International Journal of Business and Management; Vol. 19, No. 6; 2024
ISSN 1833-3850 E-ISSN 1833-8119
Published by Canadian Center of Science and Education

The Role of Industry Concentration on Competitive Inventory-Management Behaviors: Evidence from U.S. Manufacturers

Rajat Mishra[1] & Christopher J. McKenna[1]

[1] Nelson Rusche College of Business, Stephen F. Austin State University, United States

Correspondence: Rajat Mishra, Department of Management and Marketing, Stephen F. Austin State University, P.O. Box 13070, SFA Station, Nacogdoches, Texas 75962, United States. E-mail: mishrar@sfasu.edu

Received: August 5, 2024 Accepted: October 20, 2024 Online Published: December 7, 2024

doi:10.5539/ijbm.v20n1p12 URL: https://doi.org/10.5539/ijbm.v20n1p12

Abstract

This research study investigates the potential effect of industry concentration on the rivalrous moves and counter moves made between leader and challenger firms relative to inventory management decisions. Theoretically, "the perennial gale of creative destruction" proposed by Schumpeter (1934) enables an examination of the competitive dynamics between firms. Mimetic isomorphism (as embedded within institutional theory, per DiMaggio & Powell (1983)) and signaling theory (Porter, 1980) have likewise been applied here to the presumed actions and reactions of firms relative to management and operational decisions. For their part, Ferrier, Smith & Grimm (1999)—in leveraging earlier research from Young, Smith & Grimm (1996)—offer evidence to indicate that higher industry concentrations may result in fewer rivalrous moves. In such concentrated environments, the dynamism of competitive rivalries may be lessened, thereby suppressing otherwise potentially aggressive moves and counter moves relative to inventory and other operational decisions.

Keywords: industry concentration, operations management, inventory management, competitive behavior, Schumpeter, Austrian economics

1. Introduction

The strategies associated with operations planning and control for a manufacturing firm involve not only the decisions prompted by a firm's own strategic positioning and posture; rather, they likewise involve the outcomes of the contingencies to which firms are exposed through rivalrous competitive behavior. Given the ongoing research initiatives seeking to identify and to advance an understanding of the behavioral paradigms and business strategies pertaining to Operations Management (OM), the presumed boundaries between how a firm makes its internal choices pertaining to operations planning and control remain subject to analysis. It is to be hoped that OM-related research is extended to accommodate a widening set of competitive influences impacting firms across industries (Mishra, Napier & Yasar, 2019; Mishra et al., 2021). For its part, the purpose of this research study is to analyze the extent to which an industry's market concentration can influence strategic decisions concerning inventory leanness.

Competitive influences are typically expected to occur between the leading firms in a given market, and in most industries, market observers can identify a given market's leader and its primary challenger. Hofer, Cantor and Dai (2011) defined a market leader as the firm with the highest market share in an industry, while the primary market challenger was represented to be the firm with the industry's second-highest market share. Due to the often intensive level of competitive behavior seen between market leaders and challengers—competitive behavior that can impact all aspects of an organization's operations—it is worth considering the extent to which this competition is mirrored in the dynamics observed between a leader and challenger combination relative to their operational management metrics, including their (seemingly internal) inventory decisions. As such, this study examined the relative inventory leanness between market leaders and challengers for a period of ten years across multiple manufacturing industries.

Since it is possible that the market leadership within a given industry can change hands over time, then for the purposes of this study, the authors will define the firm which is acting as a responder to the actions of a market leader at a given point in time as a challenger firm. Given likely real-world decision and implementation timeframes, a challenger's responding actions have been assumed to occur with a one-year time lag relative to the initial action of the market leader. Conversely, a challenger's actions can spur a subsequent response from the

initial market-leading firm with a similar lag. In this study, the potential two-way influences involving both parties and directions characteristic of this kind of action/response cycle will be referred to as a form of dyadic competition in which the initial market leader and challenger represent a logical grouping of two entities operating within in a defined, logical, and often longstanding relationship with one another. And even as many market observers tend to assume that market leaders both beget and influence their markets, such that the path of behavioral impact is often assumed to run in one direction (typically, from leader to follower), it's quite possible that the influencing interplay between either firm's actions and reactions may be significantly more complex—and more bi-directional—then intuition alone might suggest.

Certainly, market observers understand why competitive behavior exists: It is motivated by a thirst to supersede one's rivals and to accrue the distinct advantages of market leaders who can then exploit first-mover & reputational advantages—as well as potential economies of scale—while seeking to maintain their market power (Armstrong & Collopy, 1996; Buzzell, Gale, & Sultan, 1975; Ferrier, Smith & Grimm, 1999; Lieberman & Montgomery, 1988; Zeithaml & Fry, 1984). While it is assumed that every firm engages in some form of rivalrous behavior with either its immediate rival or against an identifiable set of rival firms, this research study focuses specifically on the expected rivalrous behaviors of market-leader and immediate-challenger firms because many market researchers both anticipate and report that competitive behavior is often maximized between a market's two leading firms (Ferrier et al., 1999; Hofer, Cantor and Dai, 2011).

