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**Drivers of the Cash Conversion Cycle in Retail:
A Test of Resource Dependency Theory**

by

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**An Honors Thesis in partial fulfillment of the requirements for the degree Bachelor of
Science in International Business in Transportation and Logistics.**

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I. Abstract

This study analyzes the role of resource dependency theory in the supply chain, specifically investigating the supplier-retailer relationship. Resource dependency theory attempts to summarize the power-seeking behavior found in interorganizational relationships, as firms attempt to increase their own independence while increasing other firms' dependence on them. The interdependent nature of a supply chain provides an ideal environment to analyze this type of relationship. In order to assess a firm's influence over other members, the cash conversion cycle was used as it considers the interlocking nature of the supply chain, since each action taken to constrict one firm's cycle affects that of others in the supply chain as well. It is also calculated from data that is publically available. The empirical analysis of this study, utilizing 97 of the largest public global retailers, statistically supports both of the hypotheses tested in this study: that firm size, measured by total revenue, increases influence over the supply chain, allowing the retailer to achieve a lower cash conversion cycle, and that this relationship is moderated by the level of assets, which reflects the retailer's dependence on the supplier.

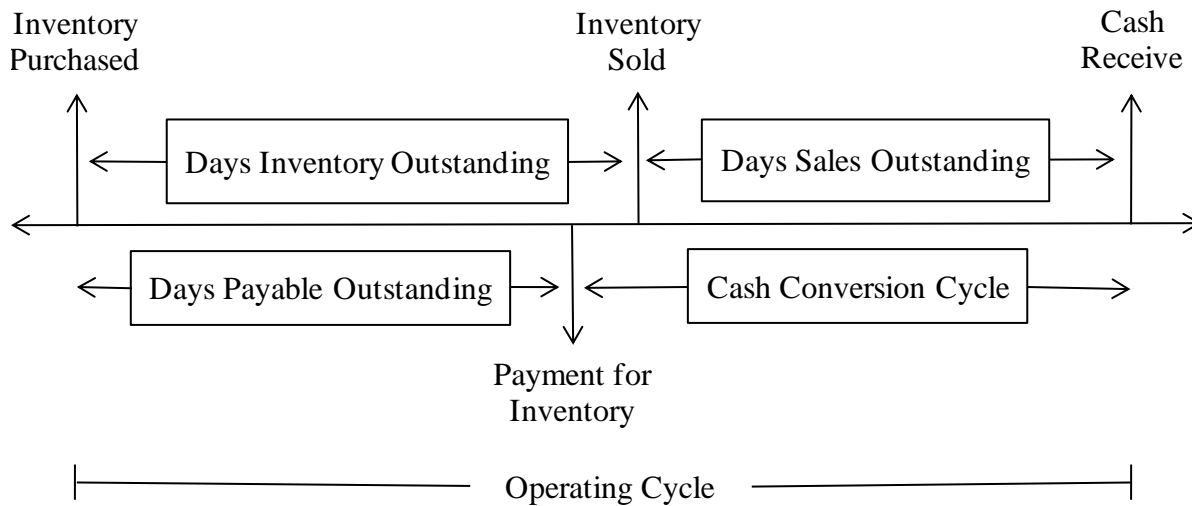
II. Introduction

Supply chain management focuses on managing all flows in a supply chain, including the flows of materials, information, and finances throughout the entire network (Akgün and Gürünlü, 2010). As defined by the Council of Supply Chain Management Professionals (2011), “Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers.” The study of supply chain management stems from the reasoning that the success of one firm in a supply chain depends on all of the partners in the total chain, from the suppliers of raw materials to the final customer. Variances between supply and demand in any link in the chain can cause shortages or excess inventory and any increases in cost can result in additional costs for all firms involved, which led to the focus on collaboration throughout the supply chain (Akgün and Gürünlü, 2010).

