current policies, practices and future literature on working capital management within the context of South Africa.

The rest of this paper is organized as follows: section 1 provides the problem statement and study objectives. Section 2 highlights the relevant empirical findings on the WCM and financial performance relationship. Section 3 outlines the research design and methodology. Section 4 presents the data analysis process and results, while the last section concludes by discussing the results and their policy implications.

## 1. STATEMENT OF THE PROBLEM

Empirical study on the relationship between working capital management practices and financial performance appears to be scanty yet, South Africa boasts one of the fastest-growing economies on the continent. According to Masocha and Dzomonda (2016), this economy has in the past experienced exponential growth in small and medium-sized enterprises (SMEs). These SMEs provide a remarkable milestone towards solving the country's development challenges such as unemployment, poverty and income inequality. And yet, several of these entities continue to fail due to their improper management of working capital and a resulting lack of the appropriate financing (Masocha & Dzomonda, 2016; Enow & Brijlal, 2014).

Hence, the dearth in empirical study on working capital management creates a gap between policy makers and practitioners that warrants attention. In attempting to bridge this gap, this study assesses the impact of working capital management practices on firm performance us-

ing the JSE manufacturing sector as a point of reference. To do this, the study proposes the following research objectives:

1. To investigate the relationship between working capital management, measured using the cash conversion cycle (CCC) and the profitability of manufacturing firms listed on the JSE.

2. To investigate the relationship between the various components of working capital management and profitability, measured using the return on total assets (ROA).

3. Comment on the overall impact of the working capital management practices on the profitability of listed manufacturing firms on the JSE.

## 2. A REVIEW OF THE EMPIRICAL FINDINGS

Empirical evidence on the relationship between WCM practices and financial performance indicates that these practices have a significant impact on both profitability and liquidity. Additionally, the findings seem to align with documented literature with a few exceptions. Variations occur due to the different methodologies used, the sample sizes or variables applied, and the different environments within which firms operate.

For instance, Gill et al. (2010), replicated a Lazaridis and Tryfondis (2006), study on Greek firms, using an American sample of 88 manufacturing firms listed during the 2005 to 2007 period. Their study used a weighted least squares (WLS) regression technique to estimate the effect of the CCC, accounted receivable days (AR), accounts payable days (AP) and average days in inventory (INV), on the firms' gross operating profit. Contrary to findings by Lazaridis and Tryfondis (2006), their study found that the CCC affects profitability positively and significantly. This implies that firms require a longer CCC to be profitable. Several studies including conventional literature disagree with this view (Ngwenya, 2010; Erasmus, 2010; Padachi, 2006).

Nevertheless, an analysis of the relationship between working capital components and profitability aligns with some empirical findings. Gill et al. (2010) find the AR to be significantly and negatively correlated with profitability, suggesting that firms which effectively manage their receivables become profitable. This is in line with findings by Akoto et al. (2013), Mathuva (2010), Padachi (2006). However, a further analysis by Gill et al. (2010) on the relationships between INV and AP with profitability produced weak results. Therefore, current empirical studies seem to align more closely when components of working capital are regressed with profitability than when their combined measure the CCC is used.

Conversely, the working capital management profitability relationship highlights the results that align closely with literature postulates. According to Correia et al. (2015), firms enhance their profitability by reducing their CCC and by effectively managing the AR. Several studies confirm this observation and include, but are not limited to, Bibi and Ajmad (2017), Enow and Brijlal (2014), Charitou et al. (2010).

Charitou et al. (2010) investigate this relationship using firms listed on the Cyprus Stock Exchange (CSE). Their sample consists of 43 industrial firms listed during the period 1998–2007. Their study uses a multivariate regression analysis approach similar to Deloof (2003) that operationalizes the ROA as the dependent proxy against the inventory holding period (INV), debtors' collection period (AR), creditors' payment period (AP) and a combined measure – the CCC, as independent proxies. To increase robustness, their model incorporates institutional control dummies like the natural logarithm of sales, sales growth and financial leverage.