2. Additional Theoretical Frameworks

If traditionally, a firm's operational decisions (such as those pertaining to inventory leanness) generally remained the product of strictly internal and institution-specific deliberations, given recent advancements in operations management processes combined with an ongoing search for competitive advantage among market participants, this study has opted to analyze these decisions as choices additionally informed by the rivalrous actions and reactions taken between top-two firms, and it does so due to the behavioral and demographic frameworks discussed below.

2.1 Inventory Management

Inventory management represents a major strategic decision within the operations management sphere, perhaps first and foremost because firms recognize that holding excess inventory can deteriorate their financial performance. Perhaps as a result, Chen et al. (2005, 2007) have found that inventories have generally been decreasing in industries, in part because excess inventory is viewed as a waste of resources (Womack, Jones & Roos, 1990). Since inventory leanness represents the extent to which minimal inventory is held by a firm (Mishra et al., 2021), it follows that managing a lean inventory has become an indicator of strong inventory management principles that aim to hold smaller inventories as often as possible (Eroglu and Hofer, 2011; Hall, 1983; Zipkin, 1991; Chen et al., 2005; Cooper and Maskell, 2008). When inventories are kept to a minimum, firms expect to accrue the financial benefit of their lean inventory behaviors.

Yet somewhat surprisingly, not all firms can automatically operate in this fashion; indeed, firms may choose to vary their inventory positions depending (in part) upon the behaviors of rival firms. In other words, rather than simply basing their inventory management upon internal strategic and financial planning considerations, a firm may view external rivalrous influences as factors in subsequent decisions to expand or reduce inventories. Along these lines, Mishra et al. (2021) have analyzed some of the strategies informing inventory leanness under dynamic competitive scenarios, wherein the action of the market leader could trigger a reaction from its challenger, potentially prompting a competitive cycle that can ultimately impact levels of inventory leanness via decisions in both firms that might otherwise not have occurred.

2.2 Competitive Behavior

Over time, of course, a firm's leadership position within an industry is neither certain nor automatically sustainable (Hofer, Cantor and Dai, 2011). Competitors regularly seek to dethrone market leaders, and at times the former are successful, perhaps partly due to a lack of vigilance shown by the latter, as in cases when a "leader's decline may be caused either by its own complacency and feelings of invincibility or by the aggressive behavior of challengers" (Ferrier, Smith & Grimm, 1999). Along these lines, Weiss and Pascoe (1984) have reported that only 39% of leaders within industry segments managed to continue as leaders during the span between 1950 to 1975. Likewise, Mueller (1986) noted that only 44% of industries saw continuing market leadership within their observed industries.

As so notably highlighted by Schumpeter (1942), a series of creative destructions may occur within an industry which significantly disturb the basic factors underpinning an established market-share hierarchy through forms of

"competitive dynamics." In the headlong pursuit of either sustaining one's market leadership or overthrowing one's rival, firms can engage in behaviors with the potential to cause significant market disequilibrium, given that market equilibrium is typically defined as a static state of affairs brought about though an absence of rivalry (as in Kirzner, 1997 and Ferrier, Smith & Grimm, 1999). Within market rivalries, all sorts of business strategies may be competitively duplicated, sometimes even sub-optimally, within general attempts to match the strategies or the market metrics of a rival firm. Indeed, Schumpeterian economics (1942) predicts that "a firm's competitive activity instigates a rival's competitive response, ultimately leading to cycles of 'creative destruction' of competitive advantage" that, in turn, can create or erode those advantages (Grimm and Smith, 1997; Hofer, Cantor & Dai, 2012). Thus, leader firms anticipating occupying a position of central dominance within an industry may find that that leadership position challenged (and potentially, eventually coopted) by competitor firms through such creative-destruction cycles.

2.3 The Potential Significance of Industry Concentration

It seems logical that the firms within industries with fewer players—i.e., within industries characterized by higher market concentrations—are more likely to be able to stay abreast of the actions taken by potential rivals, given the relatively smaller number of rivals to observe. As such, one might expect a flurry of targeted rivalrous actions in these industries. Yet as the market concentration within an industry increases, that market becomes more stable (Caves & Porter, 1978; Gort, 1963). Therefore, such concentration-driven stability may result in fewer rivalrous moves among the contending firms (Ferrier Smith, & Grimm, 1999; Young et al., 1996). Therefore, if inventory decisions can be observed by rival firms generally, then it seems worthwhile to analyze the potential effect of industry concentration on the inventory-management moves and counter moves made by leader and challenger firms in industries characterized by greater and lesser degrees of market concentration.

