Wal-Mart's Dilemma In The 21st Century: Sales Growth Vs. Inventory Growth

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ABSTRACT

Wal-Mart has been a leader in the retail industry since 1980s. In the 21st century, Wal-Mart's RFID initiative is another innovation for Wal-Mart's supply chain management. Wal-Mart's recent business target in the 21Century is making a higher sales growth rate than inventory growth rate. Comparing with financial ratios of Wal-Mart's competitors, Wal-Mart has significantly better ratios for days-in-inventory, inventory-sales-ratio, and cash-conversion-cycle. However, there is no significant evidence of better ratios for supply chain related profit ratio. Regression analysis reveals that while days-in-inventory has a similar effect on both sales growth rate and inventory growth rate, supply chain ratio has more effect on inventory growth rate than sales growth rate.

Keywords: Wal-Mart; RFID; Supply Chain Innovation

1. INTRODUCTION

According to the McKinsey Global Institute's (MGI) first productivity report (2001), during the second half of the 1990s, a quarter of U.S. productivity growth is attributable to the retail industry and one sixth of retail productivity growth is attributable to Wal-Mart. Ten years later, the MGI's second productivity report (2011), during the 2000s, retail industry and semiconductors and electronics industry contribute 35% of U.S. productivity growth and Wal-Mart's portion of U.S. retail industry is one fourth. Since the start of the 21st century, Wal-Mart has always been ranked first or second in Fortune's top 500 lists. Wal-Mart is the number one retailer in the world and much of its success can be attributed to cost minimization strategies in supply chain management. As such, it is not surprising that Wal-Mart has been one of the top 25 rankers in Gartner's Top 25 Supply Chain list since 2008 when Gartner started to announce its supply chain ranking annually.

Wal-Mart has an excellent experience in its information technology and analysis of operations. Wal-Mart built its own satellite based network system in the 1980s (Johnson, 2006) and it had the world's largest private sector data warehousing system in the 1990s (Mark, 2012). In the 21st Century, Wal-Mart invested heavily in Radio Frequency Identification (RFID) technology. RFID is defined as a wireless Automatic Identification and Data Capture (AIDC) technology (Fosso Wamba, Lefebvre, Bendavid, & Lefebvre, 2008) and it is a good solution of tracking products. Combined with its database system for better inventory management, the RFID technology is the heart of supply chain management system (Hsieh, Prudilova, and Binshan, 2010). Wal-Mart's history is one of making an effort to reduce inventory cost. Wal-Mart's annual reports from 1970 to 2012 report that days-in-inventory (DII), a number of days before a product is sold, has reduced from 118 days in 1970 to 40 days in 2009, and its per employee gross profit has increased from $8,500 in 1972 to $56,000 in 2012. Its efficiency performance has been improved year by year since the time of opening the first Wal-Mart store in 1962. Wal-Mart continues to make significant efforts to reduce cost of logistics using information systems to provide a competitive advantage over its competitors. An information system with integrated RFID technology allows Wal-Mart to accurately track product location from manufacturer, to distributor, to storage pallets, to distribution center, to truck, and finally to the store.

Wal-Mart's efficient management of inventory systems is based on its Distribution Center (DC) network and transportation systems. According to the Wal-Mart's corporate site (http://corporate.walmart.com), the number

of item products in Wal-Mart's super centers is 142,000 items. In 2013, 81% of product sold at Wal-Mart stores is shipped through Wal-Mart's DCs (Wulfraat, 2014). Wal-Mart has several different DC networks in U.S.: 42 general merchandise DCs, 42 grocery DCs, 17 perishable DCs, 8 fashion and footwear DCs, 8 import DCs and 17 specialty product DCs. In addition, there are 23 Sam's Club DCs and DCs for return and refurbishment. According to Wulfraat's analysis (2014), the number of Wal-Mart's DC's square feet has increased steeply in the 21 century and it has been leveled out to 120 million square feet. At the same time, the number of retail store square feet to DC square feet has reduced from 18 in 1970s to 6 in 2000s. This implies that Wal-Mart has developed its several specialized DC networks to support 4,835 U.S. stores in the 21 Century.