Their study confirms that a shorter CCC enhances firms' financial performance and that a higher inventory turnover, an effective management of debtors and the timely payments to creditors increase firm profitability. These findings agree with documented literature and with empirical studies by, Erasmus (2010), Mathuva (2010), Deloof (2003). Their study provides plausible results on the relationship between their control variables and firm profitability. For instance, a high growth in

sales enhances profitability, while too much debt increases default risk and impacts negatively on profitability.

Similarly Enow and Brijlal (2014) investigate the effect of WCM on firm profitability using Small, Medium and Micro Enterprises (SMMEs) in South Africa. Their study covers a five-year period (2008–2012) for listed SMMEs on the alternative exchange (AltX) of the JSE with a refined second ary panel of 15 SMMEs and 75 firm-year observations. The study employs a methodology similar to Sharma and Kumar (2011), Nazir and Afza (2009) in which both correlation and regression analyses are applied to the dependent variable, the ROA, and several independent variables.

Findings indicate a negative relationship between the CCC and the ROA consistent with studies by Mathuva (2010), Padachi (2006), Deloof (2003). Results also indicate a positive relationship between the inventory days (INV), account receivable days (AR), growth, size and the current ratio (CR) with profitability, while simultaneously indicating a significantly negative relationship between days in accounts payable (AP) and profitability. Notably, while relationships between growth, size and the current ratio with profitability are consistent with the literature, as a rule of thumb, the relationships between INV, AR and AP are inconsistent with some findings (Raheman & Nasr, 2007; Padachi, 2006; Deloof, 2003).

The results indicate that South African SMMEs' increase their profitability by accumulating inventory, by offering credit to their debtors and by paying their creditors on time – a finding inconsistent with conventional literature, but one that provides good rationale about the environment in which South African SMMEs' operate.

Therefore, current empirical findings on the relationship between WCM and financial performance are mixed but provide some observations. First, the several local and international methodologies applied have an apparent overlap among them. Moreover, these replicated methodologies provide conflicting results among similar studies suggesting that other undocumented institutional and economic factors affect the WCM – profitability relationship.

Secondly, most credible empirical studies use the ROA (as opposed to the operating profit margin) as their measure of profitability. These include: Dalayeen (2017), Meena and Reddy (2016), Ayako, Kungu, and Githui (2015), Enow and Brijlal (2014), Akoto et al. (2013). Therefore, in order to advance the literature on WCM practices and financial performance, this study will adopt the ROA as a proxy for profitability.

Finally, most empirical studies focus on developed economies. While some studies focus on emerging economies in general, the paucity of research in Africa concentrates on the East and West African regions. So, with the exception of a few recent South African studies, most are fairly out-dated and do not capture the latest working capital management practices of firms. This study applies some of the recently used methodologies on this topic in order to attempt to bridge this gap.

## 3. STUDY DESIGN AND METHODOLOGY

The study adopted a panel data methodology similar to studies by Enow and Brijlal (2014), Sharma and Kumar (2011), Charitou et al. (2010) to investigate the relationship between WCM and profitability among manufacturing firms listed on the JSE. Panel data methodology pools cross-sectional units of observations over several time dimensions and produces estimates that are more robust than cross-sectional or time-series estimations alone. It assumes that the variables are heterogeneous thereby controlling for bias and ensuring less collinearity but greater degrees of freedom (Baltagi, 2005).

### 3.1. Sample and data

The study employed audited financial statement data from Orbis – a flagship of the Bureau Van Dijk (BvD) database which contains financial and economic information on private and listed companies. The sample consisted of all manufacturing firms listed on the JSE during the period 2007–2016. According to the North American Industry Classification System, 2012 (NAICS, 2012), this sample consisted of 69 firms grouped into three

sub-industries with codes; 31 (food, beverage, clothing and textile), 32 (paper printing, chemical and non-metallic) and 33 (metal manufacturing, computer electronics, and furniture). The analysis was conducted on this unbalanced panel of 69 firms with an estimated total of 690 firm-year observations.

