AUDIT, ACCOUNTING & REPORTING

SECTION 2

THE IMPACT OF MERGER ON WORKING CAPITAL MANAGEMENT EFFICIENCY OF AMERICAN PRODUCTION FIRMS

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Abstract

The purpose of this study is to examine the impact of merger on the efficiency of working capital management of American production firms. This study applied a co-relational research design. A sample of 497 listed American production firms for a period of 4 years (from 2010-2014) was analyzed. The findings of this study indicate that mergers may contribute to an improvement of the efficiency of working capital management. This is a co-relational study that investigated the association between merger and working capital management efficiency. There is not necessarily a causal relationship between the two, although the paper provides some conjectures to such relationship. The findings of this study may only be generalized to firms similar to those that were included in this research. This study contributes to the literature on the factors that improve the efficiency of working capital management, and in particular on the association between merger and the efficiency of working capital management. The findings may be useful for financial managers, investors, financial management consultants, and other stakeholders.

Keywords: Merger, Working Capital Management, Corporate Governance, United States of America

1. INTRODUCTION

Studies show that merger and acquisitions are an efficient way for corporations pursuing a growth strategy to obtain external financial resources and to expand their operational domain (for example, Bradley et al., 1988). Analysts estimated that at least 30% of the world's top organizations were considering mergers and acquisitions (Bailey, 2001; Lin and Wei, 2006). According to Sagner (2007), the perceived opportunities to improve working capital management are among the most important goals of mergers by better utilization of current assets and current liabilities. This study relied on the research question, "Does merger improve the efficiency of working capital management of American production firms"?

Stock-for-stock merger between two companies usually leads to changes in the membership of the board, which may have an impact on board decisions. Because the board members make important decisions, merger can improve the effectiveness of board decisions. Hence, optimization of working capital balances, in turn, helps minimize working capital requirements (Gill and Biger, 2013). The optimization of working capital balances increases firms' free cash flow (Ganesan, 2007) and consequently, positively affect shareholders' wealth. The components of working capital include receivables, inventory, payables, and using cash efficiently for day-to-day operations (Gill and Biger, 2013).

Among the components of working capital, cash is one of the most vulnerable to wanton behavior by management (Isshaq et al., 2009). In the spirit of Keynesian postulations of the demand for money, firms hold cash for precautionary, speculative, and transactional motives. Transaction motive refers to holding cash for everyday transactions to pay for goods or services. Precautionary motive refers to cash held for safety

reasons to protect the firm from for unforeseen fluctuations. The speculation motive reflects firms' desire to hold a cash balance in order to take advantages of any bargain purchases that may arise (Besley and Brigham, 2005; Gill and Biger, 2013, p. 117). Kim et al. (2011) described that both precautionary and transaction motives play important roles in explaining the determinants of cash holdings. Ferreira and Vilela (2004) asserted that cash holding reduces financial distress, allows the pursuance of investment policy when financial constraints are met, and minimizes the costs of raising external funds or liquidating existing assets (Ferreira and Vilela, 2004). The pecking order theory of Myers (1984) suggested that when it comes to financing investments firms prefer to first refer retained earnings or internal equity (i.e., cash available), then to safe debt and risky debt, and finally to external equity in order to minimize asymmetric information costs and other financing costs.

Managerial changes following mergers can improve the effectiveness of the new firm in its management of accounts receivables, inventory, and accounts payables. This, in turn, can improve the cash conversion cycle and cash conversion efficiency. In addition, merger can improve cash management and corporate liquidity (Sagner, 2007). In light of these considerations, the purpose of this study is to document empirically the impact of mergers on the efficiency of working capital management.

Several researchers have developed new theory in the area of working capital management by using Nadiri's (1969)[15] model about optimal level of cash balances. Because a very few studies have investigated the impact of mergers on working capital management efficiency, this study focused on the relationship between merger and working capital management efficiency. This study contributes to the literature on the factors that improve the efficiency of working capital management, and in particular on the association between merger and the efficiency of working capital management. The findings of this study indicate that mergers may contribute to an improvement of the efficiency of working capital management.

The organization of the remainder of the paper is as follows. Section two reviews the previous literature and develops hypothesis. Section three describes the data and methodology used to test hypothesis. Section four analyzes and discusses the empirical results. Section five concludes and considers implications of the findings.

2. LITERATURE REVIEW

According to Sagner (2007), one goal of merger is to improve the efficiency of working capital management and improve the utilization of current assets and liabilities. Many companies hoard cash hoping to discover or develop capital projects with superior returns, while those opportunities may never appear. Merger plays an important role in the improvement of the efficiency of working capital management because of new the mixture of board members which may include directors from different companies and countries. Such boards and top management teams can make sound working capital management decisions. Indeed studies have found that foreign directors play an important advisory role in making sound strategic decisions (Masulis, Wang, and Xie, 2012). Mooney and Shim (2015) found that conglomerate mergers improve corporate liquidity.

Usually the board size increases with merger. In addition, mergers may recruit experienced board members from different industries and countries. They can play a stewardship role[16] to minimize an agency problem[17] in the merged firms and consequently improve the efficiency of working capital management. The new leadership may make sound working capital management decisions; improve the cash conversion cycle, cash conversion efficiency, and liquidity of the merged firm. Gill and Biger (2013) also found that strong corporate governance play a role in enhancing working capital management efficiency. Fama and Jensen (1983) also argue that concentration of decision management and decision control in one individual hinders boards' effectiveness in monitoring top management.