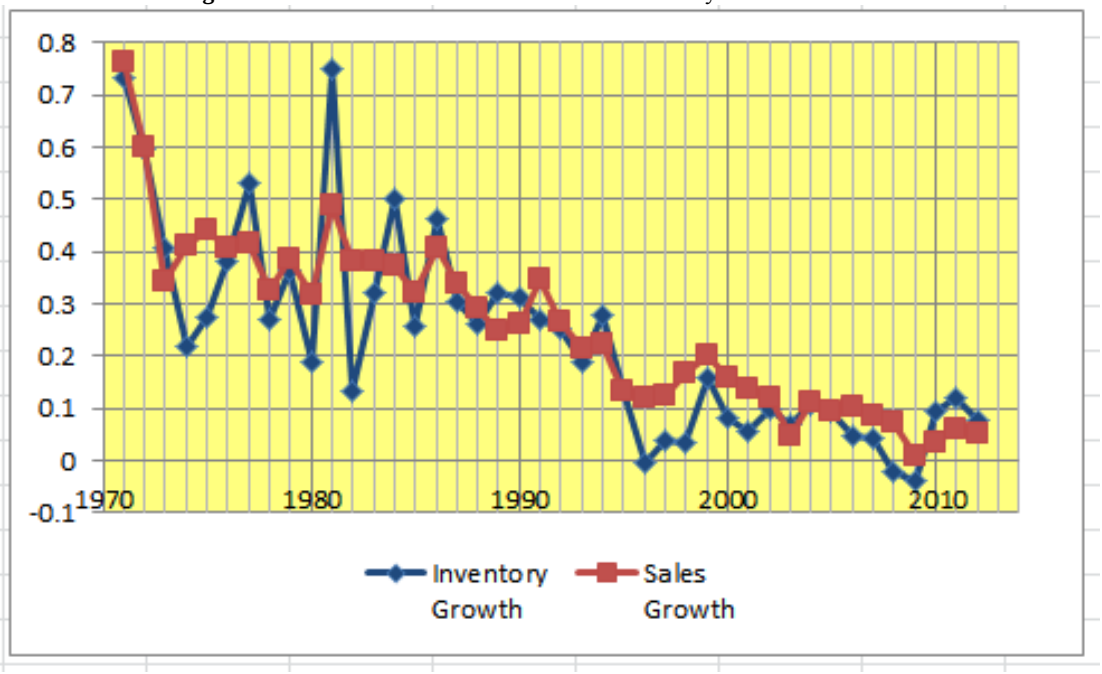
Wal-Mart's business target in the 21 Century is that "holding inventory growth to half the level of sales growth" (2006, Johnson). For the last 45 years since Wal-Mart's listing in the U.S. stock market, the trend of two growth rates (sales and inventory) has been decreasing (see Figure 1). In 2000s, the growth rate of sales has been higher than that of inventory except year 2003. However, since 2010, inventory turnover ratio (ITR) has started to decrease and DII has started to increase. At the same time since 2010, the inventory growth rate (IGR) is higher than sales growth rate (SGR), which is not a picture that Wal-Mart's management team wants.

In this paper, the authors analyze the financial ratios of both Wal-Mart and its competitors in the U.S. retail industry to answer the following two questions:

(1) Does Wal-Mart have significantly better financial ratios than those in U.S. retail industry in terms of efficiencies of inventory management and supply chain performance in the 21 Century?
(2) Which factors influence the growth of sales and inventory at Wal-Mart?

This study is organized as follows: first, the authors provide a literature review, secondly, the research method, which includes data collection procedure, research hypothesis, and testing results. Finally, the authors provide discussion and conclusion.