With the complex web of firms involved in many supply chains, measuring the performance of the network as a whole becomes increasingly difficult. The measures referred to as “supply chain metrics” within a company, such as on-time delivery and fill rate, typically only serve to evaluate internal performance (Lambert and Pohlen, 2001). According to Lambert and Pohlen, “there is no evidence that meaningful performance measures that span the supply chain actually exist” (2001 pg.1). While much of this absence of a metric can be attributed to the vast complexity of the network, the lack of a supply chain orientation of many firms, which inhibits coordination and the flow of information among companies, is also to blame (Lambert and Pohlen, 2001). Without this between-firm information available, a complete chain metric would still be impossible to quantify. To address some of these difficulties, this study uses the cash conversion cycle to analyze the supply chain relationship. This metric can be generated for the entire chain by using the sum of all firms involved, and is calculable from information that is available from public financial statements (Banomyong, 2005). Although the cash conversion cycle still has limitations, such as not providing specific financial values, and does not portray the majority of common supply chain metrics such as on time and fill rate, this metric provides an important method of analyzing the performance of the flow of the supply chain, specifically the flow of materials and finances (Akgün and Gürünlü, 2010). Because this metric “bridges across inbound material or finished goods activities with suppliers, through manufacturing, wholesale and distribution operations, and continues through the outbound sales activities with customers,” the cash conversion cycle provides unique insight for managing the entire supply chain (Farris, 2012 pg.2).

The cash conversion cycle can be defined as “the average days required to turn a dollar invested in raw materials into a dollar collected from a customer” (quoted from Faris, 2012 pg.2). This metric calculates the time lag necessary to convert inventories back into available cash. The cycle, as illustrated in Figure 1, quantifies the period from the purchase of inventory to the receipt of funds from the sale of the product, and subtracts the accounts payable period in which the firm has not paid for the inventories received. In this way, the cash conversion cycle takes the operational performance of the supply chain and expresses it in financial terms (Banomyong, 2005).

Figure 1: The Cash Conversion Cycle



Note: Adapted from (Jordan 2003)

The cash conversion cycle has three components: days inventory outstanding (the inventory period), days sales outstanding (the accounts receivable period), and days payable outstanding (the accounts payable period). The following equations are used to calculate the cash conversion cycle (Uyar, 2009):

- Days Inventory Outstanding (DIO) = Average Inventory/Cost of Goods Sold per Day
- Days Sales Outstanding (DSO) = Average Accounts Receivable/Revenue per Day
- Days Payable Outstanding (DPO) = Average Accounts Payable/Cost of Goods Sold per Day
- Cash Conversion Cycle (CCC) = DIO + DSO – DPO
- Total Supply Chain CCC = Sum of CCC of all firms involved

Ideally, the goal in managing the CCC would be to achieve the lowest cycle time possible or even a negative result, which would mean that a firm receives payment for goods before actually having to pay for them. In this way, while providing a look at how efficiently the flows of the entire supply chain are performing, the CCC is also crucial for a firm because it assesses how well the firm is managing their cash flow. The lower the conversion cycle, the fewer days the firm will have capital in inventory. Thus, a lower CCC represents that the firm is turning its working capital more frequently, as there is less capital tied up in the supply chain (Uyar, 2009). This allows the firm to produce more sales per money invested (Banomyong, 2005). With this additional cash flow available, they will be more effective at paying current liabilities using current assets, which potentially would mean less external financing for short term debt and the opportunity to use this cash flow for growth or investment (Uyar, 2009). Numerous studies have shown an inverse relationship between the length of the CCC and profitability (Akgün and Gürünlü, 2010; Uyar, 2009).

