企業規模與企業年齡是否會干擾企業行為動能

Can Firm Size and Firm Age Moderate Firm Behavioral Momentum?

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摘要：本研究延伸對企業行為及結構慣性影響之探討，並進而釐清企業所展現在行為上的動力如何與其企業規模及年齡相互影響。本研究所探討之模型主要是基於演化及慣性理論，並採用美國122家高科技公司為樣本來驗證其假設，研究結果顯示企業對於其先前行為模式之回應可能牽涉到組織學習及反學習，因為在某些策略層面上(例如：財務槓桿)，企業所表現在行為上之動能並無法持續。此外，相異於傳統的信念，企業規模干擾企業行為動能之影響僅顯現在廠房與設備更新層面上；而企業年齡亦僅能在非生產費用及廣告強度等二層面上，對企業行為動能產生干擾之影響。本研究從多層面之角度出發，來探索企業行為動能，以及企業規模及年齡對企業行為動能所產生之干擾影響，並為學界及業界提供進一步相關佐證說明及發現，以補強對相關議題之瞭解與探討。

關鍵字：常規；組織學習；組織慣性；動能效應；演化論

Abstract：This study extends research on firm behaviors and the influences of structural inertia, clarifying how a firm's behavioral momentum interacts with its size and age. Offering models predominantly based on evolutionary and inertia theories, this study tests hypotheses using data from 122 companies in U.S. high-technology sectors. Results indicate that a firm's response to its prior behaviors may involve organizational learning and unlearning, since firm behavioral momentum does not persist in some strategic dimensions (e.g., financial leverage). Contrary to conventional wisdom, firm size can significantly moderate momentum only on the dimension of plant and equipment (PE) newness, whereas firm age can moderate momentum on the dimensions of non-production overhead and advertising intensity. These findings provide researchers and business practitioners with evidence about firms' responses to their prior behaviors and the significance of firm size and firm age, according to a multi-dimensional perspective.

Keywords ： Routines; Organizational learning; Organizational inertia; Momentum effect; Evolutionary theory

1. Introduction

For many years, organizational behavior has been carefully researched and analyzed (Barnard, 1938; Cyert and March, 1963; March and Simon, 1958; Simon, 1947, 1982). Organizational learning is a key concept in the study of firm behaviors (Cyert and March, 1963). The analysis of firm behaviors involves organizational learning because organizational learning is based on a firm's history and routines (Levitt and March, 1988) and because learning processes direct the development of routines (Eisenhardt and Martin, 2000). Hence, routines determine firm behaviors and are "a source of consistency" (Essén, 2008, p. 1635), and they function as "carriers of knowledge and experience" (Cyert and March, 1963, p. 224). Nelson and Winter (1982) further argued that a firm's routines embody its capabilities and that firm behaviors are path-dependent; hence,

organizations are regarded as history-dependent systems (Cyert and March, 1963; March and Simon, 1958). Consequently, how a firm responds to its prior behaviors involves a momentum that causes the firm to maintain the direction and pattern of its prior decisions (Miller and Friesen, 1980). From an evolutionary perspective, momentum should exist in a firm, and firms' current activities should be a function of their historical patterns. Therefore, theoretical arguments from evolutionary perspectives can lead to the testable arguments that momentum in a firm significantly influences its key activities and that firm behaviors are predictable and path-dependent. In theory, firm momentum exists and influences firm behaviors.

As proposed by Isaac Newton, the first law of physical motion states that "all observed changes in the state of motion of bodies are caused by discoverable external actions" (Plaud *et al.*, 1999, p. 165). Originating from the physical sciences, the concept of momentum has been variously defined and applied in the social sciences, including in studies of sports (Adler and Adler, 1978), political campaigns (Mutz, 1997), financial markets (Deaves and Miu, 2007; Lee and Swaminathan, 2000), and operant behavior (Nevin *et al.*, 1983; Plaud *et al.*, 1997). In particular, behavioral momentum-"the persistence of behavior under altered environmental contingencies"-is relevant to behavior analysis in terms of "shaping strong behaviors and ensuring effective relapse prevention strategies in behavior modification and therapy" (Plaud *et al.*, 1999, p. 165). However, related studies, although scarce, have been devoted to human behavioral momentum, and few studies address momentum in firms from a behavioral perspective.