Previous studies have also found that strong corporate governance plays an important role in controlling the management of working capital by formulating sound policies. For example, board size helps in maintaining an appropriate level of working capital in the organization (Gill and Shah, 2012). Merger may also lead to a higher number of independent directors who can be helpful in monitoring and controlling insiders to reduce agency problems. Arosa, Iturralde, and Maseda (2010) suggested that under agency theory, independent directors monitor and control insiders, and under stewardship theory, independent directors provide valuable outside advice and counsel to the firm.

Lau and Block (2012) found that founder firms hold a significantly higher level of cash than other firms do. In addition, they found a positive interaction effect between founder management and cash holdings on firm value, suggesting the presence of founders as managers helps to mitigate the agency costs of cash holdings. The findings of Saddour (2006) on French firms suggested that growth companies hold higher cash levels than mature companies. The company growth level tends to rise with merger and acquisition. Valipour et al. (2012) analyzed a sample of 83 Iranian firms listed on the Tehran Stock Exchange for the period of 2001-2010 and found a negative relationship between sales growth and cash conversion cycle. Gill and Biger (2013) also found a positive relationship between firm size and accounts payables; firm size and cash management; firm performance and cash management; firm performance and current ratio; firm performance and cash conversion efficiency; and a negative relationship between firm size and current ratio in the American production industry. Drobetz and Gruninger (2007) found a positive relationship between CEO duality and corporate cash

[15] Nadiri (1969) is believed to be first author who pioneered a study on working capital management.

[16] Steward theory was developed by Donaldson and Davis (1991).

[17] Agency theory was pioneered by Jensen and Meckling (1976).

holdings. If cash is sitting idle on account, it will not earn anything and will not maximize shareholders' wealth; therefore, an optimal cash balance is required. According to Harford (1999), managers can increase firm value by managing their cash balances.

In summary, a very limited availability of literature suggests that merger improves the efficiency of working capital management. Hence, the following hypothesis:

Hypothesis: *The improvement in working capital management efficiency is associated with merger.*

3. METHODS

The study applied co-relational and non-experimental research design. This process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships.

As there is no single measure that fully expresses the efficiency of working capital eight different component measures of working capital similar to those used by Gill and Biger (2013) and by Bhandari and Iyer (2013) are used. These eight dependent variables are: accounts payable, inventory, accounts receivable, cash conversion cycle, cash conversion efficiency, current ratio (Gill and Biger, 2013), cash ratio, and quick ratio (Bhandari and Iyer, 2013). We also used measures related to CEO duality, CEO tenure, board size, audit committee, firm size, net profit margin, and return on sales that were used by Gill and Biger (2013).

3.1. Empirical model and the measurements of variables

Merger (*MRGR*) impacts the components of working capital management -- accounts payables (*AP*), inventory (*INV*), accounts receivables (*AR*), cash conversion cycle (*CCC*), cash conversion cycle (*CCE*), current ratio (*CR*), cash ratio (*CASH*), and quick ratio (*QR*) because two or more companies combine assets, liabilities, and sales. Because the impact of decisions related to the working capital management made by the merged firms and put all the assets together take some time, regression equation predicts the impact of current year merger on the following year working capital management efficiency (*WCME*).

The merger is the main explanatory variable in the components of *WCME* regression. CEO duality (*CD*), CEO tenure (*CT*), board size (*BS*), audit committee (*AC*), firm size (*FS*), net profit margin (*NPM*), and return on sales (*ROS*) are used as control variables because these have an impact on the working capital management efficiency. For example, higher return on sales will cause a cushion in the inventory so that sales are not lost and production continues. The regressions are described in Equation 1:

$$WCME_{i,t} = \alpha_0 + \alpha_1 MRGR_{i,t} + \sum X_{ij} + \varepsilon_{i,t} \quad (1)$$

In the model, *WCME* refers to different indicators of working capital management efficiency -- *AP, INV, AR, CCC, CCE, CR, CASH,* and *QR*; *i* refers to an individual manufacturing firm; and $X_{i,t}$ represents individual control variables (j) corresponding to manufacturing firm *i* during time period t. $\varepsilon_{i,t}$ is a normally distributed disturbance term. In the estimated model, α_1 measure the magnitude at which merger affects *WCME*. The model is extended by considering different set of control variables one at a time. Controls include *CD, TN, BS, AC, FS, NPM,* and *ROS*.

The measurements of the independent (merger), dependent (*AP, INV, AR, CCC, CCE, CR, CASH,* and *QR)*, and control variables (CEO duality, CEO tenure, board size, audit committee, firm size, net profit margin, and return on sales) are as follows:

Merger: Merger ($MRGR_{i,t}$) is a dummy variable with assigned value of 1 if a company merged in a certain year, 0 otherwise.

CEO Duality: CEO duality ($CD_{i,t}$) is a dummy variable with assigned value of 1 if same person occupied the post of the chairperson and the CEO and 0 for otherwise.

CEO Tenure: CEO tenure ($TN_{i,t}$) is measured as number of years serving as a CEO. Natural logarithm of CEO tenure was calculated.

Board Size: Board size ($BS_{i,t}$) is measured as number of directors serving on board. Natural logarithm of board size was calculated.

Audit Committee: Audit committee ($AC_{i,t}$) is measured as number of audit committee members. Natural logarithm of number of audit committee members was calculated.

Firm Size: Firm size ($FS_{i,t}$) is measured as logarithm of total assets in the year following the merger.

Net Profit Margin: Net profit margin ($NPM_{i,t}$) is measured as net income after tax/revenue in the year following the merger.

Return on Sales: Return on sales ($ROS_{i,t}$) is measured as net income before tax/total sales in the year following the merger.