3. Literature Review

In the wake of widespread local and global supply chain challenges during the COVID-19 epidemic, for market observers the interrelationship between operations planning/control and optimal enterprise performance has perhaps never been so obvious. Clearly, strategic decision-making tied to operations performance can result in positive firm financial performances (Hart and Banbury, 2006). At the same time, any number of enterprises have sought historically to imitate the successful operational strategies practiced by rival firms and/or by firms in other industries. During the early 1990's, for example, extensive research focusing on the airline industry demonstrated how firms in this highly competitive industry often imitated the successful actions or steps taken by other industry players (Chen, Smith & Grimm 1992; Chen & MacMillan, 1992; Chen & Miller, 1994; Chen & Hambrick, 1995; Smith, Ferrier & Ndofer, 2001; Smith, Grimm, Gannon & Chen, 1991; Smith, Grimm, & Gannon, 1992). Within such competitive business landscapes (as in chess), the strategic actions taken by an instigating firm are referred to as "moves," while the subsequent reactions by other firms are referred to as "counter moves" (Smith, Ferrier & Ndofer, 2001). Yet these competitive moves and counter moves are not always financially successful, and the firms involved in such rivalrous behavior sometimes end up hurting their own (or one anothers') revenues. Even as Schumpeter (1942) referred to this type of competitive rivalry as producing a "perennial gale of creative destruction," advocates of Austrian economics recognized that market relationships do not remain static. Rather, they remain dynamic, and when apparent opportunities to gain a competitive advantage arise, firms attempt to exploit those opportunities. And even if and when a market moves back towards a state of equilibrium, other potential strategic opportunities may be identified. Subsequent market dynamism kicks in, wherein cycles of imitation by rivals seek to match the behaviors of (and to accrue the first-mover benefits enjoyed by) firms initially exploiting that opportunity. Certainly, the cycles of equilibrium and disequilibrium caused by the pursuit of market opportunities can lead to (an at least temporary) market instability. And depending upon which firm has most successfully exploited its strategic opportunities, the market share of the firms involved may change. One-time leader and challenger firms may well vary across time within a given industry. While Smith, Ferrier & Ndofer (2001) note that this imitation cycle may result in improved financial results, sometimes the firms involved are willing to compromise (or unintentionally find themselves compromising) their financial performance in the process, in a manner reminiscent of Schumpeter's concept of creative destruction.

Yet since firms surely tend to imitate one another at an enterprise level, is it the case that such imitative behavior is also reflected within operations-level decisions? According to several market scholars, multiple linkages exist between a firm's enterprise-wide and its operational strategies (Boyer and Lewis, 2002; Minor et al., 1994). And there is no *prima facie* reason to believe that enterprise-level imitative behaviors would not also be mirrored in rivalrous interplay at an operations level, too. Therefore, in addition to the Schumpeterian theoretical perspectives and the competitive dynamics theories discussed above, this study also leverages the concept of institutional behavior known as Mimetic Isomorphism. As initially proposed by DiMaggio and Powell (1983), Mimetic

Isomorphism posits a general kind of "monkey see, monkey do" activity between firms. Extending Mimetic Isomorphism to operational decisions would suggest that a challenger may well imitate the actions taken by a market-leading firm when determining its current and future inventory leanness.

Finally, the aptly named Resource-Based View theory (Barney, 1986; Conner, 1991) suggests that efficient inventory management can promote a firm's competitive advantage. Therefore, in response a firm's rivals would likely seek to respond to the successful strategies implemented by its competitors. According to this theory, firms typically desire acquiring and developing valuable, rare, inimitable, and non-substitutable resources to achieve and sustain competitive advantages over their rivals. Moreover, while each firm not only attempts to develop its own critical resources, it also attempts to follow the actions of rival firms relative to developing and acquiring similar competitive-advantage resources. A firm's inventory is, undeniably, a tangible resource. Thus, Mishra et al. (2021) contended that firms do not just execute inventory management decisions strictly due to a given firm's internal strategies. Rather, these decisions likewise consider a rival's inventory management actions as well, including those affecting inventory levels (and inventory leanness). Certainly, the organizational inertia behind observing one's rivals and executing inventory decisions would likely impact the reaction times facing the firms involved. Moreover, firms may simply be too wary or too skeptical to react immediately to a rival's inventory decisions, particularly (though not exclusively) when accurate data concerning the current year's inventory levels may not yet be available. As such, the authors and others have suggested that most changes in a rival firm's inventory management strategies would likely result in a one-year *lag* on the inventory leanness of the responding firm.

Assuming these rivalrous dynamics do occur, however, then how might industry concentration play a role in such inventory management decisions? As the market concentration in an industry increases, then the reduced number of firms might result in fewer competitive actions and reactions overall, given that the firms involved potentially face more significant losses (given their augmented market shares) than might smaller firms if a strategic implementation fails. Indeed, market stability tends to be higher when an industry's concentration is high, and when an industry's market concentration increases, that market's stability increases (Caves & Porter, 1978; Gort, 1963). Along these lines, Ferrier, Smith & Grimm (1999)—influenced influenced by Young et al. (1996)—have reported that higher market concentrations tend to result in fewer rivalrous moves among the market participants. Since the total set of competitive actions and reactions are reduced when industry concentrations are higher, the overall risk of losing market leadership in such an industry should remain relatively low. This lessened overall risk may suppress a firm's appetite for taking on operational risks in order to seek a competitive advantage, regardless of what actions their rivals have engaged in, because the potential upside of such initiatives may appear to be relatively diminished.

4. Hypotheses

As such, this study seeks to test the extent to which industry concentration impacts the dynamic interactions between leader and challenger firms concerning inventory leanness, and it does so via the following hypotheses.