### 3.2. Variables

The ROA was operationalized as the dependent variable and a proxy for profitability. This proxy is defined as the ratio of earnings before taxes (EBT) to total assets and relates a company's profitability to its asset base (Padachi, 2006). Other proxies operationalized as independent variables and measures of WCM included: the number of days in accounts receivable (AR/ACP) calculated as a ratio of the number of days in a year (365) and the accounts receivable turnover, with a high value indicating a high investment in accounts receivable, the accounts payable days (AP/APP) and the number of days in inventory (INV) calculated as 365 x [inventory/purchases] and 365 x [accounts payable/purchases], respectively. The former indicates the number of days in which inventory is held and the resulting investment in inventory, while the latter indicates the average time it takes for a firm to pay its suppliers.

A combination of the above independent proxies was then used to calculate the combined measure of WCM – the CCC, calculated as the number of days in inventory plus the number of days in accounts receivable minus the number of days in accounts payable [CCC = INV + AR – AP]. A longer CCC indicates the time delay between an outlay of cash and the recovery of cash. The ideal situation for operational efficiency would be for a firm to have a shorter than longer CCC (Correia et al., 2015; Akoto et al., 2013).

Additionally, and in agreement with Akoto et al. (2013), Charitou et al. (2010), this study includes control variables to increase robustness. Control variables affect the validity of the study if excluded. These included: size (SIZE) of the firm, calculated as the natural logarithm of total assets, sales growth (SGROW), calculated as (Sales 1 – Sales 0) / Sales 0 and leverage (DEBT) measured as the ratio of total debt to total assets (Samiloglu & Akgun, 2016).

Conventional literature postulates where followed to hypothesize an inverse relationship between profitability (ROA) and AR in line with findings by Samiloglu and Akgun (2016), Akoto et al. (2013), Ngwenya (2010). It was also speculated that the accounts payable days (AP) should relate positively with ROA, since by delaying payments, firms accumulate funds to invest in profitable ventures (Akoto et al., 2013). Similarly, firms that expeditiously turnover their inventory generate more income meaning that INV should vary negatively with profitability (Sharma & Kumar, 2011). Lastly, any efficient management of working capital dictates a shorter CCC as opposed to a longer one. Consequently, the study hypothesized that profitability will vary inversely with the CCC (Correia et al., 2015; Charitou et al., 2010; Ngwenya, 2010). As a rule of thumb, SIZE and SGROW will vary positively with profitability, while DEBT will vary negatively (Enow & Brijlal, 2014; Charitou et al., 2010).

## 4. DATA ANALYSIS AND RESULTS DISCUSSION

The adopted empirical framework, similar to studies by Sharma and Kumar (2011), Charitou et al. (2010), Garcia-Teruel and Martinez-Solano (2007), involves an estimation of the following Ordinary Least Squares (OLS) regression equations:

$$ROA_{it} = \beta_0 + \beta_1 SGROW_{it} + \beta_2 DEBT_{it} + \\ + \beta_3 SIZE_{it} + \beta_4 INV_{it} + e_{it}, \quad (1)$$

$$ROA_{it} = \beta_0 + \beta_1 SGROW_{it} + \beta_2 DEBT_{it} + \\ + \beta_3 SIZE_{it} + \beta_4 AR_{it} + e_{it}, \quad (2)$$

$$ROA_{it} = \beta_0 + \beta_1 SGROW_{it} + \beta_2 DEBT_{it} + \\ + \beta_3 SIZE_{it} + \beta_4 AP_{it} + e_{it}, \quad (3)$$

$$ROA_{it} = \beta_0 + \beta_1 SGROW_{it} + \beta_2 DEBT_{it} + \\ + \beta_3 SIZE_{it} + \beta_4 CCC_{it} + e_{it}, \quad (4)$$

where, the ROA denotes a measure of the firms' return on assets, SGROW measures the sales growth, INV – the number of days in inventories, AR/ACP – the number of days in accounts receivable, AP/