Accounts Payables: Accounts payables (in days) ($AP_{i,t}$) is measured as (Accounts payables/cost of goods sold) x 365 days in the year following the merger.

Inventory: Inventory holding (in days) ($INV_{i,t}$) is measured as (Inventory/cost of goods sold) x 365 days in the year following the merger.

Accounts Receivables: Accounts receivables (in days) ($AR_{i,t}$) is measured as (Accounts receivables/sales) x 365 days in the year following the merger.

Cash Conversion Cycle: Cash conversion cycle (in days) ($CCC_{i,t}$) is measured as number of days *AR* + number of days inventory – number of days *AP* in the year following the merger.

Cash Conversion Efficiency: Cash conversion efficiency ($CCE_{i,t}$) is measured as cash flow from operations/sales in the year following the merger.

Current Ratio: Current ratio ($CR_{i,t}$) is measured as current assets/current liabilities in the year following the merger.

Cash Ratio: Cash ratio ($CASH_{i,t}$) is measured as total cash holdings/current liabilities in the year following the merger.

Quick Ratio: Quick ratio ($QR_{i,t}$) is measured as (current assets – inventory)/current liabilities in the year following the merger.

3.2. Data collection

A database was built from a selection of approximately 1,100 annual financial reports of publicly traded companies between January 1, 2011 and December 31, 2014. The selection was drawn from COMPUSTAT to collect a sample of manufacturing firms. Out of approximately 1,100 financial reports of public companies between January 1, 2011 and December 31, 2014, only 497 financial reports were usable. Cross sectional yearly data was used in this study. Thus, 497 financial reports resulted in 1988 total observations. Data related to CEO tenure, CEO duality, board size, and audit committee was collected from Mergent Online (www.mergentonline.com/compsearch.asp). The sample included manufacturing firms that manufactured and processed products for the following sectors:

- mining (42 firms);
- food processing (71 firms);
- textile mills (6 firms);
- clothes and shoes production (19 firms); and
- manufacturing (359 firms).

Of all companies in our sample, 23 percent are companies that were merged and 77 percent were not.

4. ANALYSIS AND DISCUSSION

4.1. Descriptive statistics

Table 1 shows a series of descriptive statistics. The explanation on descriptive statistics is as follows:

- Total observations = 497 x 4 = 1,988;

Working Capital components:

- *AP* = 3.83 (62.54 days);
- *INV* = 4.28 (107.08 days);
- *AR* = 3.82 (57.15 days);
- *CCC* = 4.12 (101.58 days);
- *CCE* = 0.13;
- *CR* = 2.63;
- *CASH* = 0.87;
- *QR* = 1.92;

Explanatory variables:

- *MRGR* = 0.23;
- *CD* = 0.38;
- *TN* = 0.95;
- *BS* = 0.94;
- *AC* = 0.35;
- *FS* = 7.39;
- *NPM* = 0.10; and
- *ROS* = 0.05.

Table 1. Descriptive statistics

	Mean	*Standard Deviation*	*Minimum*	*Median*	*Maximum*
AP	3.83	0.74	0.00	3.81	7.80
INV	4.28	1.01	0.00	4.36	7.03
AR	3.82	0.75	0.00	3.90	6.29
CCC	4.12	1.36	0.00	4.42	6.86
CCE	0.13	0.15	-0.96	0.10	0.99
CR	2.63	1.87	0.00	2.13	17.79
CASH	0.87	1.33	0.00	0.49	18.68
QR	1.92	1.65	0.00	1.45	16.31
MRGR	0.23	0.42	0	0	1
CD	0.38	0.48	0	0	1
TN	0.95	0.40	0.00	1	1.74
BS	0.94	0.15	0.48	0.95	1.30
AC	0.35	0.28	0.00	0.48	0.95
FS	7.39	2.31	1.58	7.46	12.92
NPM	0.10	0.19	-2.46	0.10	0.77
ROS	0.05	0.16	-0.87	0.05	0.75

Notes: Variables include accounts payables (AP), inventory (INV), accounts receivables (AR), cash conversion cycle (CCC), cash conversion efficiency (CCE), current ratio (CR), cash ratio (CASH), quick ratio (QR), merger (MRGR), CEO duality (CD), CEO tenure (TN), board size (BS), audit committee (AC), firm size (FS), net profit margin (NPM), and return on sales (ROS).

4.2. Pearson correlation analysis

Table 2 presents the Pearson correlation matrix. Focusing on the relationships between mergers in the previous year the working capital management indicators we found positive and significant correlation with *AP* (days accounts payable), *INV* (days inventory holding), *CCC* (cash conversion cycle) and *CCE* (cash conversion efficiency. No bivariate significant correlation was found between mergers in the previous year and quick ratio (*QR*), cash as a percentage of current liabilities (*CASH*), current ratio (*CR*), and days of accounts receivable (AR) in the year following the mergers.