Figure 1. Wal-Mart's Sales Growth Rate and Inventory Growth Rate Trends



2. LITERATURE REVIEW

Wal-Mart's supply chain management is the key enabler of its growth from a small retailer in rural Arkansas to a global leader. Wal-Mart is one of the first retailers that adopted a decision making system based on data analysis provided by a barcode scanning system combined with an Electronic Data Interchange (EDI) and a point-of-sale system with real time data collection (Mark, 2012). According to Chandran (2003), Wal-Mart has been in a leadership position in the retail industry because efficient supply chain practices make possible by automated distribution centers and computerized inventory systems. Wal-Mart is well known for operating its own trucking system and an innovative cross-docking logistic technique whereby they can transfer products from inbound trailers to outbound trailers without intermediate storage (Johnson, 2006).

Wal-Mart has continued to prove that it is the leader in supply chain management for the U.S. Retail Industry throughout the years. K-Mart and Sears are Wal-Mart's main competitor in the 1980s and the 1990s and Target and Costco are main competitors in the 2000s. In recent years, Amazon.com has become the emerging competitor. There are many comparisons between Wal-Mart and its main competitors; Gill and Abend (1997) compare cost of inventory between Wal-Mart and K-Mart and Johnson (2006) compares a ratio of distributing cost to sales cost of K-Mart and Sears with that of Wal-Mart. Mark (2012) compares ITR of Target, Amazon, Sears with that of Wal-Mart. In all three comparisons, Wal-Mart is always a winner against its competitors. These examples of supply chain management efficiency leadership are attributed to Wal-Mart being the innovator in Supply Chain Management Technologies. Wal-Mart's pilot RFID project has decreased their stock-out rate by 30 percent (Hargrave, Waller, & Miller, 2006). A real time representation of stock can be located and identified with RFID communication technology being placed in crucial spots in Wal-Mart stores. The RFID placement makes Wal-Mart one of the companies that do not report the mis-measurement of stock-out.

Freeman (2011) claims that Wal-Mart is a technology leader with world's biggest private sector data warehouse as well as business leader with supply chain coordinating technique for collaborative planning, forecasting, and replenishment (CPFR) and vendor managed inventory (VMI). Wal-Mart shares its data with its suppliers to keep its inventory cost low. According to Kim and Mahoney (2006), Wal-Mart has economic benefit from its CPFR program, which minimizes distortion of demand information and coordinates the business plan with supply chain partners. The case study between P&G and Wal-Mart is a famous, successful story for Wal-Mart's CPFR program (Grean & Shaw, 2002).

Wal-Mart successfully captures the benefits of information technology by re-engineering its business lines. With the advent of RFID allowing the creation of real-time databases, Wal-Mart creates the opportunity to integrate efficient targeting a minimal inventory. Minimizing inventory is proving to be a means to developing a sustained competitive advantage in the arena of cost reduction. Cost containment through effective inventory management is reducing storage footprint, inventory taxes and insurance costs which are the driving factors propelling corporations seeking efficiency and profitability (Emiliani, Stec, Grasso, & Stodder, 2007). However, one of the great difficulties in capturing the cost advantage is "supplier" cooperation and regional economic infrastructure (Glaser-Segura, Tucci, and Anghel, 2006). Wal-Mart has overcome much of this resistance with buyer power. As a side benefit, the effect of reduced inventory also makes the entire supply chain "*greener*" by minimizing spoilage, shrinkage, and obsolescence through inventory reduction.

3. RESEARCH HYPOTHESES

As mentioned in the previous sections, Wal-Mart has been a leader of supply management in U.S. retail industry during 1980s and 1990s. The first two hypotheses are about whether Wal-Mart still maintains its leadership position in supply chain in the 21st Century. The last two hypotheses are about which factors influence SGR and IGR of Wal-Mart. The following are four research hypotheses to be tested.

H1. Wal-Mart shows stronger signs of performance in financial ratios of inventory management than those of its competitors in the 21 Century.

H2. Wal-Mart shows stronger signs of performance in financial ratios of supply chain management than those of its competitors in the 21 Century.

H3. A significant relationship exists between efficiency of inventory management and supply chain management and Wal-Mart's SGR.

H4. A significant relationship exists between efficiency of inventory management and supply chain management and Wal-Mart's IGR.