In order for a firm to constrict its CCC, it must affect one of the three leverage points used in the calculation: (1) extend DPO, or shorten either (2) DIO or (3) DSO. To increase the accounts payable, a firm could, for example, negotiate longer payment terms with its suppliers,

utilize an electronic payment system to make sure the payment is not received until the last possible day, or schedule partial payments in intervals to extend the complete payment (Farris, 2012). In reducing the DIO, a firm could implement new inventory strategies that optimize the amount of inventory held. It is important to note the difference between optimum inventory that is necessary to meet immediate demand and overage inventory that is burdening the company and therefore should be eliminated (Farris, 2012). To accomplish this, many companies are turning to strategies such as just-in-time delivery and using real-time inventory tracking. Improvements may also be found in improving supply and demand planning and using cross-docking systems at warehouse locations to decrease the amount of time inventory must flow through this level (Farris, 2012). To improve the CCC through a reduction in the DSO, a firm can encourage its customers by providing discount terms for shorter payment terms and could also implement a system to follow up and prevent possible delinquent accounts (Farris, 2012).

Although a lower CCC has a positive effect on a firm's cash flow, there are some adverse effects that can occur from leveraging these three components. One of the main limitations from this calculation is that it serves as more of a summary of the total performance in days instead of diving into the exact financial costs that could be incurred. For example, extending the days payable could be very beneficial for one firm. The delay of payment would allow this firm to use this capital in other areas such as in growth opportunities or in eliminating short term debt. However, the CCC of the entire supply chain illustrates the interlocking nature of the supply chain; the cash outflows at one link in the chain are equal to the cash inflows at the next level (Akgün and Gürünlü, 2010). So although one firm is able to lengthen its days, this will also adversely lengthen the cycle of its suppliers by adding to their days sales outstanding. Therefore, this increase in payment terms will negatively impact their suppliers, which could also make this firm a less attractive customer to their suppliers. This could cause the firm to lose these suppliers or to incur additional costs in order to offset these additional days of not receiving payment (Banomyong, 2005).

The CCC of the entire supply chain is the sum of the cycles of all firms involved. In this way, some methods taken by individual firms to shorten their own conversion cycles will have no effect or benefit on the supply chain as a whole, but will still affect the other firms. A similar reaction will occur from a firm shortening its DSO, although providing discount terms to the customers could offset the additional costs they would incur with these shorter payment terms.

A change in DIO can also have negative effects. For an individual firm, a simple decrease in inventory can easily lead to shortages and lost sales if not implemented in the right areas. Keeping optimum inventory levels, as well as any strategic inventory such as ordering in bulk units for discount prices, can be much more beneficial to a firm than improving the CCC (Banomyong, 2005). Finding the correct level of inventory is the key in balancing the opportunity cost of capital tied up in inventory and the sales and growth that this inventory provides. As for affecting the total supply chain, inventory improvements such as the synchronization of supply and demand or decreasing overage inventory throughout the network can provide benefits for the entire network, but using a strategy such as just-in-time delivery could only serve to push this inventory downstream in the chain.

With all of these changes affecting the entire interlocking supply chain, it is clear why supply chain management is necessary in ensuring the success of all firms. However, although successful supply chain management is built around cooperation and benefit for the entire chain, some firms can achieve increased channel power, providing them with a greater influence on the decisions made in the supply chain. With this power, it may be more beneficial than harmful to

this firm to affect the components of their own CCC, thus also affecting the entire chain. One of the most influential theories in explaining this type of interorganizational relationship is resource dependency theory (Hillman et al., 2009). Proposed over 30 years ago, this theory is still widely used in studying how organizations use their influence on other firms to lower their own dependence on others while attempting to increase other firm's dependence on them (Hillman et al., 2009). This theory is built around the idea of mutual dependence between firms working together, but where there is an imbalance of power that could allow some firms to have more influence on the rest of the network (Casciaro and Mikolaj, 2005). According to resource dependency theory, organizations attempt to decrease others' power over them by increasing their independence, in order to increase their chances of survival and decrease uncertainty (Hillman et al., 2009).

III. Hypothesis Development

This study examines the idea of power-seeking behavior in the supply chain by analyzing the global retail environment, specifically utilizing the supplier-retailer relationship. The supplier ultimately depends on the retailer for access to the customer, while the retailer depends on the supplier for the products and brands that it sells, delivered at optimal time periods (Hofer et al., 2012). Although other intermediaries and other channels, such as direct selling or e-commerce by the supplier to reach the customer, exist, this study will investigate the mutual dependence found in this supplier-retailer relationship.