The univariate results also show that:

- *AP* is significantly positively correlated with *MRGR, BS, FS, NPM,* and *ROS* ($\rho_{MRGR, AP}$ = 0.069; $\rho_{BS, AP}$ = 0.125; $\rho_{FS, AP}$ = 0.112; $\rho_{NPM, AP}$ = 0.100; and $\rho_{ROS, AP}$ = 0.058, all significant at the one percent level), and significantly negatively correlated with *TN* ($\rho_{TN, AP}$ = 0.057, significant at the five percent level). Thus, merger, firm size, net profit margin, and return on sales increase accounts payables days and CEO tenure decreases accounts payable days in the American production firms;
- *INV* is significantly positively correlated with *MRGR, TN, BS, AC, NPM,* and *ROS* ($\rho_{MRGR, INV}$ = 0.080; $\rho_{TN, INV}$ = 0.059; $\rho_{BS, INV}$ = 0.090; $\rho_{AC, INV}$ = 0.077; $\rho_{NPM, INV}$ = 0.075; and $\rho_{ROS, INV}$ = 0.058, all significant at the one percent level), indicating that merger, CEO tenure, board size, audit committee, net profit margin, and return on sales increase inventory holding days in the American production firms;
- *AR* is significantly negatively correlated with *TN, FS,* and *NPM* ($\rho_{TN, AR}$ = -0.051; $\rho_{FS, AR}$ = -0.061; and $\rho_{NPM, AR}$ = -0.066, all significant at the one percent level), suggesting that CEO tenure, firm size, and net

profit margin decrease accounts receivables days in the American production firms;

- *CCC* is significantly positively correlated with *MRGR* and *CD* ($\rho_{MRGR, CCC}$ = 0.049; $\rho_{MRGR, CCC}$ = 0.055, both significant at the five percent level), and significantly negatively correlated with *FS* ($\rho_{FS, CCC}$ = -0.107, significant at the one percent level), implying that merger and CEO duality increase cash conversion cycle days, and firm size decreases cash conversion cycle days in the American production firms;
- *CCE* is significantly positively correlated with *MRGR, TN, BS, FS, NPM*, and *ROS* ($\rho_{MRGR, CCE}$ = 0.097; $\rho_{TN, CCE}$ = 0.068; $\rho_{BS, CCE}$ = 0.121; $\rho_{FS, CCE}$ = 0.321, $\rho_{NPM, CCE}$ = 0.593, and $\rho_{ROS, CCE}$ = 0.503, all significant at the one percent level), suggesting that merger, CEO tenure, board size, firm size, net profit margin, and return on sales increase cash conversion efficiency of the American production firms.
- *CR* is significantly positively correlated with *TN, AC, NPM,* and *ROS* ($\rho_{TN, CR}$ = 0.103; $\rho_{AC, CR}$ = 0.051; $\rho_{NPM, CR}$ = 0.073; and $\rho_{ROS, CR}$ = 0.094, all significant at the one percent level), and significantly negatively correlated with *BS* and *FS* ($\rho_{BS, CR}$ = -0.158 and $\rho_{FS, CR}$ = -0.377, both significant at the one percent level). Hence CEO tenure, audit committee, net profit margin, and return on sales increase current ratio, and board size and firm size decrease current ratio in the American production firms;
- *CASH* is significantly positively correlated with *NPM* and *ROS* ($\rho_{NPM, CASH}$ = 0.102; and $\rho_{ROS, CASH}$ = 0.129, both significant at the one percent level), and significantly negatively correlated with *BS* and *FS* ($\rho_{BS, CASH}$ = -0.138 and $\rho_{FS, CASH}$ = -0.263, both significant at the one percent level). It follows that net profit margin and return on sales increase cash ratio, and board size and firm size decrease cash ratio in the American production firms; and
- *QR* is significantly positively correlated with *TN, NPM,* and *ROS* ($\rho_{TN, CASH}$ = 0.066; $\rho_{NPM, CASH}$ = 0.109; and $\rho_{ROS, CASH}$ = 0.121, all significant at the one percent level), and significantly negatively correlated with *BS* and *FS* ($\rho_{FS, CASH}$ = -0.138; and $\rho_{FS, CASH}$ = -0.325, both significant at the one percent level), suggesting that net profit margin and return on sales increase quick ratio, and board size and firm size decrease quick ratio in the American production firms.

Table 2. Correlation coefficient

	AP	*INV*	*AR*	*CCC*	*CCE*	*CR*	*CASH*	*QR*	*MRGR*
AP	1								
INV	0.362***	1							
AR	0.356***	0.248***	1						
CCC	-0.131***	0.628***	0.398***	1					
CCE	0.073***	-0.057**	-0.172***	-0.148***	1				
CR	-0.125***	0.247***	0.071***	0.281***	0.022	1			
CASH	-0.043	0.052**	-0.008	0.092***	0.104***	0.583***	1		
QR	-0.053**	0.132***	0.100***	0.168***	0.074***	0.943***	0.619***	1	
MRGR	0.069***	0.080***	0.033	0.049**	0.097***	-0.009	-0.003	-0.005	1
CD	-0.027	-0.014	0.029	0.055**	-0.020	-0.007	-0.039	-0.028	0.030
TN	-0.057**	0.059***	-0.051***	0.021	0.068***	0.103***	0.031	0.066***	0.015
BS	0.125***	0.090***	0.024	0-.009	0.121***	-0.158***	-0.136***	-0.138***	0.141***
AC	-0.034	0.077***	-0.021	0.052**	-0.008	0.051***	-0.003	0.023	0.057**
FS	0.112***	-0.013	-0.061***	-0.107***	0.321***	-0.377***	-0.263***	-0.325***	0.180***
NPM	0.100***	0.075***	-0.066***	0.011	0.593***	0.073***	0.102***	0.109***	0.056**
ROS	0.058***	0.058***	-0.041	0.027	0.503***	0.094***	0.129***	0.121***	0.031
	CD	*TN*	*BS*	*AC*	*FS*	*NPM*	*ROS*		
CD	1								
TN	0.221***	1							
BS	-0.056**	0.110***	1						
AC	0.122***	0.215***	0.221***	1					
FS	0.034	-0.012	0.478***	0.105***	1				
NPM	0.012	0.095***	0.117***	0.071***	0.269***	1			
ROS	-0.002	0.111***	0.098***	0.090***	0.206***	0.732***	1		

*Notes: * = 10%, ** = 5%, and *** = 1%; Variables include accounts payables (AP), inventory (INV), accounts receivables (AR), cash conversion cycle (CCC), cash conversion efficiency (CCE), current ratio (CR), cash ratio (CASH), quick ratio (QR), merger (MRGR), CEO duality (CD), CEO tenure (TN), board size (BS), audit committee (AC), firm size (FS), net profit margin (NPM), and return on sales (ROS).*

4.3. Regression results and discussion

Next we applied multiple regression analysis. To overcome potential of heteroskedasticity (changing variation after short period of time) (Raheman and Nasr, 2007) because we used panel data, general least square regression with cross section weights was used. The common intercept was also calculated for all variables and assigned a weight.