4. DATA COLLECTION

4.1 Data Collection For H1 And H2

Chandran (2003), Johnson (2006), and Mark (2012) analyze Wal-Mart's competitiveness against its competitors in their case studies. They categorize Wal-Mart's competitors in retail industry into several sectors: Discount store, grocery store, drug store, apparel, and department store. They choose some retailers from each category and make a pool of 15 through 20 competitors for Wal-Mart. Evans (2005) selects top 50 retailers for 20 years and choose 21 retailers which appear each year. The data collection methods in this paper use the combined two above ways: Top U.S. 50 publicly traded retailers from 2001 to 2012 are chosen and the companies examined must be competitors of Wal-Mart in multiple key product segments. The categories used in the selection are: discount store (6), grocery store (6), drug store (3), catalog (1), home improvement (2) , auto parts (3), electronics (2), home furnishing (1), sporting goods (1), footwear(1) and specialty (2). The number in parenthesis is a number of retailers in that category. Department stores and apparel are excluded because their segmentation and price range are different from Wal-Mart's. Total 28 retailers are chosen to analyze against Wal-Mart. Their financial data are downloaded from the *Compstat* database. Therefore, the total number of data including Wal-Mart's is 348 data observations (29 retailers over 12 years).

Six financial ratios are calculated in order to compare performance of efficiency between Wal-Mart and its competitors. The following six financial ratios are categorized into two groups: ratios for inventory management and ratios for supply chain management. ITR, DII, and inventory-sales-ratio (ISR) belong to inventory management group. Return on assets (ROA), cash conversion cycle (CCC), and supply chain ratio (SCR) belong to supply chain management group. Table 1 describes definition and calculation of the financial six ratios. CCC and ROA are popular metrics to check financial performance of supply chain management (Gosman & Kohlbeck, 2006; Mottner & Smith, 2009). Gartner uses ROA, ITR, and SGR when Gartner makes a list of top 25 Supply Chain Companies. SCR is recently proposed by Johnson and Templer (2011) which is a product of cash generation ratio (CGR) and asset efficiency ratio (AER). CGR is defined by net cash inflow from operations divided by sales and AER is defined by sales divided by total assets minus current liability. SCR is a unified ratio of company's financial performance and supply chain performance.

Table 1: Definition Of Six Financial Ratios

Ratios	Definition	Calculation
ITR	number of times inventory is used	= Cost of Goods Sold (COGS) / Inventory
DII	number of days a company holds its inventory before selling it	= 365 / ITR
ISR	percentage of inventory to sales	= Inventory / Sales
ROA	how many dollars of earnings a company derives from each dollar assets a company controls	= Net income / Total Assets
CCC	number of days between disbursing and collecting cash	= Inventory / (COGS/365) + Account Receivable / (Sales/365) – Account Payable / (COGS/365)
SCR	A ratio of supply chain performance associated with financial performance	= AER * CGR = EBITDA / (Total Assets – Current Liability)

4.2 Data Collection for H3 and H4

As mentioned earlier, Wal-Mart has been listed in the NYSE since 1970. The same six financial ratios of Wal-Mart are collected for 43 annual data from 1970 to 2012. Because SGR and IGR are calculated by previous year's sales and inventory, data record of 1970 is not generated. The number of data records in the data set is 42.

5. T-TEST RESULTS FOR H1 AND H2

The null hypothesis examines if the mean financial ratio value of competitors and Wal-Mart are the same (*Ho:* $\mu_{Competitor} = \mu_{Wal\text{-}Mart}$). The alternative hypothesis examines if the mean values for Wal-Mart is better. Because six financial ratios are tested for each of the 12 years, there are 72 T-tests conducted.