**Table 1.** Descriptive results of all variables over the 10-year period

| | ROA | ACP* | APP* | CCC | INV | LEVERAGE | LNASSETS | SGROW |
|---|---|---|---|---|---|---|---|---|
| Mean | 7.94 | 48.99 | 40.09 | 65.07 | 56.16 | 0.488 | 14.63 | 0.139 |
| Median | 8.08 | 48.15 | 37.44 | 63.23 | 49.70 | 0.472 | 14.79 | 0.083 |
| Maximum | 71.31 | 172.32 | 274.10 | 208.14 | 396.73 | 1.675 | 19.78 | 13.500 |
| Minimum | –91.34 | 0.390 | 5.064 | –112.46 | 1.468 | 0.133 | 8.936 | –0.821 |
| Std. Dev. | 14.11 | 22.53 | 23.69 | 40.99 | 37.54 | 0.183 | 1.840 | 0.699 |
| Skewness | –0.823 | 0.976 | 4.378 | 0.251 | 2.656 | 1.109 | –0.145 | 14.75 |
| Kurtosis | 11.79 | 7.205 | 39.61 | 4.473 | 19.06 | 7.108 | 3.011 | 268.53 |
| Jarque-Bera | 1696.978 | 455.05 | 29996.68 | 51.34 | 6058.15 | 461.38 | 1.803989 | 1510852. |
| Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.405 | 0.000 |
| Observations | 508 | 508 | 508 | 508 | 508 | 508 | 508 | 508 |

*Note:* ROA = return of assets, *ACP or AR = debtors collection period, INV denotes the average days inventory is held, *APP or AP = creditors' payment period, CCC = Cash Conversion Cycle, LNASSETS = the natural logarithm of assets, SGROW = sales growth and LEVERAGE = the debt ratio. All variables are estimated for an annual cycle.

APP – the number of days is accounts payable and CCC – the cash conversion cycle. Subscript represents the cross-sectional dimension of firms ranging from 1to 69, while t denotes the time-series dimension in years from 2007 to 2016. β estimates the coefficients of the independent variables and e the error term. The study uses pooled but unbalanced panel data and Eviews 9.5 to estimate the model coefficients while accounting for missing information.

## 4.1. Descriptive statistics

Table 1 above presents the descriptive statistics of variables used and the estimates for normality. Of all the 69 manufacturing firms (adjusted for missing data), the average ROA was 7.94% with a maximum of 71% and a minimum –91%.The standard deviation of 14.1% does not suggest a wide variation in the distribution of this measure. The average days of inventory were 57 and firms on aver-

**Table 2.** Pearson's correlation analysis

| | Correlation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Probability** | **ROA** | **ACP** | **APP** | **CCC** | **INV** | **LEVERAGE** | **LNASSETS** | **SGROW** |
| ROA | 1.0000 | | | | | | | |
| ACP | –0.0882**<br>0.0469 | 1.0000<br>– | | | | | | |
| APP | –0.3337***<br>0.0000 | 0.2390***<br>0.0000 | 1.0000<br>– | | | | | |
| CCC | 0.0800*<br>0.0715 | 0.4775***<br>0.0000 | –0.1043**<br>0.0186 | 1.0000<br>– | | | | |
| INV | –0.07032<br>0.1134 | 0.0720<br>0.1046 | 0.3737<br>0.0000 | 0.7393<br>0.0000 | 1.0000<br>– | | | |
| LEVERAGE | –0.2511***<br>0.0000 | 0.0299<br>0.5006 | 0.4448<br>0.0000 | –0.2709***<br>0.0000 | –0.0330<br>0.4571 | 1.0000<br>– | | |
| LNASSETS | 0.1275***<br>0.0040 | 0.1098**<br>0.0133 | –0.0346<br>0.4363 | 0.1033<br>0.0199 | 0.0250<br>0.5736 | –0.0086<br>0.8461 | 1.0000<br>– | |
| SGROW | 0.0790*<br>0.0752 | 0.0584<br>0.1886 | –0.0131<br>0.7679 | 0.0074<br>0.8678 | –0.0352<br>0.4275 | 0.0125<br>0.7783 | –0.0161<br>0.7159 | 1.0000<br>– |