Please note that hypothesis 1 involves a dyadic two-way relation while hypotheses 1a and 1b represent two one-way hypotheses.

Hypothesis 1: A focal firm's reaction to a rival firm's past decisions impacting inventory leanness will be moderated by the industry concentration, such that the higher the industry concentration, the lower a focal firm's reaction would be to a rival firm's previously established inventory leanness.

Hypothesis 1a: The market leader's reaction to a challenger's past inventory leanness will be moderated by the industry concentration, such that the higher the industry concentration, the lower would be the leader's reaction to the challenger's past inventory leanness.

Hypothesis 1b: A market challenger's reaction to the industry leader's past inventory leanness will be moderated by the industry concentration, such that the higher the industry concentration, the lower would be the challenger's reaction to the leader's past inventory leanness.

Even if these hypotheses are true, it is worth seeking to understand whether or not such decisions concerning inventory leanness positively impact a firm's overall financial performance. For without such an impact, one may indeed question what the fuss about inventory leanness might even signify. Certainly, lean inventory management is often characterized as part of an effective management system (Hall, 1983; Zipkin, 1991; Chen, Frank & Woo, 2005; Cooper and Maskell, 2008; Eroglu and Hofer, 2011). Inventories have been decreasing across industries (as reported by Chen, Frank & Woo, 2005 and 2007), an outcome that is likely the result of management's realization that holding excess inventory adversely affects financial performance, Indeed, some researchers have branded inventory excess as an explicit form of waste (Womack, Jones & Roos, 1990). Based upon data generated by

manufacturing firms between 1981 and 2000, Chen, Frank & Woo (2005) found that reductions in inventory investment tended to increase the stock price of the firms involved. Additionally, some firms experienced situations in which excess inventories became associated with greater risks for loss, theft, deformation, and other operational risks. All things being equal, therefore, a sensible inventory management strategy would seek to balance the costs (and delays) of ordering new inventory with the costs of hold longer onto existing inventory (since many firms hope to operate in line with Economic Order Quantity rules regarding optimally holding inventories at their lowest possible level). In the end, regression analyses performed by Swamidass (2007) established that top market performers maintain lower inventory-to-sales ratios than weaker performing companies, while Capkun, Hameri & Weiss (2009) similarly have demonstrated that effective inventory management positively affects firm performance. These considerations, therefore, have led this study to posit an additional hypothesis, namely:

Hypothesis 2: The greater the inventory leanness of a firm, the better its financial performance.

5. Data and Methodology

Table 1. Variables and their Proxies

Business Element	Treatment Type	Notes
Inventory Leanness	Measured in this study by change in Inventory Turnover (per Eroglu & Hofer, 2011).	Change in inventory turnover is preferred to a simple scale of inventory turnover because of the potential impact of inventory turnover during the previous period (in line with Cannon 2008).
Industry Concentration	Represented by a Herfindahl index.	Index calculated from COMPUSTAT data for each four-digit SIC industry represented in the sample (Mishra, Napier & Yasar, 2019).
Firm Size	Used as a control variable. Following Ferrier, Smith & Grimm (1999), it is valued via each firm's total number of employees.	Included because of Schumpeter's (1934) claim that large firms are in a better position to design and implement competitive actions due to greater financial and human resource availability.
Barriers to Entry	Controlled for via a composite entry barrier measure for each industry year—in line with Caves et al. (1984) and Ferrier, Smith & Grimm (1999).	Computed as the sum of industry means for investments in research and development, selling activities, and total assets, taking industry-level data from the business segment files of COMPUSTAT.
Diversification	Proxied via GEI (i.e., Generalized Entropy Index) in line with Cowell & Kuga (1977 and 1981). GEI is computed as a summation from i 1 to n [Pi* ln (1/Pi)] where Pi is the proportion of sales in segment i, and the segment is an industry (four-digit standard industry classification—SIC—code).	Controlled for due to the assumption that a highly diversified firm's competitive strategy (and its tendency to imitate the rival firm's operations' strategic behavior) will be different than that of a less diversified firm primarily because a highly diversified company has income from various business segments—and thus is not as focused in the competitive behavior of a single rival firm.

The authors selected for analysis the years 2001 through 2010, since that period (a) represented a decade's worth of business activity, and (b) because the recession beginning in 2008 potentially offered an inflection point in which long-term market leaders may have faced additional pressures to respond to rival firms' actions (and vice versa)—to the point where market leadership may well have changed hands in certain industries. Even in highly concentrated industries, the recession may have forced firms to look more closely at their competitors, as overall market activity (and potentially market shares) may have fallen off significantly. Those firms that may have been reticent to take strategic risks previously may well have considered taking them in light of radically changing market conditions. In addition, the year 2000 was selected to create the lagged values for the study's analysis

variables. Firms were grouped according to their respective four-digit SIC industry codes and ranked in descending order of their sales within these industries. Manufacturing industries with a four-digit SIC code ranging from 2000 to 4000 were selected for the analysis, and following on from Ferrier, Smith & Grimm (1999), industry groups that did not contain at least two large, non-diversified U.S. firms (i.e., industries with a clear leader and a second-place challenger) for all of the ten years from 2001 to 2010 were eliminated from further consideration.