Table 2 shows the t-test results. The number in each cell is *p*-value from each T-test. Two critical values of α (0.01 and 0.05) are used for rejecting 72 null hypotheses. Among the ratios for inventory management, DII and ISR of Wal-Mart are significantly better than those of its competitors with 1% significance level for all 12 years and ITR of Wal-Mart is significantly better for six years out of 12. Overall, for H1, we can conclude that Wal-Mart shows a stronger sign of performance in financial ratios of inventory management than its competitors. Among the ratios of supply chain management, CCC of Wal-Mart is the only ratio that has a better performance with 1% significance level for 12 years than its competitors. While ROA of Wal-Mart has seven out of 12 years better performance, SCR of Wal-Mart does not show any stronger statistical signs of performance. By simple difference of mean value of competitors' SCR and Wal-Mart SCR, the competitors' mean value of SCR is higher for 10 out of 12 years. SCR is a proxy for representing supply chain financial performance, which is a close concept of profitability. This means that even if Wal-Mart has a reputation for faster cash conversion cycling and Wal-Mart shows a remarkable efficiency of inventory management, there is a broken link with financial performance of supply chain. Overall, for H2, we cannot say that Wal-Mart has a stronger sign of financial performance of supply chain management even if it has a stronger sign of cash operation performance.

Table 2: P-Values From 72 T-Tests

	Inventory Management Ratios			Supply Chain Performance Ratios		
Year	**ITR**	**DII**	**ISR**	**ROA**	**CCC**	**SCR**
2001	.090	.002**	.003**	.020*	.003**	.576
2002	.063	.001**	.002**	.022*	.003**	.847
2003	.119	.002**	.004**	.041*	.001**	.875
2004	.077	.001**	.002**	.386	.001**	.749
2005	.109	.002**	.002**	.550	.000**	.960
2006	.022*	.002**	.002**	.500	.000**	.974
2007	.007**	.001**	.001**	.130	.000**	.808
2008	.004**	.002**	.001**	.006**	.000**	.268
2009	.001**	.001**	.000**	.002**	.000**	.134
2010	.005**	.001**	.000**	.010**	.000**	.528
2011	.044*	.003**	.000**	.113	.000**	.902
2012	.154	.004**	.003**	.046*	.001**	.814

* α = 0.05, ** α = 0.01

6. REGRESSION ANALYSIS RESULTS FOR H3 & H4

Among the six financial ratios, the three ratios of inventory management of Wal-Mart have high correlation coefficients with each other, which are greater than .9. CCC also has a high correlation coefficient (greater than .9) with three ratios of inventory management because DII is a part of CCC. In addition, there exists a high correlation coefficient (.91) between ROA and SCR, which are close related with profitability. Considering coefficient correlation in Table 3, which is less than .7, DII from inventory management and SCR from supply chain management are selected to find a relationship with SGR and IGR. The following are two regression models.

$$SGR_i = \beta_0 + \beta_1 DII_i + \beta_2 SCR_i + e_i \quad \text{Model 1}$$

$$IGR_i = \beta_0 + \beta_1 DII_i + \beta_2 SCR_i + e_i \quad \text{Model 2}$$

where i = 1971 ~ 2012

Table 3: Correlation Matrix

	ITR	DII	ISR	ROA	CCC	SCR
ITR	1					
DII	-0.96386	1				
ISR	-0.97062	0.995933	1			
ROA	-0.54665	0.499558	0.491176	1		
CCC	-0.9711	0.983136	0.978043	0.533722	1	
SCR	-0.5575	0.546451	0.516537	0.908193	0.563276	1