There was possibility of endogeneity issues. The issues of endogeneity also take place if certain variables are omitted and there are measurement errors (Gill and Biger, 2013). To minimize endogeneity issues, the most important variables that impact the working capital management efficiency were used and the measurements were based on previous empirical studies. For example, sales variable was changed to return on sales because of the high Variance Inflation Factor (VIF) between firm size and sales (VIF>10).

As the sample of companies only included companies that "survived" during the study period, there might have been a survival bias in the study. This bias problem is considered a minor issue as the purpose of the study was to focus on the effects of merger on the efficiency of the management of working capital by firms.

Tables 3 through 6 report the estimated coefficients of Equation 1. For each working capital component three versions of the model are presented. Version I only regresses the dependent variable against the dummy variable *MRGR* in order to find out whether merger explains any of the working capital components. Versions II and III included the control valuables as additional explanatory variables. Since we found the two control variables *ROS* (Returns on sales) and *NPM* (net profit margin) to highly correlated, the variable *NPM* was omitted from the regression. Version III included all explanatory variables.

In the regression analysis, findings show that *MRGR* (main explanatory variable) positively affects all the working capital measures *AP, INV, AR, CCC, CCE, CR, CASH,* and *QR*.

Tables 3 reports the relationships among *MRGR, CD, TN, BS, AC, FS,* and *ROS* on account payable (*AP*) and on Inventory (*INV*). As shown in model specification I of *AP*, the coefficient of *MRGR* is 0.129, significant at the five percent level, implying that merger positively impacts accounts payable days. In model specification II where the two control variables are also included, the coefficient of *MRGR* is 0.098, significant at the five percent level; and the coefficient of *FS* is 0.031, significant at the one percent level, indicating that merger and firm size positively impact accounts payable days. In model III where all the control variables are included, the coefficient of *MRGR* is 0.091, significant at the five percent level; the coefficient of *TN* is -0.120 and the coefficient of *FS* is 0.017, both significant at the five percent level; and the coefficient of *BS* is 0.482, significant at the one percent level, suggesting that merger, firm size, and board size positively, and CEO tenure negatively impact accounts payable days.

Similarly, in model specification I of *INV*, the coefficient of *MRGR* is 0.218, significant at the one percent level, indicating that merger positively affects inventory holdings. In model specification II where two control variables are included, the coefficient of *MRGR* is 0.234 and the coefficient of *ROS* is 0.589, both significant at the one percent level; and the coefficient of *FS* is 0.026, significant at the five percent level, suggesting that mergers, firm size, and return on sales positively impact inventory holdings. In model specification III where all the control variables are included, the coefficient of *MRGR* is 0.213, the coefficient of *BS* is 0.862, the coefficient of *FS* is -0.052, and the coefficient of *ROS* is 0.526, all significant at the one percent level, implying that merger, board size, and return on sales positively, and firm size negatively impact inventory holdings.

Tables 4 reports the relationships among *MRGR, CD, TN, BS, AC, FS,* and *ROS* on account receivables *(AR)* and on cash conversion cycle *(CCC)*. As shown in model specification II of *AR*, the coefficient of *MRGR* is 0.070, significant at the ten percent level; and the coefficient of *FS* is -0.015, significant at the five percent level, implying that merger positively and firm size negatively impact accounts receivable days. In model III where all the control variables are included, the coefficient of *MRGR* is 0.066, significant at the ten percent level; the coefficient of *TN* is -0.127, the coefficient of *BS* is 0.343, and the coefficient of *FS* is -0.026, all significant at the five percent level, suggesting that merger and board size positively, and CEO tenure and firm size negatively impact accounts receivable days.

Table 3. Merger, accounts payables, and inventory[18]
Dependent variables = AP and *INV*

	AP			***INV***		
Variables	*I*	*II*	*III*	*I*	*II*	*III*
MRGR	0.129**	0.098**	0.091**	0.218***	0.234***	0.213***
	(3.38)	(2.55)	(2.37)	(4.02)	(4.27)	(3.90)
CD	-	-	-0.001	-	-	-0.057
	-	-	(-0.02)	-	-	(-1.18)
TN	-	-	-0.120**	-	-	0.068
	-	-	(-2.89)	-	-	(1.15)
BS	-	-	0.482***	-	-	0.862***
	-	-	(3.87)	-	-	(4.69)
AC	-	-	-0.064	-	-	0.131
	-	-	(-1.06)	-	-	(1.54)
FS	-	0.031***	0.017**	-	0.026**	-0.052***
	-	(4.42)	(2.16)	-	(2.59)	(-4.56)
ROS	-	0.005	-0.050	-	0.589***	0.526***
	-	(0.04)	(-0.44)	-	(3.63)	(3.23)
Constant	3.833***	3.610***	3.397***	4.242***	4.398***	3.698***
	(207.19)	(68.61)	(32.12)	(161.14)	(58.68)	(24.63)
N	497	497	497	497	497	497
F-test statistic	11.40**	10.78***	7.96***	16.14	10.85***	9.85***
R^2	0.006	0.015	0.027	0.008	0.016	0.034
Adjusted R^2	0.005	0.015	0.024	0.008	0.015	0.030

*Notes: * = 10%, ** = 5%, and *** = 1%; Dependent variables includes include accounts payables (AP) and inventory (INV). Independent variables include merger (MRGR), CEO duality (CD), CEO tenure (TN), board size (BS), audit committee (AC), firm size (FS), and return on sales (ROS).*

(18) The lowest tolerance is 0.717 and the highest VIF is 1.394 indicating that multicollinearity is not a serious issue. Sales variable was changed to return on sales (ROS) because of the high Variance Inflation Factor (VIF) between firm size and sales (VIF>10).