*Note:* (*) (**) and (***) represent statistical significance at the 10%, 5% and 1% levels, respectively. Where: ROA = return of assets, ACP or AR = debtors collection period, INV denotes the average days inventory is held, APP or AP = creditors' payment period, CCC = Cash Conversion Cycle, LNASSETS = the natural logarithm of assets, SGROW = sales growth and LEVERAGE = the debt ratio. All variables are estimated for an annual cycle. Included observations: 508 after adjustments balanced sample (listwise missing value deletion).

age collect their receivables within 49 days yet pay their creditors within 40 days. Almost half of all firms' capital structure is financed by debt (48.8%), and the firms have a comparatively shorter cash conversion cycle of 65 days (Akoto et al., 2013; Lazaridis & Tryfonidis, 2006). Firms grow their sales at an average of 14% per annum. A Pearson's Correlation analysis of the variables under study indicated the initial expected causality among them with the ROA. This is presented in Table 2 below.

Notably, none of the variables exhibited high bivariate or multivariate correlation values to suggest cases of multi collinearity (Garcia-Teruel & Martinez-Solano, 2007). Secondly, most independent and control variables produced plausible results with regard to the expected direction of causality with the dependent variable ROA. For example, the accounts receivable days (AR/ACP) varies negatively with ROA at statistically significant levels, while SIZE and SGROW vary positively and significantly with it. However, DEBT/LEVERAGE and APP/AP vary negatively with ROA in contrast to findings by Akoto et al. (2013), Charitou et al. (2010). Based on Padachi's (2016) assertion that the Pearson's correlation coefficients do not, in isolation, provide a reliable indicator of association, this study estimated its theoretical multivariate models using the pooled Ordinary Least Squares (OLS) estimation, the fixed effects estimation and the random effects estimation. While the analysis justifies the use of a suitable estimator, it is necessary to compare the findings across other alternatives.

## 4.2. Data analysis

Estimating models from panel data requires a determination of whether a correlation exists between the unobservable heterogeneity of each firm and the independent variables within a model (fixed effects). This helps to ascertain whether a within-group estimator or a random effects estimator is more appropriate for the analysis (Garcia-Teruel & Martinez-Solano, 2007). In order to determine the appropriate estimator for the short panel data used, a Hausman (1978) test (test for the null hypothesis of no correlation) was run on a random effects regression estimation. The obtained statistically insignificant p-value of 0.3534 meant that the null hypothesis could not be rejected, hence, a random effects model (REM) was adopted as the best estimator for the panel data. Nonetheless, this study reports the findings using all the 3 estimation techniques. First, Table 3 below provides the regression estimates using the random effects estimation technique.

**Table 3.** Multivariate regression estimates for study models using REM

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **Coefficient** | **p-value** | **Coefficient** | **p-value** | **Coefficient** | **p-value** | **Coefficient** | **p-value** |
| Constant | 21.52** | 0.016 | 17.98** | 0.035 | 18.68** | 0.024 | 20.13** | 0.024 |
| AR | | | –0.080** | 0.011 | | | | |
| AP | | | | | –0.068*** | 0.000 | | |
| INV | –0.024 | 0.216 | | | | | | |
| SGROW | 2.552*** | 0.000 | 3.798*** | 0.000 | 3.059*** | 0.000 | 2.539*** | 0.000 |
| LNASSETS | 0.048 | 0.932 | 0.554 | 0.319 | 0.235 | 0.660 | –0.028 | 0.960 |
| CCC | | | | | | | 0.017 | 0.376 |
| LEVGE | –26.36*** | 0.000 | –30.02*** | 0.000 | –23.94*** | 0.000 | –26.18*** | 0.000 |
| F-statistic | 13.73*** | 0.000 | 26.09*** | 0.000 | 35.24*** | 0.000 | 13.54*** | 0.000 |
| R-square | 9.8% | | 16.68% | | 21.29% | | 9.7% | |
| Hausman test: t-statistic = 6.66 and p-value = 0.3534. | | | | | | | | |