6.1 Ordinary Least Squares Method

Two regression models are built under the classical assumption of ordinary least squares (OLS): homoskedasticity, no multicollinearity, and no autocorrelation. *P*-values of both models' overall model fit are 0.000. The R^2 value of model 1 is 0.855 and that of model 2 is 0.723. The Breusch-Pegan (BP) test is used to test the homoskedasticity assumption by running a regression with the squared residuals as a single dependent variable. Because *p*-value (0.007611) of model 1 from the BP test is less than .01, the null hypothesis of homeoskedasticity is rejected with a 1% significance level. Because *p*-value (0.02053) of model 2 from the BP test is greater than .01, the model 2 qualifies homoskedasticity. To overcome the heteroskedasticity problem, Halbert White (1980) proposed heteroskedasticity-consistent (HC) standard errors. The output from the HC standard errors has the same coefficient with different *p*-values of the coefficients in model 1. There is no significant difference in *p*-values of model 1 between OLS and OLS with HC standard errors(see Table 4). Variance inflation factor (VIF) is a measure of multicollinearity. The VIF values of both models are less than 1.5, which means there is no multicollinearity problem in both models. Durbin Watson (DW) *d* statistics is used to test for serial correlation in error terms. DW *d* must be compared to two critical *d* values: d_L and d_H. If the DW *d* is less than d_L, the null hypothesis of no serial correlation is rejected. If the DW *d* is greater than d_H, the null hypothesis cannot be rejected. If the DW *d* is between d_L and d_H, the test is inconclusive. According to the table of critical values for DW test (http://web.stanford.edu/~clint/bench/dw01a.htm), with three independent variables including intercept and 42 observations, the 1% one-tail critical values are d_L = 1.21752 and d_H = 1.40882. DW *d* of model 1 is 1.3508, which means that the null hypotheses is neither accepted nor rejected. DW *d* of model 2 (2.1540) is greater than d_H, which indicates there is no autocorrelation problem. Even if *p*-values of all coefficients of model 1 are less than 0.01, because of inconclusive result of DW test, OLS method to estimate regression model cannot be accepted.

Table 4: Test Statistics And Results Of OLS

	Model 1	Model 2
N	42	42
R^2	0.855	0.723
Model Fit	$F(2, 39) = 114.98$ *p*-value = 0.0000	$F(2, 39) = 56.28$ *p*-value = 0.0000
BP test	*p*-value= 0.007611	*p*-value= 0.02053
VIF test	1.425738	1.425738
DW test	*d* = 1.3508 *p*-value = 0.0065	*d* = 2.1540 *p*-value=0.5827
Coefficients (*p*-value) by OLS	β0 =-0.4218 (0.0000) β1=+0.0054 (0.0000) β2=+0.9918 (0.0002)	β0 =-0.5323 (0.0000) β1=+0.0055 (0.0000) β2=+1.2654 (0.0019)
Coefficients (*p*-value) by OLS with HC standard errors	β0 =-0.4218 (0.0000) β1=+0.0054 (0.0000) β2=+0.9918 (0.0003)	β0 =-0.5323 (0.0000) β1=+0.0055 (0.0000) β2=+1.2654 (0.0005)

6.2 General Least Squares Method

To overcome the autocorrelation problem in model 1, generalized least squares (GLS) method is used. GLS is a method of avoiding pure first-order serial correlation and providing a minimum variance property to its estimation (Studenmund, 2001). To estimate GLS equation, the AR(1) method is used. Because of no autocorrelation problem, model 2 does not need to use GLS. However, to compare the two models, the authors decide to apply GLS-AR(1) method to both models. In model 2, coefficients from all three methods, OLS, OLS with HC standard errors, and GLS, are very similar because model 2 satisfies all OLS requirements.

Comparing coefficients of both models with GLS-AR(1) method, β_1 is almost the same in both model 1 and model 2. However, β_2 of model 2 is greater than that of model 1. This means that DII of Wal-Mart influences equally to both SGR and IGR, but SCR influences more to IGR than to SGR. When a value of DII increases 1 unit, it will increase 0.005 units to both SGR and IGR. However, when a value of SCR increases 1 unit, it will increase 0.2 units (=1.26 – 1.06) more to IGR than SGR. Therefore, as Wal-Mart's supply chain efficiency improves, growth rate of inventory increases faster than that of sales. Table 5 presents GLS regression results for both models.