Similarly, in model specification I of *CCC*, the coefficient of *MRGR* is 0.169, significant at the five percent level, indicating that merger positively affects cash conversion cycle of the American production firms. In model specification II where two control variables are included, the coefficient of *MRGR* is 0.234, significant at the five percent level; and the coefficient of *FS* is -0.079 and the coefficient of ROS is 0.753, both significant at the one percent level, suggesting that mergers and return on sales positively, and firm size negatively impact cash conversion cycle of the American production firms. In model specification III where all the control variables are included, the coefficient of *MRGR* is 0.218, the coefficient of *BS* is 0.662, and the coefficient of *ROS* is 0.764, all significant at the five percent level; the coefficient of *CD* is 0.118, significant at the ten percent level; and the coefficient of *FS* is -0.100, significant at the one percent level, implying that merger, board size, return on sales, and CEO duality positively, and firm size negatively impact cash conversion cycle of the American production firms.

Tables 5 reports the relationships among *MRGR, CD, TN, BS, AC, FS,* and *ROS* on cash conversion efficiency *(CCE)* and on current ratio *(CR)*. As shown in model specification I of *CCE*, the coefficient of *MRGR* is 0.063, significant at the one percent level, implying that merger positively impacts cash conversion efficiency of American production firms. In model specification II where the two control variables are also included, the coefficient of *MRGR* is 0.016, significant at the five percent level; and the coefficient of *FS* is 0.012 and the coefficient of *ROS* is 0.554, both significant at the one percent level, indicating that merger, firm size, and return on sales positively impact cash conversion efficiency of American production firms. In model specification III where all the control variables are included, the coefficient of *MRGR* is 0.017, the coefficient of *BS* is -0.047, and the coefficient of *AC* is -0.021, all significant at the five percent level; and the coefficient of *FS* is 0.013 and the coefficient of *ROS* is 0.555, both significant at the one percent level, suggesting that merger, firm size, and return on sales positively, and board size and audit committee negatively impact cash conversion efficiency of American production firms.

Similarly, in model specification II of *CR* where two control variables are included, the coefficient of *MRGR* is 0.265, significant at the five percent level; and the coefficient of *FS* is -0.366 and the coefficient of *ROS* is 2.807, both significant at the one percent level, suggesting that mergers and return on sales positively, and firm size negatively impact current ratio of American production firms. In model specification III where all the control variables are included, the coefficient of *MRGR* is 0.251; the coefficient of *TN* is 0.302, and the coefficient of AC is 0.458, all significant at the five percent level; and the coefficient of *FS* is -0.370 and the coefficient of *ROS* is 2.619, both significant at the one percent level, implying that merger, CEO tenure, audit committee, and return on sales positively, and firm size negatively impact current ratio of American production firms.

Tables 6 reports the relationships among *MRGR, CD, TN, BS, AC, FS,* and *ROS* on cash ratio *(CASH)* and on quick ratio *(QR)*. As shown in model specification II of *CASH* where the two control variables are included, the coefficient of *MRGR* is 0.170, significant at the five percent level; and the coefficient of *FS* is -0.197 and the coefficient of *ROS* is 2.042, both significant at the one percent level, indicating that merger and return on sales positively, and firm size negatively impact cash ratio of American production firms. In model III where all the control variables are included, the coefficient of *MRGR* is 0.172, significant at the one percent level; and the coefficient of *FS* is -0.192 and the coefficient of *ROS* is 2.006, both significant at the one percent level, suggesting that merger and return on sales positively, and firm size negatively impact cash ratio of American production firms.

Similarly, in model specification II of *QR* where two control variables are included, the coefficient of *MRGR* is 0.216, significant at the five percent level; and the coefficient of *FS* is -0.285 and the coefficient of *ROS* is 2.560, both significant at the one percent level, suggesting that mergers and return on sales positively, and firm size negatively impact quick ratio of American production firms. In model specification III where all the control variables are included, the coefficient of *MRGR* is 0.207 and the coefficient of *TN* is 0.282, both significant at the five percent level; and the coefficient of *FS* is -0.291 and the coefficient of *ROS* is 0.976, both significant at the one percent level, implying that merger, CEO tenure, and return on sales positively, and firm size negatively impact quick ratio of American production firms.

In summary, merger in the previous year positively affects the following year's accounts payable days, inventory holding days, accounts receivable days, cash conversion cycle days, cash conversion efficiency, current ratio, cash ratio, and quick ratio. The positive impact of merger on accounts payables days, inventory holding days, and accounts receivable days may be due to the increase in operations leading to increase in sales which requires inventory cushion and leads to increase in accounts receivables and accounts payables days. In addition, the increase in accounts receivable days and accounts payable days may be because of the integration issues of collection system and accounts payable days system. The increase in sales also causes higher levels of accounts payables, higher levels of inventory, and accounts receivables.