*Note:* (*) (**) and (***) represent statistical significance at the 10%, 5% and 1% levels, respectively. ROA = return of assets, ACP or AR = debtors collection period, INV denotes the average days inventory is held, APP or AP = creditors' payment period, CCC = Cash Conversion Cycle, LNASSETS = the natural logarithm of assets, SGROW = sales growth and LEVERAGE = the debt ratio. All variables are estimated for an annual cycle.

**Table 4.** Multivariate regression estimates using pooled OLS, REM and FEM

| | Pooled OLS | Random Effects (REM) | Fixed Effects (FEM) |
|---|---|---|---|
| constant | 5.92 | 22.14** | 58.57*** |
| | (0.24) | (0.012) | (0.001) |
| AR/ACP | –0.024 | –0.047** | –0.048 |
| | (0.362) | (0.018) | (0.277) |
| INV | 0.011 | 0.038* | 0.065** |
| | (0.506) | (0.0804) | (0.015) |
| AP/APP | –0.163*** | –0.170*** | –0.174*** |
| | (0.000) | (0.000) | (0.000) |
| CCC | 0.011 | 0.017 | 0.065** |
| | (0.506) | (0.376) | (0.015) |
| SGROW | 1.662** | 2.415*** | 2.654*** |
| | (0.047) | (0.000) | (0.000) |
| LNTASSETS | 0.934*** | 0.081 | –2.281* |
| | (0.003) | (0.885) | (0.063) |
| LEVERAGE | –9.80*** | –17.11*** | –24.425*** |
| | (0.008) | (0.000) | (0.000) |
| F-statistic | 14.35*** | 15.41*** | 8.87*** |
| | (0.000) | (0.000) | (0.000) |
| Adjusted R2 | 13.64% | 14.57% | 52.84% |
| Obs | 508 | 508 | 508 |

*Note:* (*) (**) and (***) represent statistical significance at the 10%, 5% and 1% levels, respectively. p-values in parenthesis. ROA = return of assets, ACP or AR = debtors collection period, INV denotes the average days inventory is held, APP or AP = creditors' payment period, CCC = Cash Conversion Cycle, LNASSETS = the natural logarithm of assets, SGROW = sales growth and LEVERAGE = the debt ratio. All variables are estimated for an annual cycle.

In Table 3 above, the individual components of working capital together with firm characteristics (control variables) were sequentially regressed with the dependent variable using a random effects estimation procedure (see equations 1 to 4). According to Raheman and Nasr (2007), a random effects model counters the problem of heteroscedasticity by calculating a common weighted intercept for all variables. These authors contend that the generalized least squares procedure normalizes the data by making the weighted residuals more comparable to the un weighted residuals thereby providing a more consistent estimation. Table 3 shows the coefficients and p-values estimated for each of the models. Model 1 indicates the estimates for the number of days in inventory (INV) regressed with the return on assets (ROA). While the model coefficient and F-statistic were significant at the 5% and 1% levels, respectively, the inverse relationship between INV and the ROA was weak to support the reasonable inference. However, all control variables varied as predicted by empirical findings at statistically significant levels of 1%. Model 2 confirms a statistically significant but negative relationship between AR/ACP and the ROA (at the 5% level). Similarly, all control variables are statistically significant and influence the ROA in the directions predicted by theory. These findings are consistent with studies by Garcia-Teruel and Martinez-Solano (2007), Deloof (2003).

Interestingly, the accounts payable days (AP/APP) varied negatively at a statistically significant level of 1% with the ROA as indicated in model 3. This is consistent with findings by Enow and Brijlal (2014), Sharma and Kumar (2011), Garcia-Teruel and Martinez- Solano (2007), suggesting that most profitable firms pay their creditors early in order to increase their profitability. According to the F-statistic (35.24) and R-square value (21.29%), this model exhibits a reasonably high explanatory power on the re-

lationship between working capital and profitability, since most of the variables coefficients contribute sufficiently to the model. Finally, while the cash conversion cycle (in equation 4) exhibits a positive sign with the return on assets, its β estimate is weak to offer reliable inference. However, the strength and direction of all control variable coefficients mirror empirical prediction.