At the outset of the data analysis, the sample set included 219 industries resulting in 36,174 observations from the years 2000-2011. However, across these 219 industries, any firms potentially to be included in the analysis were dropped if they did not fall within the top two firms in an industry. Consequently, the total number of observations for the years 2000 through 2011 dropped to 4,877. Additional statistical tests applied against these observations resulted in a reduction in the final observation set down to 218 observations across 40 industries. [Note that the number of industries dropping from 219 to 40 while the total number of observations dropping from 4,877 to 218 is the direct result of missing values within one or more of the variables within the regression calculations. Moreover, since the analysis' inventory measurement is operationalized as a difference and not an absolute value, the total number of observations would have had to drop by half in any case. Furthermore, whenever one value in a potential observation is missing from the base data, a pair of observations must be lost given the differential figure used within the analysis. Finally, note that Compustat data can contain negative values in fields that represent "count" data. These cannot logically be treated as negative values; therefore, the additional resulting observation eliminations also reduced the final sample size. Observation reductions are not unusual in econometric panel data analyses, particularly when a variable is operationalized as a difference of a value across two periods, but the levels of reduction in this study were both marked and noticeable.]

6. Results

The relationships between the leading and challenger firms are tested with the moderator industry concentration (hhi_s). The moderator, which represents the interaction term of the lagged inventory position (mean_inv_o~3) and industry concentration, is abbreviated as 'hinv'. A negative coefficient is expected of the variable hinv, as proposed in hypothesis 1.

The regression involves the inventory position of the focal firm (dintof) being regressed against the inventory position of the rival firm (mean_inv_o~3), industry concentration (hhi_s), and the moderator term hinv, with the control variables being firm size (lnemp), barrier, and diversification (sdiv). Hypothesis 1 involves a two-sided moderated test using GEI as a proxy for diversification. The model is significant with the value of F as 2.6 and the p value of the F-test as 0.0000 with the number of observations as 200. The p-value of the t-test of the moderator term is 0.709, which turned out to be insignificant. The coefficient of determination, R-squared, is .50. The sign of the coefficient is negative, as expected. An R-squared of 50% indicates that 50% of the variability of the inventory position of the leading firm is explained by this model, which is significant at the p value of 0.0000. The hypothesis, thus, is not supported. Yet while our hypothesis 1 is not supported, the model with all the variables including industry concentration is significant (given the R-squared value).

Table 2. Hypothesis 1

dintof	Coef.	Std. Err.	t	P>|t|	Lower CI	Upper CI
mean_inv_o~3	.8982784	1.050302	0.86	0.394	-1.177846	2.974403
hhi_s	-.8648793	1.938266	-0.45	0.656	-4.696235	2.966477
hinv	-.4204739	1.126055	-0.37	**0.709**	-2.646337	1.805389
lnemp	-.0901311	.039469	-2.28	0.024	-.1681491	-.0121132
barrier	.0000276	.0000956	0.29	0.773	-.0001614	.0002166
sdiv	.0390323	.1629421	0.24	0.811	-.2830542	.3611187

Next, the study investigated if, individually, a challenger firm has a moderated effect of industry concentration upon the leading firm's inventory position (and vice versa) through hypotheses 1a and 1b. The interaction of industry concentration (hhi_s) and challenger firm's lagged inventory position (intd2) is abbreviated as intd2_ind_~c, whose impact is investigated on the leading firm's inventory position (intd0). This is a one-sided test in which the control variables stay the same as hypothesis 1 above. Using GEI as a proxy for diversification, the p-value of the t-test is .65, as shown in Table 3 below, which is insignificant. The model is highly insignificant, as

the R-squared value is 0.2722. The sign of the coefficient is positive. This clearly is an adverse result and different than what would be expected (per the literature review above).

Table 3. Hypothesis 1A

intd0	Coef.	Std. Err.	t	P>|t|	Lower CI	Upper CI
intd2	-.2401299	.403145	-0.60	0.552	-1.037023	.5567637
hhi_s	.248189	.3219772	0.77	0.442	-.3882609	.8846389
intd2_ind_~c	.2474281	.5445083	0.45	**0.650**	-.8288973	1.323753
lnemp	.0019671	.0064375	0.31	0.760	-.0107578	.0146921
barrier	-.0000125	.0000158	-0.79	0.429	-.0000437	.0000187
sdiv	.0183053	.0266715	0.69	0.494	-.0344159	.0710266

Next, the leading firm's lagged inventory performance's impact (intd) is tested against the challenging firm's inventory performance (intd01) using industry concentration (hhi_s) as the moderator. This is a one-sided test as indicated by hypothesis 1b. The control variables stay the same as above. The model is highly significant with an F-value of 2.8 and a p-value of the F-test as 0.0000. The R-squared of 52.16% indicates that 52.16% of the variability in the challenging firm's inventory performance is explained by the lagged inventory performance of the leading firm when controlling for firm size, diversification, and barriers to entry. This hypothesis is not supported, therefore, although the coefficient of the moderator has a negative sign, as expected.