Merger in the previous year also improves next year's cash conversion efficiency, current ratio, cash ratio, and quick ratio which improves the liquidity in the firms to make liability payments and consequently reduces chances of bankruptcy. Thus, merger plays some role in the improvement of working capital management efficiency. The findings of this study lend some support to the argument of Sagner (2007) in that merger improves cash conversion efficiency, current ratio, cash ratio, and quick ratio. The findings of this study also lend some support to the findings of Mooney and Shim (2015) who found that conglomerate mergers improves corporate liquidity.

Table 4. Merger, accounts receivables, and cash conversion cycle[19]
Dependent variables = AR and *CCC*

	AR			***CCC***		
Variables	*I*	*II*	*III*	*I*	*II*	*III*
MRGR	0.054	0.070*	0.066*	0.169**	0.234**	0.218**
	(1.45)	(1.87)	(1.75)	(2.38)	(3.28)	(3.06)
CD	-	-	0.029	-	-	0.118*
	-	-	(0.86)	-	-	(1.87)
TN	-	-	-0.127**	-	-	-0.028
	-	-	(-3.13)	-	-	(-0.37)
BS	-	-	0.343**	-	-	0.662**
	-	-	(2.82)	-	-	(2.86)
AC	-	-	-0.072	-	-	-0.012
	-	-	(-1.23)	-	-	(-0.11)
FS	-	-0.015**	-0.026**	-	-0.079***	-0.100***
	-	(-2.37)	(-3.33)	-	(-6.02)	(-6.73)
ROS	-	-0.104	-0.051	-	0.753***	0.764**
	-	(-0.94)	(-0.45)	-	(3.57)	(3.59)
Constant	3.891***	4.006***	3.892***	4.138***	4.661***	4.179***
	(216.61)	(78.14)	(37.72)	(120.27)	(47.87)	(21.29)
N	497	497	497	497	497	497
F-test statistic	2.09	3.13**	3.88***	5.68**	15.62***	8.28***
R^2	0.001	0.005	0.014	0.003	0.023	0.028
Adjusted R^2	0.001	0.003	0.010	0.002	0.022	0.025

*Notes: * = 10%, ** = 5%, and *** = 1%; Dependent variables includes include accounts receivables (AR) and cash conversion cycle (CCC). Independent variables include merger (MRGR), CEO duality (CD), CEO tenure (TN), board size (BS), audit committee (AC), firm size (FS), and return on sales (ROS).*

Table 5. Merger, cash conversion efficiency, and current ratio[20]
Dependent variables = CCE and *CR*

	CCE			***CR***		
Variables	*I*	*II*	*III*	*I*	*II*	*III*
MRGR	0.063***	0.016**	0.017**	-0.044	0.265**	0.251**
	(4.53)	(2.53)	(2.73)	(-0.43)	(2.82)	(2.67)
CD	-	-	0.002	-	-	-0.085
	-	-	(0.38)	-	-	(-1.02)
TN	-	-	0.011	-	-	0.302**
	-	-	(1.56)	-	-	(2.97)
BS	-	-	-0.047**	-	-	0.086
	-	-	(-2.29)	-	-	(0.28)
AC	-	-	-0.021**	-	-	0.458**
	-	-	(-2.08)	-	-	(3.13)
FS	-	0.012***	0.013***	-	-0.366***	-0.370***
	-	(10.06)	(10.18)	-	(-21.07)	(-18.99)
ROS	-	0.554***	0.555***	-	2.807***	2.619***
	-	(29.41)	(29.19)	-	(10.10)	(9.37)
Constant	0.108***	-0.004	0.025	2.695***	5.143***	4.698***
	(28.03)	(-0.41)	(1.40)	(53.97)	(40.07)	(18.22)
N	497	497	497	497	497	497
F-test statistic	20.51***	402.33***	174.99***	0.18	157.16***	71.54***
R^2	0.010	0.378	0.382	0.000	0.192	0.202
Adjusted R^2	0.010	0.377	0.380	0.000	0.191	0.199

*Notes: * = 10%, ** = 5%, and *** = 1%; Dependent variables include cash conversion efficiency (CCE) and current ratio (CR). Independent variables include merger (MRGR), CEO duality (CD), CEO tenure (TN), board size (BS), audit committee (AC), firm size (FS), and return on sales (ROS).*

[19] The lowest tolerance is 0.717 and the highest VIF is 1.394 indicating that multicollinearity is not a serious issue. Sales variable was changed to return on sales (ROS) because of the high Variance Inflation Factor (VIF) between firm size and sales (VIF>10).

[20] The lowest tolerance is 0.717 and the highest VIF is 1.394 indicating that multicollinearity is not a serious issue. Sales variable was changed to return on sales (ROS) because of the high Variance Inflation Factor (VIF) between firm size and sales (VIF>10).