Resource dependency theory proposes that a firm with increased power in a relationship would have more influence on the other firm (Hillman et al., 2009). This power could stem primarily from relative size, or from a number of other factors, such as providing resources with no close substitutes, that increase the other firm's dependency (Hillman et al., 2009). Hypothesis 1 focuses on the impact of retailer size on this power imbalance. Because the supplier depends on the retailer for contact with customers, as the retailer's relative size increases, thus increasing its access to customers, one would expect the retailer's power to increase. This study uses the CCC to evaluate resource dependency theory in the context of this relationship. As previously explained, this metric can be used to assess the relationship between channel members because the majority of factors that can improve one's own cycle can adversely affect other channel members. Viewing this metric through the lens of dependency theory, one could see how increased channel power could allow one firm to influence other links in the supply chain to improve their own CCC by negotiating longer accounts payable, shorter accounts receivable, and fewer days of inventory held. Using total revenue to quantify a retailer's size and contact with customers, we can expect that:

H1: There is an inverse relationship between retailer size and the length of the CCC.

In addition, just as the supplier depends on the retailer for access to final consumers in this relationship, the retailer is also dependent on the supplier to deliver the optimal amount of product at the right time intervals. Thus, the more stores and warehouses that the retailer has, the greater the dependence on the suppliers to fill these locations with product. In this way, the amount of total assets a retailer maintains should segment the relationship tested in H1. In order to eliminate the confounding effect of DIO on the CCC, inventories were subtracted from total assets for use in this analysis.

H2: There is a positive relationship between total assets and the length of the CCC, which serves to moderate the relationship between retailer size and CCC.

IV. Hypothesis Testing

The scope of this study serves to use the CCC of 97 of the largest public global retailers to test the two previous hypotheses. The data was collected from the balance sheets and income statements of the companies, accessed through Mergent Database. Using the calculations presented earlier, the CCC for 2010 was generated for each of the 97 retailers. For the purpose of this study, retailer size is measured by total sales revenue and assets are measured as total assets minus inventories in 2010.

Table 1

Descriptive statistics of sample retail firms (N=97).

Variable	Median	Mean	Std. Deviation
Total Revenue*	10,880,907	26,111,073	47,477,540
Total Assets without Inventories*	5,862,816	12,768,772	19,178,700
Days Inventory Outstanding	49	59	47
Days Sales Outstanding	10	20	26
Days Payable Outstanding	39	51	33
Cash Conversion Cycle	19	28	43

*In thousand dollars

Note : Statistics reported for year 2010.

Table 2

Pairwise correlations (N=97).

	1	2	3	4	5
1 Total Revenue					
2 Total Assets without inventories	0.92				
3 DIO	-0.14	-0.06			
4 DSO	-0.09	0.03	0.07	1.00	
5 DPO	-0.05	0.06	0.60	0.25	
6 CCC	-0.17	-0.10	0.69	0.48	0.05

To test the correlations in the hypotheses, a multiple regression was developed with independent variables of total revenue, total assets without inventories, and an interaction term of total revenue multiplied by total assets without inventories against the dependent variable, CCC. Each variable is significant at the 0.05 level, with Total Revenue negatively significant and Total Assets without inventory positively significant, as shown in Table 3. From these regression results, the equation below can be produced to estimate the CCC based on these variables.

$$\text{Cash conversion cycle} = 37.58 - 1.15\text{E-}06(\text{Total Revenue}) + 1.16\text{E-}06(\text{Total Assets without inventories}) + 4.60\text{E-}15(\text{Total Assets without inventories} * \text{Total Revenue})$$

Table 3

Regression results (N=97).