Table 4. Hypothesis 1B

intd01	Coef.	Std. Err.	t	P>|t|	Lower CI	Upper CI
intd	1.120711	1.193123	0.94	0.349	-1.237726	3.479149
hhi_s	-.7803475	1.877309	-0.42	0.678	-4.491209	2.930514
intd_ind_c~c	-.6910441	1.269028	-0.54	**0.587**	-3.199522	1.817434
lnemp	-.0939353	.038463	-2.44	0.016	-.1699648	-.0179059
barrier	.0000404	.000093	0.43	0.664	-.0001434	.0002242
sdiv	.0333703	.1578618	0.21	0.833	-.2786739	.3454145

In testing the relationship between inventory leanness and overall financial performance for hypothesis 2, the study's tests control for the firm size (lnemp) and the industry (sich), while the impact of inventory position on the financial performance is tested. Tobin's Q and ROE are used for operationalizing financial performance.

When initially testing inventory position with Tobin's Q, as shown below in Table 5, the number of observations were 1,331. The overall model is significant, with an F-value of 52.02 and the p-value of the F-test as 0.0000. R-squared is 10.52%, meaning that the model predicts 10.52% of the variability in financial performance. A unit change in the inventory position of a firm would cause the Tobin's Q to rise 25.7%. As such, hypothesis 2 is supported. Note that the estimated regression equation is given as follows:

Ln Q= .5116483 + .2570243 dintof -.0642313 lnemp -.0000363 sich

Table 5. Hypothesis 2 LnQ

lnQ	Coe	Std. Err.	t	P>|t|	Lower	Upper
dintof	.2570243	.0310308	8.28	0.000	.1961495	.3178991
lnemp	-.0642313	.0075389	-8.52	0.000	-.0790208	-.0494417
sich	-.0000363	.0000282	-1.29	0.198	-.0000916	.000019
_cons	.5116483	.0895614	5.71	0.000	.335951	.687345

When testing the inventory position and ROE, as shown below in Table 6, the number of observations were 1,395. The overall model is significant at 10% with an F-value of 52.02 and the p-value of the F-test as 0.0633. R-squared is 0.52%. A unit change in the inventory position of a firm would cause the ROE to rise by .844 (keeping other factors constant). So again, hypothesis 2 is supported. Note that the estimated regression equation is given as follows:

$$ROE = .01582 + .8448506\ dintof + .0118751\ lnemp - .000014\ sich$$

Table 6. Hypothesis 2 with ROE

roe	Coeff	Std. Err.	t	P>|t|	Lower CI	Upper CI
dintof	.8448506	.3128948	2.70	0.007	.231054	1.458647
lnemp	.0118751	.0758984	0.16	0.876	-.1370127	.1607628
sich	-.000014	.0002796	-0.05	0.960	-.0005626	.0005346
_cons	.01582	.8868355	0.02	0.986	-1.723859	1.755499

7. Discussion of Findings and Conclusion

Overall, hypothesis 1 is not supported. Therefore, based on the data available for the study, the authors cannot definitively infer that industry concentration makes a statistically significant impact on the set of leader/challenger competitive actions and reactions linked to inventory management decisions.

Given the significance found within the tests above in hypothesis 2, however, one can infer that the level of a firm's inventory position has an impact on the financial performance. The Tobin's Q and ROE measures clearly indicated (with strong significance) that there is a positive impact.

When considering the results of these hypothesis tests, it is worth recalling that specific theoretical foundations were used to build the hypotheses, as in any deductive research study. Several compelling theories appear to corroborate the direction of this study, including the theories and findings of Schumpeter (1934 & 1943) , mimetic isomorphism or institutional theory (DiMaggio & Powell, 1983), signaling theory (Porter, 1980), just to name a few. Having tested the hypotheses seeking to find a relationship between industry concentration on competitive inventory leanness, however, the authors concede that the data did not support all of the hypotheses as expected. Such an outcome is not unusual in deductive studies, and the authors attribute the failures to support the main hypotheses largely to limitations uncovered within the data and, to a lesser extent, within the analytical methodology.

Since the research literature suggests that the proposed hypotheses could very well be true, the authors invite similar research studies representing an extension to or modification of this one. Primarily, two different approaches would be recommended in such a study. First, a follow-up study can widen the time horizon for the datasets in order to seek out additional observations to test. Second, it might be useful to subdivide the Herfindahl index (hhi_s) values and to group them into, say, four categories or tranches (from 0 to 0.25, 0.26 to 0.50, 0.51 to 0.75, and 0.76 to 1) before analyzing an industry concentration's effects on the hypotheses, rather than looking at the absolute values of hhi_s as has been performed here. The authors believe that these modified approaches might potentially lead future authors to more definitive results.

Nonetheless, this study has sought to extend the (to date) relatively rare application of competitive dynamics to specific areas of Operation Management research. More specifically, it has sought to analyze strategic operational decisions (i.e., inventory management choices) through the lens of the competitive dynamics between the leader and challenger firms within an industry. While the concepts of competitive rivalry, mutual destruction, and imitation have typically been studied in greater detail at an enterprise level, studies incorporating the Schumpeterian perspective of the "perennial gale of creative destruction" still remain rare at the business operations level.