Table 5: Results Of GLS-AR(1)

Model	***β_0 (p-value)***	***β_1 (p-value)***	***β_2 (p-value)***
Model 1	-0.4334 (0.0000)	0.0053 (0.0000)	1.0610 (0.0019)
Model 2	-0.5255 (0.0000)	0.0054 (0.0000)	1.2589 (0.0012)

7. DISCUSSION

Wal-Mart is well known for cost leadership strategy in retail industry. The cost reduction is achieved through the efficient use of inventory system which enables to reduce stock-out rate and inventory storage space. In the comparison analysis with 28 Wal-Mart's competitors, Wal-Mart has showed superiority in DII and ISR for all 12 years and in ITR for 10 out of 12 years. Therefore, Wal-Mart's inventory management system has much more efficiency than its competitors. Efficient inventory management is the heart of the supply chain system. Even if Wal-Mart has greater values of inventory management ratios, the financial performance ratios about supply chain systems are not much better than those of its competitors. Wal-Mart's ROA has statistically better values than that of its competitors in seven out of 12 years. While CCC is the only supply chain ratio for Wal-Mart to have superior numbers to its competitors for all 12 years, there is no statistical evidence that SCR of Wal-Mart is better than that of its competitors for those 12 years. Even if Wal-Mart invests huge amount of money in RFID enabled IT systems and modernized DC network in the 21 Century, comparing absolute mean values of SCR between Wal-Mart and its competitors, SCR of Wal-Mart has been lesser than its competitors in 10 out of 12 years (see Table 6). In the regression analysis, while DII gives the same effect to both SGR and IGR, SCR gives more effect on IGR than SGR, which is not a situation the Wal-Mart management team expects. This means successful supply chain management does not guarantee a boost of sale growth increase within a short period time

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Table 6: Mean Difference Of SCR Values Between Wal-Mart And Its Competitors

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Competitors	0.245	0.271	0.273	0.265	0.265	0.266	0.255	0.238	0.235	0.259	0.286	0.284
Wal-Mart	0.240	0.250	0.252	0.252	0.234	0.234	0.236	0.246	0.254	0.257	0.250	0.263
Difference	0.005	0.021	0.021	0.013	0.031	0.032	0.019	-.008	-.019	0.002	0.036	0.021

8. CONCLUSION

The infusion of advanced "real-time" information technology, advanced inventory systems, and the willingness of the suppliers to conform to RFID standards has allowed Wal-Mart to increase inventory management efficiency, to create a more efficient market, and at the same time to contribute towards the creation of a greener environment by reducing wastes created by holding excess inventory. With significant advances in information technology with integration of RFID technology, Wal-Mart has been able to leverage these assets to significantly overcome the problems of time and distance differentials. However, with a relatively short history of RFID technology and the financial crisis of 2007-2008 (Shin & Eksioglu, 2014), even if there is a remarkable advanced in

inventory management systems, Wal-Mart does not show improved financial performance ratios associated with supply chain systems than its competitors. The effect of inventory management efficiency in terms of DII and ISR and the effect of supply chain efficiency in terms of CCC have been proven clearly in all 12 years in the 21 Century. However, Wal-Mart does not have any statistical evidence for better SCR than its competitors in the 21st Century. As seen from Wal-Mart forcing suppliers to comply with RFID standards, to reap the full benefits, the whole supply chain must efficiently use the RFID technology. As Hsieh et al. (2010) said, the benefit of RFID technology is a long run benefit. Shin and Eksioglu (2014) argue that RFID technology will enable total productivity gain through business process efficiency, but it will take a long-term improvement.

In our regression analysis, we found that there is a strong relationship between SCR and growth rates in the retail industry even if SCR of Wal-Mart is not significantly better than that of its competitors. SCR of Wal-Mart gives more effect on IGR than SGR. The current RFID implementation status in Wal-Mart is a pallet-level, not an item-level. With the expansion to item-level RFID operation, each and every product item in Wal-Mart stores must have a RFID tag, which allows tracking each and every product item. The item-level RFID tag will improve efficiency of cost and revenue, which will boost up the sales growth rate in the near future.