In their study on organizational inertia and momentum, Kelly and Amburgey (1991) suggested that "structural inertia varies with organizational size and age" (p. 594). Size relates to resistance to change (Hannan and Freeman, 1984); "organizational behavior becomes predictable, rigid, and inflexible" as organizations increase in size (Quinn and Cameron, 1983, pp. 34-35). Structural stability increases with age, since older organizations have had time to formalize their relationships and standardize their routines (Stinchcombe, 1965). Therefore, both size and age may have an impact on organizational behaviors. Empirical studies on this topic, however, are scarce. Thus, this study fills the gap by

focusing on the following two research questions. Does behavioral momentum prevail in a firm? Can firm size and age moderate behavioral momentum?

To examine issues relating to momentum's main effect, the subject will be considered from an evolutionary perspective. Chung *et al.,* (1987) defined momentum, in regard to a firm's performance, as "a function of its pre-succession performance" (p. 328). The previous section also addresses introductory issues of the moderating effect from an inertia perspective to test whether firm size and age can moderate the main effect of behavioral momentum. Thus, this study offers two fundamental contributions to the literature as well as to business practitioners. First, this research includes various strategic dimensions in the study of firm momentum in order to analyze the related issues from multiple dimensions rather than just the single dimension of business activities. Second, this study elaborates arguments to further the debate on firm behavioral momentum, particularly its interactions with firm size and age, in order to generate results about firm behaviors (i.e., how firms respond to their prior behaviors and whether their sizes and ages affect their momentous forces, from a multi-dimensional perspective).

This study contains five sections. The first section addresses momentum issues from the evolutionary and inertia perspectives, in order to develop the hypotheses further. The second section addresses the method used to analyze the data from a sample of 122 firms in the high-technology sectors in the United States. The third section explains the results from the empirical tests of the models run in the Stata and SPSS software programs. The fourth section addresses the conclusion and presents a discussion of the findings from the empirical tests, noting implications for the managerial and theoretical fields. The final section addresses the limitations of the current study and offers recommendations for future research.

2. Theory and Hypotheses

2.1. Firm Behavioral Momentum

Behavioral momentum has gained a great deal of attention, but most

attention is paid to personal behaviors and psychology (Li and Wehr, 2007; Pipkin and Vollmer, 2009; Volkert *et al.*, 2008). As momentum can be regarded as "resistance to disruption" (Porritt *et al.*, 2009, p. 295) and Plaud *et al.*, (1999) regarded behavioral momentum as "the persistence of behavior under altered environmental contingencies" (p. 165), while Li and Wehr (2007) regarded behavioral momentum as habits and routines adhered to behaviors, Chung *et al.*, (1987) discussed the effect of momentum, explaining that a firm's performance is a function of its prior performance, implying that a firm's pre-succession performance should affect post-successional performance. That is, research on behavioral momentum can be applied not only to individual behaviors, but also to firm behaviors, which receive less attention. Building on a concept from the physical sciences, firm behavioral momentum denotes a firm's performance or behaviors being a function of its performance or behaviors before environmental contingencies are altered (e.g., a CEO succession). Firm behaviors are path-dependent and routine-based. Prior knowledge that is embedded in a firm's specific routines is "cumulative and follows a particular path of development" (Liyanage and Barnard, 2002, p. 37). In technological development, for example, the path of investing in technologies depends on a firm's past. In other words, historical paths play a key role in determining the pace of future technological change (Redding, 2002). Therefore, path dependency generates a force of movement to carry on the past patterns of activities. Momentum is a tendency to maintain existing motion, and it can refer to an object's quantity of motion. As Chung *et al.*, (1987) noted, "things in motion tend to remain so while things not in motion tend to remain stationary" (p. 326). The same tendency is evident in firm behaviors; a firm tends to continue its present course (Chung *et al.*, 1987) or to "balance the tendency toward stability, brought about by prior investments" (Mumford *et al.*, 2000, p. 13).

Therefore, the force of movement continues the patterns of a firm's activities over time, and the momentum effect from preceding periods influences later behaviors. "As circumstances change, a firm may be required to undergo a 'core logic shift' to maintain consistency between its strategy and its strategic context" (Lengnick-Hall and Wolff, 1999, p. 1109). Since firm activities are multi-faceted,

a study on persistence of firm strategies should involve multiple dimensions. Hence, this study involves various dimensions of strategic persistence proposed by Finkelstein and Hambrick (1990), and these dimensions include plant and equipment (PE) newness, inventory level, non-production overhead, financial leverage, advertising intensity, and research and development (R&D) intensity. Therefore, this study constructs its first set of hypotheses regarding firm behavioral momentum in several strategic dimensions-PE newness, inventory level, non-production overhead, financial leverage, advertising intensity, and R&D intensity-in order to examine the momentum of firm behaviors from multiple activities rather than a single firm activity to better understand how firm behavioral momentum prevails in a firm.