8. Additional Note on Research Limitations

One of the limitations of this research study that the authors want to acknowledge pertains to the data source itself. The use of Compustat data involves a limiting factor on the potential breadth of market data, as "not publicly held" corporate data and data for firms not "large enough for inclusion" (Cagle, 2011) are not housed within Compustat. Moreover, missing data within potential observational records turned out to be a significant issue within the Compustat database, at least for the timeframe under consideration. As noted previously, the values of some count

variables were (illogically) signed as negative, thus requiring those observations to be dropped from the analysis. So while hypothesis 1 is not supported yet—given the dataset used for the analysis—the concepts supporting that hypothesis remain strongly backed by the literature.

9. Potential Future Study Extensions

Finally, when it comes to identifying and analyzing a given firm's strategic decisions, the authors sense that a great deal of additional room exists within its operational domain for future research. While the authors have used the popular categorization of leader and challenger firms to represent the leader as the firm with the highest market share and the challenger as the one with the second-highest market share, it is worth considering what similar study results would look like across the top fifty percent of the companies (or, for that matter, across the bottom fifty percent) of companies within several manufacturing industries. Another potentially interesting study would be to examine the relative Research & Development expenses across market leaders and challengers. Given that R&D is often considered a pillar of a firm's strength and future success, a competitive firm's level of R&D investment could reasonably be expected to be highly imitable. Certainly, there appears to be additional room for analyses concerning the reactions of top firms within an industry to the operational choices of their rivals—and vice versa—relative both to these operational metrics and to the overall profitability of the firms in question.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal and publisher adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

References

Armstrong, J. S., & Collopy, F. (1996). Competitor orientation: Effects of objectives and information on managerial decisions and profitability. *Journal of Marketing Research, 33*, 188-199. https://doi.org/10.2307/3152146

Barney, J. B. (1986). Types of competition and the theory of strategy: Toward an integrative framework. *Academy of Management Review, 11*(4), 791-800. https://doi.org/10.5465/amr.1986.4283938

Boyd, B. (1990). Corporate Linkages and Organizational Environment: A Test of the Resource Dependence Model. *Strategic Management Journal, 11*(6), 419-430. https://doi.org/10.1002/smj.4250110602

Boyer, K. K., & Lewis, M. W. (2002). Competitive priorities: Investigating the need for trade-offs in operations strategy. *Production and Operations Management, 11*(1), 9-20. https://doi.org/10.1111/j.1937-5956.2002.tb00181.x

Buzzell, R., Gale, B., & Sultan, G. (1975). Market share: A key to profitability. *Harvard Business Review, 53*(1), 97-106.

Cagle, C. J. (2011). Capacity position and financial performance: Longitudinal evidence from US manufacturers. (Unpublished doctoral dissertation). University of Texas at Arlington, Arlington.

Capkun, V., Hameri, A., & Weiss, L. A. (2009). On the relationship between inventory and financial performance in manufacturing companies. *International Journal of Operations & Production Management, 29*(8), 779-806. https://doi.org/10.1108/01443570910977698

Caves, R., & Porter, M. (1978). Market structure, oligopoly, and stability of market shares. *Journal of Industrial Economics, 26*, 289-313. https://doi.org/10.2307/2098076

Caves, R., Fortunato, M., & Ghemawat, P. (1984). The decline of dominant firms, 1905-1929. *The Quarterly Journal of Economics, 99*, 523-546. https://doi.org/10.2307/1885963

Chen, H., Frank, M. Z., & Wu, O. Q. (2005). What actually happened to the inventories of American companies between 1981 and 2000? *Management Science, 51*(7), 1015-1031.

Chen, H., Frank, M. Z., & Wu, O. Q. (2007). U.S. retail and wholesale inventory performance from 1981 to 2004. *Manufacturing & Service Operations Management, 9*(4), 430-456. https://doi.org/10.1287/mnsc.1050.0368

Chen, M. J., & MacMillan, I. C. (1992). Nonresponse and delayed response to competitive moves: The roles of competitor dependence and action irreversibility. *Academy of Management Journal, 35*(3), 539-570. https://doi.org/10.5465/256486

Chen, M. J., Smith, K. G., & Grimm, M. C. (1992). Action characteristics as predictors of competitive responses. *Management Science, 38*(3), 439-455. https://doi.org/10.1287/mnsc.38.3.439

Chen, M., & Hambrick, D. (1995). Speed, stealth and selective attack: How small firms differ from large firms in competitive behavior. *Academy of Management Journal, 38*, 453-482. https://doi.org/10.5465/256688

Chen, M., & Miller, D. (1994). Competitive attack, retaliation and performance: An expectancy-valence framework. *Strategic Management Journal, 15*, 85-102. https://doi.org/10.1002/smj.4250150202

Connor, K. R. (1991). A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm? *Journal of Management, 17*, 121-154. https://doi.org/10.1177/014920639101700109

Cooper, R., & Maskell, B. (2008). How to manage through worse-before-better. *MIT Sloan Management Review, 49*(4), 58-65.

Cowell, F. A., & Kuga, K. (1977). Additivity and the entropy concept: An axiomatic approach to inequality measurement. *Institute of Social and Economic Research Discussion Paper No. 96*.