Hypothesis	DV=Cash Conversion Cycle	Coefficients	Standard Error	P-Values
	Constant	37.57900271	6.140865131	2.205E-08
H1	Total Revenue	-1.14675E-06	3.59531E-07	0.00194248
H2	Total Assets without Inventories	1.16415E-06	5.77037E-07	0.04652988
	Total Revenue*Total Assets w/o Inv.	4.59873E-15	1.87946E-15	0.01629036
	R-Square	0.1074593		
	F	3.732309689		
	P>F	0.013913531		

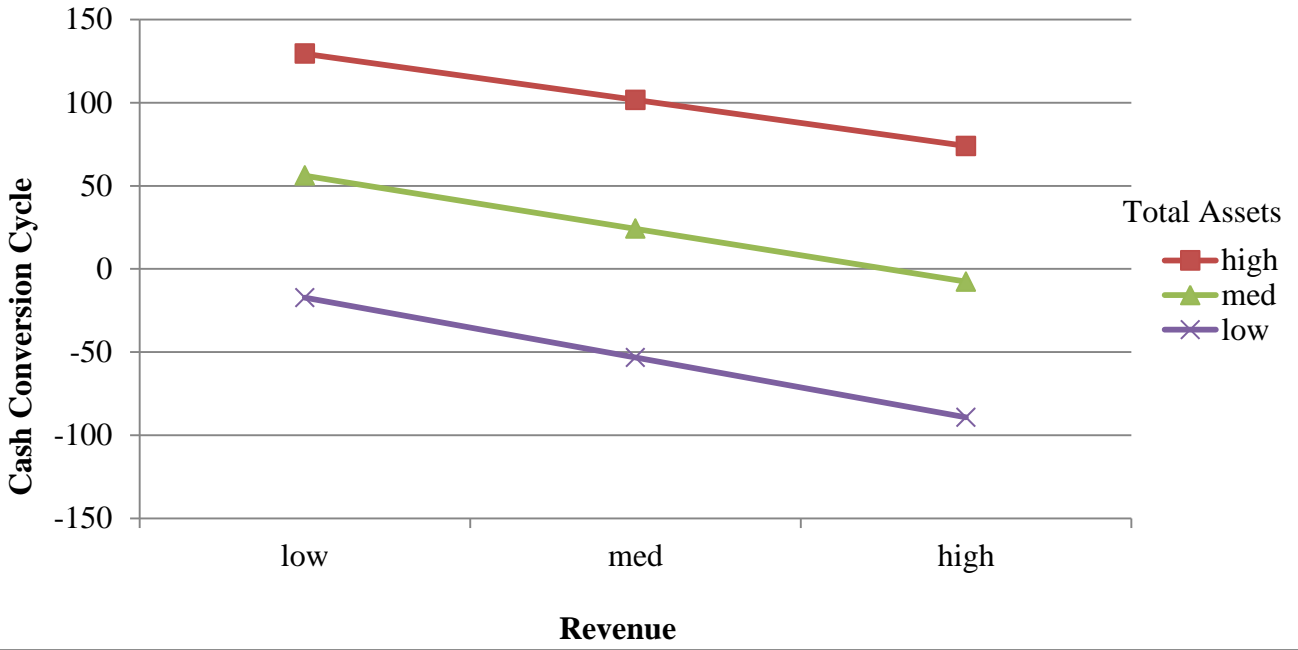
Note: All coefficients significant at 0.05.

Based on the regression results, hypothesis 1 is accepted, as the regression has shown that the independent variable of total revenue is inversely related with CCC. This means that as the revenue increases, the CCC time decreases. This data supports the power seeking behavior of resource dependency theory by showing that as firm size increases, retailers are able to decrease their CCCs. As retailer size increases, they are able to exert more influence over their supply chain in order to improve their CCC, even though this action has the ability to adversely affect other channel members.

This analysis also accepts the second hypothesis that assets moderate the relationship between size and CCC in retailers. As shown in Table 3, the independent variable of total assets is also statistically significant and shows a positive relationship with the CCC in these retailers. Thus, as total assets increases, and therefore their dependency on suppliers increases, retailers lose some of their power over suppliers and are unable to reach the low CCC of those with equivalent revenue but lower assets.