Table 6. Merger, cash ratio and quick ratio

(The lowest tolerance is 0.717 and the highest VIF is 1.394 indicating that multicollinearity is not a serious issue. Sales variable was changed to return on sales (ROS) because of the high Variance Inflation Factor (VIF) between firm size and sales (VIF>10))

Dependent variables = CASH and *QR*

	CASH			***QR***		
Variables	*I*	*II*	*III*	*I*	*II*	*III*
MRGR	0.012	0.170**	0.172**	-0.020	0.216**	0.207**
	(0.16)	(2.44)	(2.46)	(-0.22)	(2.56)	(2.44)
CD	-	-	-0.076	-	-	-0.120
	-	-	(-1.23)	-	-	(-1.60)
TN	-	-	0.030	-	-	0.149
	-	-	(0.39)	-	-	(1.62)
BS	-	-	-0.190	-	-	0.162
	-	-	(-0.84)	-	-	(0.59)
AC	-	-	0.142	-	-	0.282**
	-	-	(1.30)	-	-	(2.13)
FS	-	-0.197***	-0.192***	-	-0.285***	-0.291***
	-	(-15.29)	(-13.19)	-	(-18.27)	(-16.52)
ROS	-	2.042***	2.006***	-	2.560***	0.976***
	-	(9.90)	(9.62)	-	(10.23)	(2.54)
Constant	0.893***	2.185***	2.280***	1.992***	3.884***	2.450***
	(25.13)	(22.94)	(11.85)	(45.26)	(33.62)	(9.71)
N	497	497	497	497	497	497
F-test statistic	0.03	91.75***	39.78***	0.05	123.42***	54.73***
R^2	0.000	0.122	0.123	0.000	0.157	0.162
Adjusted R^2	0.000	0.121	0.120	0.000	0.156	0.159

*Notes: * = 10%, ** = 5%, and *** = 1%; Dependent variables include cash ratio (CASH) and quick ratio (QR). Independent variables include merger (MRGR), CEO duality (CD), CEO tenure (TN), board size (BS), audit committee (AC), firm size (FS), and return on sales (ROS).*

The CEO duality increases cash conversion cycle days. The CEO tenure increases current ratio and reduces accounts payable and accounts receivable days which may be considered in the favor of the firm. The board size has a positive impact on accounts payable, inventory holding, accounts receivable, and cash conversion cycle days, and a negative impact on the cash conversion efficiency which may not be in the favor of the firm; therefore, an optimal board size should be designed because a small board of directors is more effective in the decision-making process than a larger board of directors (Yermack, 1996; Lipton and Lorsch, 1992). Audit committee positively impacts current and quick ratios but negatively impacts cash conversion efficiency.

While firm size increases accounts payables and cash conversion efficiency, it decreases inventory holding days, accounts receivable days, cash conversion cycle days, current ratio, cash ratio, and quick ratio. The improvement in cash conversion efficiency and decrease in inventory holding days, accounts receivable days, cash conversion cycle days, current ratio, cash ratio, and quick ratio are in the favor of the firm because they improve the efficiency of the working capital management. The findings lend some support to the finding of Gill and Biger (2013) in that firm size increases accounts payables and decreases current ratio.

Return on sales positively affects inventory days, cash conversion cycle, cash conversion efficiency, current ratio, cash ratio, and quick ratio. The positive impact of return on sales on inventory days and cash conversion cycle days may be due to the increase in sales and merged firm tend to build inventory cushion. As described before, average inventory holding period for production firms is 107.08 days. Firms, however, do not prefer long cash conversion cycle and high inventory holdings because they negative impact on the firm.

One-Way ANNOVA was used to examine whether the efficiency of working capital management differs between industries and between years. The results show that the efficiency of working capital management (*AP, INV, AR, CCC, CCE, CR, CASH,* and *QR*) do differ from industry to industry but they are not different between years.

5. CONCLUSION

The present study found that merger plays some role in the improvement of the efficiency of working capital management of American production firms. The results of this study generally support the tradeoff theory of cash holdings. Precautionary and transaction motives play important roles in explaining the determinants of cash holdings for American firms (Gill and Biger, 2013).

One should note that this study is limited to the sample of American manufacturing firms. This is a co-relational study that investigated the association between merger and working capital management efficiency. There is not necessarily a causal relationship between the two. The findings of this study may only be generalized to firms similar to those that were included in this research.

In practice, there may be implementation challenges of the findings. For example, merger may improve cash conversion efficiency in one company, but not in another company. In similar manners, other findings may not be applicable to other companies.

Since merger has a positive impact on the accounts receivable days, accounts payable days, and inventory holding days, it is strongly recommended that the merged companies minimize issues related to integration of accounts payable, accounts receivable, and inventory systems by making sound working capital management decisions. For example, average accounts receivables for the sampled production firms are $1,603.91 million and the average delay in the merged firms is 4.40 days (β = 0.044). If a merged firm pays prime + 1% (e.g., 3.25 + 1 = 4.25%), merged company will have to pay $0.82173 million [{1,603.91 million x .0425) / 365 days} x 4.40 days = $0.82173 per year] additional interest per year. Similarly, average inventory for the sampled companies is $1,219.82 million and the average increase in inventory holding days in the merged firms is 9.60 days (β = 0.096). If a merged company pays prime + 1% (e.g., 3.25 + 1 = 4.25%), merged company will have pay $1.36352 million [{1,219.82 million x .0425) / 365 days} x 9.60 days = $1.36352 per year] additional interest per year. Likewise, average 5.70 days (β = 0.057) delay in the accounts payables is detrimental to the firm (unless merged firm has been granted an extension for accounts payable) because it will increase the costs of borrowings and might adversely affect the reputation of the firm. Suppliers will tend to charge penalty and interest for late payments. Thus the delays in accounts receivables and longer holding time periods of inventory have a negative impact on the cash conversion cycle. It follows that a strong accounts receivables control, inventory ordering management, and proper accounts payable systems are recommended in order to improve the efficiency of working capital management.

As described before, merger tend to increase board size which is not in the favor of the firm because it increases accounts payable, accounts receivable, and cash conversion cycle days and has a negative impact on the cash conversion efficiency; therefore, an optimal board size is strongly recommended.

Future research should investigate possible generalizations of the findings beyond the American firms. Important control variables such as industry sectors from different countries, board composition, etc., should also be used.

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