Cowell, F. A., & Kuga, K. (1981). Inequality measurement: An axiomatic approach. *European Economic Review, 15*, 287-305. https://doi.org/10.1016/S0014-2921(81)80003-7

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review, 48*(2), 147-160. https://doi.org/10.4324/9781315247533-34

Eroglu, C., & Hofer, C. (2011). Lean, leaner, too lean? The inventory-performance link revisited. *Journal of Operations Management, 29*, 56-69. https://doi.org/10.1016/j.jom.2010.05.002

Ferrier, W. J., Smith, K. G., & Grimm, C. M. (1999). The role of competitive action in market share erosion and industry dethronement: A study of industry leaders and challengers. *Academy of Management Journal, 42*(4), 372-388. https://doi.org/10.5465/257009

Gort, M. (1963). Stability and change in market shares. *Journal of Political Economy, 71*, 51-61. https://doi.org/10.1086/258734

Grimm, C., & Smith, K. (1997). *Strategy as action: Industry rivalry and coordination*. South/Western, Cincinnati.

Hall, R. W. (1983). *Zero inventories.* Homewood, IL: Dow Jones-Irwin.

Hart, S., & Banbury, C. (2006). How strategy making processes can make a difference. *Strategic Management Journal, 15*, 251-259. https://doi.org/10.1002/smj.4250150402

Hofer, C., Cantor, D. E., & Dai, J. (2012). The competitive determinants of a firm's environmental management activities: Evidence from US manufacturing industries. *Journal of Operations Management, 30*(1/2), 69-84. https://doi.org/10.1016/j.jom.2011.06.002

Kirzner, I. (1997). Entrepreneurial discovery and the competitive market process: An Austrian approach. *Journal of Economic Literature, 35*, 60-85. https://www.jstor.org/stable/2729693

Lieberman, M., & Montgomery, C. (1988). First-mover advantages. *Strategic Management Journal, 9*, 41-58. https://doi.org/10.1002/smj.4250090706

Miller, D., & Chen, M. (1996). The simplicity of competitive repertoires: An empirical analysis. *Strategic Management Journal, 17*, 419-440. https://doi.org/10.1002/(SICI)1097-0266(199606)17:6%3C419::AID-SMJ818%3E3.0.CO;2-Z

Minor, E., Hensley, R., & Wood, D. R. (1994). A review of empirical manufacturing strategy studies. *International Journal of Operations & Production Management, 14*(1), 5-25. https://doi.org/10.1108/01443579410049252

Mishra, R., Napier, R., & Yasar, M. (2019). Do competitors respond to capacity changes? Evidence from US manufacturers. *Operations Management Research, 12*(3), 159-172. https://doi.org/10.1007/s12063-019-00145-9

Mishra, R., Rasheed, A., Yasar, M., Napier, R., & Nakkas, A. (2021). Inventory positions in US manufacturing: A competitive dynamics approach. *International Journal of Production Economics, 238*, 108167. https://doi.org/10.1016/j.ijpe.2021.108167

Mueller, D. (1986). *Profits in the long run.* Cambridge: Cambridge University Press.

Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.

Schumpeter, J. A. (1934). *The theory of economic development*. Cambridge: Harvard University Press.

Schumpeter, J. A. (1942). *Capitalism, socialism and democracy*. Harper, New York.

Smith, K. G., Ferrier, W. J., & Ndofor, H. (2001). Competitive dynamics research: Critique and future directions. In B. Blackwell (Ed.), *The Blackwell Handbook of Strategic Management*, 309-354. https://doi.org/10.1111/b.9780631218616.2006.00012.x

Smith, K. G., Grimm, C., Gannon, M., & Chen, M. J. (1991). Organizational information processing, competitive responses and performance in the U.S. domestic airline industry. *Academy of Management Journal, 34*, 60-85. https://doi.org/10.5465/256302

Smith, K., Grimm, C., & Gannon, M. (1992). *Dynamics of competitive strategy*. Newbury Park, CA: Sage.

Swamidass, P. M. (2007). The effect of TPS on US manufacturing during 1981-1998: Inventory increased or decreased as a function of plant performance. *International Journal of Production Research, 45*(16), 3763-3778. https://doi.org/10.1080/00207540701223675

Weiss, L., & Pascoe, G. (1984). The extent and permanence of market dominance. Wissenschaftszentrum, Berlin.

Womack, J. P., Jones, D. T., & Roos, D. (1990). The machine that changed the world. HarperCollins, NY: Rawson Associates. https://doi.org/10.1002/hfm.4530040310

Young, G., Smith, K., & Grimm, C. (1996). "Austrian" and industrial organization perspectives on firm-level competitive activity and performance. *Organization Science, 7*, 243-254. https://doi.org/10.1287/orsc.7.3.243

Zeithaml, C., & Fry, L. (1984). Contextual and strategic differences among mature businesses in four dynamic performance situations. *Academy of Management Journal, 27*, 841-860. https://doi.org/10.5465/255882

Zipkin, P. H. (1991). Does manufacturing need a JIT revolution? *Harvard Business Review, 69*(1), 40-50.