As graphically represented in Chart 1, higher total revenue and lower total assets lead to more favorable CCCs.

Chart 1: Relationship between Cash Conversion Cycle and Independent Variables



VI. Summary

As outlined in Table 4, there is no statistical reason to reject either of the hypotheses tested in this analysis. In support of resource dependency theory, larger firms, ranked by Total Revenue, are able to achieve more favorable CCCs. Their size allows them to shorten their own conversion cycle by lengthening accounts payable, or constricting either DIO or DSO. In this way, these retailers have less capital tied up in inventory which allows them to use this additional cash in other opportunities. In addition, the retailer's dependence on suppliers, quantified by total assets without inventories, segments this relationship. With equivalent total revenue, retailers with fewer assets are able to achieve lower CCCs.

Table 4

Summary of empirical findings.

H#	Variable	Findings	Relationship
H1	Firm Size	Larger firms (by total revenue) are able to achieve smaller cash conversion cycles by exerting their increased channel influence.	-
H2	Total Assets	Total assets illustrates the retailer's dependence on the suppliers and moderates the relationship between retailer size and the cash conversion cycle.	+

VII. Managerial Implications

This research has major implications for both suppliers and retailers engaged in this type of relationship. As a retailer, this study serves for benchmarking purposes to see where one is positioned, as well as what components one could improve in order to get more aligned with its competitors with shorter CCCs. Financially, a firm that finds itself with shorter payment terms than its competitors could begin to negotiate longer terms with its suppliers, especially those suppliers that also serve its competitors with longer payment terms. On the other hand, from a marketing perspective, this retailer may be able to use these shorter payment terms in order to negotiate other benefits, such as lower product costs in order to offset these terms. Additionally, a retailer with shorter payment terms could use this information to publicize that they are not using their size to control their suppliers and are better business partners. In terms of supply chain management, this study could draw a retailer's attention to a problem of excessive levels of inventory when compared to similar format competitors.

Similarly, this study can also be used in benchmarking from a supplier perspective. Financially, a supplier may see that their customers are demanding payment terms much longer than the industry average. This supplier may be able to offer incentives to negotiate shorter payment terms closer to those of the retailer's competitors or tailor the relationship to accommodate the longer payment terms. Looking at the supply chain, a supplier may see the need to negotiate changes in the inventory flow if it sees that the retailer is holding far below average which could be negatively affecting their sales. This information can also be used when considering supplying a new retailer as the CCC will provide an overview of how that retailer is working with its suppliers in terms of payment terms and inventory levels. This metric also provides an assessment of the retailer's cash flow management, so it will be another view of the retailer's performance in making this decision.

VIII. Limitations

The main limitation of this study could be the amount of data collected. Only one year of annual reports was used in this analysis, so it does not investigate trends in the CCC over time. This analysis also only uses a sample size of 97 retailers, so any segmentation is difficult in order for each group to be an adequate sample for comparison. Additionally, this study does not look at any other supply chain relationships other than that of the supplier and retailer, and only provides a retail-based analysis of this relationship.

Another limitation would be the high correlation between total revenue and total assets without inventories. Although the research is valid as both variables were found to be statistically significant, it is possible that there is multicollinearity between these two dependent variables that would interfere with the results.

IX. Future Research

Future research to expand this study should involve a longitudinal view, in order to test the hypotheses in a longer period of time. In this way, one could look at trends as retailers grow and change over time. Also, by expanding the sample size, one could further segment the analysis to see if the CCC holds the same relationship with the independent variables in different groups. For example, one could compare the relationships with CCC in different formats to see how they perform in comparison, or if certain types of retailers follow differing trends. One could also perform a similar analysis to see whether firm size and total assets maintain the same type of relationship with the CCC in other links of the supply chain. One would be able to investigate other supply chain relationships, such as resource dependency found in the retailer supplier-manufacturer relationship.

Future research could also be done to control for other variables such as market concentration, profitability, etc.

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