In order to check for consistency, all independent and control variables were run against the dependant variable ROA to produce estimates using the pooled Ordinary Least Squares (OLS), fixed effects (FE) and the random effects (RE) estimation techniques. In certain instances, however, the CCC was interchanged with the INV variable due to possible collinearity among these variables. The results presented in Table 4 below indicate alignment with earlier findings in Table 3.

First, all estimation techniques produced similar results on the causality between the dependent and independent variables. Secondly, the model constants, F-statistics and R-square values depicted a high explanatory power on the theoretical model fits albeit the fixed effects model produced the highest prediction among the estimation techniques. These estimates are also comparatively higher than similar studies conducted on this relationship (Sharma & Kumar, 2011; Charitou et al., 2010; Samiloglu & Akgun, 2016). Overall, the estimation using three procedures assisted the researcher in affirming the effect of working capital management on profitability among listed manufacturing firms in South Africa.

Across all three estimators, the coefficient of the accounts receivables days (ACP/AR) is negative and significant at the 5% level (random effects model). This implies that firms which efficiently manage their credit policies become more profitable (other factors constant). Similarly, the accounts payable days (APP/AP) influence profitability negatively meaning that a significant number of manufacturing firms pay their creditors promptly in order to enhance their financial performance. While this finding is consistent with findings by Charitou et al. (2010), Mathuva (2010), Deloof (2003), it is not supported by Akoto et al. (2013), Mathuva (2010).

Two of the three estimators in this study confirmed a positive significant relationship between the average age of inventory (INV) and firm profitability implying that firms that stock-up inventory for longer, do not suffer from inventory scarcity and, hence, enhance their profitability. This finding is consistent with Mathuva (2010), and Padachi (2006). Finally, all control variables related significantly to profitability as predicted by most empirical studies.

In order to detect for intra-industry characteristics between WCM and profitability, the above analysis was done on individual subsets of the industry classified under codes 31 to 33 (see sample and data). The results indicated similar albeit weak relationships between WCM and profitability. While correlations were found, a significant number of them were weak to offer possible inference. These finding are not reported at this stage.

## CONCLUSION AND POLICY IMPLICATIONS

The present study investigated the role of working capital management on the financial performance of the manufacturing sector on the JSE. This sector experienced a decline in its contribution towards the country's Gross Domestic Product (GDP) from 15% in 2014 to 13.7% in 2015 (IDC report, 2016), and part of this decline is attributed to production inefficiencies within the sector, global competition and the lack of financing for small, micro and medium enterprises (SMMEs).

By the nature of this industry, a significant amount of cash is invested in the working capital. It can, therefore, be expected that the latter significantly impacts on the profitability of these firms, raising the need to develop research that informs policy. To this end, the present study found that the negative significant relationship between the average collection period and profitability implies that firms that proactively manage their receivables enhance their profitability. Similarly, firms that pay their creditors on time perform better than those that delay such payments.

Additionally, manufacturing firms that stock-up and maintain their inventory levels do not suffer from stock-outs and/or face challenges of securing finance to invest in such inventory. This increases operational efficiency and enhances firm profitability in the long run. Lastly, it cannot be confirmed whether manufacturing firms require a shorter to longer cash conversion cycle as such findings where weak to support inference. However, the composition of debt in the capital structure of manufacturing firms is alarmingly high and requires attention. Financial managers and policy makers need to address such aspects of working capital management in order to enhance financial performance. Finally, while this study attempted to investigate the relationship between working capital management and profitability it could not categorically investigate the effect of positive or negative working capital effects on profitability. Positive or negative working capital amounts for firms present managerial implications on financing strategies that warrant further study.

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