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REFERENCES

1. Chandran, M. H. (2003). Wal-Mart's Supply Chain Management Practices, Retrieved from http://mohanchandran.files.wordpress.com/2008/01/wal-mart.pdf
2. Emiliani, B., Stec, D., Grasso, L., Stodder, J. (2007). *Better thinking, better results: case study and analysis of an enterprise-wide lean transformation* 2nd e., Kensington, Conn: Center for Lean Business Management.
3. Evans, J. R. (2005). Are the Largest Public Retailers Top Financial Performers? A Longitudinal Analysis, *International Journal of Retail and Distribution Management*, 33 (11), 842-857.
4. Fosso Wamba, S., Lefebvre, L.A., Bendavid, Y., and Lefebvre, E. (2008). Exploring the Impact of RFID Technology and the Epc Network on Mobile B2b Ecommerce: A Case Study in the Retail Industry, *International Journal of Production Economics*, 112 (2), 614-629.
5. Freeman, R. B., Nakamura, A. O, Nakamura, L. I., Prud'homme, M, and Pyman, A. (2011). Wal-Mart Innovation and Productivity: A Viewpoint, *Canadian Journal of Economics*, Vol. 44 (2), pp 486-508.
6. Gill, P. and Abend, J. (1997). Wal-Mart: The Supply Chain Heavyweight Champ, *Supply Chain Management Review*, Spring 1997, pp 14-20.
7. Glaser-Segura, D. A., Jack E. T., and Anghel, L. D. (2006). Supply Chain Management and the Romanian Transition, Amfiteatru Economic, (8:19), pp 18-26.
8. Gosman, M., Kohlbeck, M. (2006). The effects of Wal-Mart on the profitability and investor valuation of its suppliers. Working paper. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=906606
9. Grean, M. and Shaw, M. J. (2002). 'Chapter 8. Supply-chain partnership between P&G and Wal-Mart' in M. J. Shaw (ed.), *E-Business Management: Integration of Web Technologies with Business Models*. Norwell, MA: Kluwer Academic Publishers, 155-71.
10. Hargrave, B. C., Waller, M., and Miller, R. (2006). "RFID's Impact on Out of Stocks: A Sakes Velocity Analysis," Retrieved from http://rfid.uark.edu/papers/ITRI-WP068-0606.pdf.

11. Hsieh, C., H. Prudilova, and L. Binshan, (2010). Radio Frequency Identification Systems at Universities: Current Status and Future Applications, *Proceeding of 2010 Southwest Decision Sciences Institute Conference*, Dallas, TX.
12. Johnson, M, and Templar, S. (2011). The relationship between supply chain and firm performance: the development and testing of a unified proxy, *International Journal Of Production, Distribution And Logistics Management*, 14 (2).
13. Johnson, P. F. (2006). Supply Chain Management at Wal-Mart, Harvard Business School Press 907D01.
14. Kim, S.M., and J.T. Mahoney (2006). 'Collaborative planning, forecasting, and Replenishment (CPFR) as a relational contract: an incomplete contracting perspective,' working paper. Retrieved from http://www.business.illinois.edu/Working_Papers/papers/06-0102.pdf.
15. Mark, K. (2012). "Half a Century of Supply Chain Management at Wal-Mart," Harvard Business School Press, 9B12D010.
16. McKinsey Global Institute (2001). U.S. productivity growth,1995–2000: understanding the contribution of information technology relative to other factors, Retrieved from http://www.mckinsey.com/insights/americas/us_productivity_growth_1995-2000
17. McKinsey Global Institute. (2011). Growth and renewal in the United States: Retooling America's economic engine, Retrieved from http://www.mckinsey.com/insights/americas/growth_and_renewal_in_the_us
18. Mottner, S. and Smith, S. (2009). Wal-Mart: Supplier performance and market power, Journal of Business Research, 62, pp 535-41.
19. Shin, S. & Eksioglu, B. (2014). Effects of RFID Technology on Efficiency and Profitability in Retail Supply Chains, Journal of Applied Business Research, 30 (3), 633-645.
20. Studenmund, A. H. (2001). *Using Econometrics, 4th Edition*. Addison Wesley Longman: New York.
21. Wulfraat, M. (2014). The Walmart Distribution Center Network in the United States, Retrieved from http://www.mwpvl.com/html/walmart.html

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