> *H1a: A firm's pre-succession performance in PE newness positively affects its post-succession performance in PE newness.*

> *H2a: A firm's pre-succession performance in inventory levels positively affects its post-succession performance in inventory levels.*

> *H3a: A firm's pre-succession performance in non-production overhead positively affects its post-succession performance in non-production overhead.*

> *H4a: A firm's pre-succession performance in financial leverage positively affects its post-succession performance in financial leverage.*

> *H5a: A firm's pre-succession performance in advertising intensity positively affects its post-succession performance in advertising intensity.*

> *H6a: A firm's pre-succession performance in R&D intensity positively affects its post-succession performance in R&D intensity.*

2.2. The Moderating Role of Firm Size

Structural inertia is regarded as one of the sources that may affect a firm's efforts for a core logic change (Lengnick-Hall and Wolff, 1999). Based on the fundamental assumptions by Hannan and Freeman (1984), structural inertia theory can be concluded as "organisations that develop reproducibility through institutionalising and standardising processes, are more able to meet reliability and accountability requirements" (Pearse, 2009, p. 377). Since routines determine firm behaviors and are "a source of consistency" (Essén, 2008, p. 1635), firm behaviors are routine-based and firm behavioral momentum is "fueled by familiarity and experience" (Lengnick-Hall and Wolff, 1999, p. 1127). That is, firm actions' patterns may lead to firm momentum, affected by familiarity and experience. Since routines with experience may be entrenched, structural inertia theory can be used to "provide some insights into the role of experience in the development of systems and processes that contribute to structural capital" (Pearse, 2009, p. 376). Furthermore, structural inertia theory considers that the power of inertial forces may vary with firm size and age (Hannan and Freeman, 1984). Hence, firm size and age can be significant factors to moderate firm behavioral momentum.

According to Kelly and Amburgey (1991), "structural inertia varies with organizational size" (p. 594); accordingly, firm size is associated with a resistance to change (Hannan and Freeman, 1984). As organizations increase in size, "organizational behavior becomes predictable, rigid, and inflexible" (Quinn and Cameron, 1983, p. 34-35). Hence, from a theoretical perspective, firm size should interact with organizational behaviors. In order to study the effect of momentum comprehensively and to advance the search for evidence in the focal puzzle, this study incorporates the theory of structural inertia into its analysis. Because of the association between size and resistance to change, this study proposes to test whether firm size can moderate organizational momentum from various dimensions.

H1b: Firm size can moderate momentum's influence on PE newness, such that the main effect is more positive in larger firms.

H2b: Firm size can moderate momentum's influence on inventory, such that the main effect is more positive in larger firms.

H3b: Firm size can moderate momentum's influence on non-production overhead, such that the main effect is more positive in larger firms.

H4b: Firm size can moderate momentum's influence on financial leverage, such that the main effect is more positive in larger firms.

H5b: Firm size can moderate momentum's influence on advertising intensity, such that the main effect is more positive in larger firms.

H6b: Firm size can moderate momentum's influence on R&D intensity, such that the main effect is more positive in larger firms.

2.3. The Moderating Role of Firm Age

Kelly and Amburgey (1991) also suggested that structural inertia varies with organizational age. Structural stability can increase with age because older firms may have more time to formalize rapports and standardize routines (Stinchcombe, 1965). "Inertia also increases monotonically with age" (Hannan and Freeman, 1984, p. 157); radical change becomes less possible as the organization ages (Cyert and March, 1963). Since age may also influence firm behaviors, this study controls for firm size and firm age to analyze firm behavioral momentum, and it further focuses on the interactive impact of firm age on momentum's influence over the dimensions of strategic persistence. Thus, this study uses firm age as a moderator.

H1c: Firm age can moderate momentum's influence on PE newness, such that the main effect is more positive in older firms.

H2c: *Firm age can moderate momentum's influence on inventory, such that the main effect is more positive in older firms.*

H3c: *Firm age can moderate momentum's influence on non-production overhead, such that the main effect is more positive in older firms.*

H4c: *Firm age can moderate momentum's influence on financial leverage, such that the main effect is more positive in older firms.*

H5c: *Firm age can moderate momentum's influence on advertising intensity, such that the main effect is more positive in older firms.*

H6c: *Firm age can moderate momentum's influence on R&D intensity, such that the main effect is more positive in older firms.*

3. Methods

3.1. Data and Sample

This study's sources of data are the Compustat, Hoover, and Yahoo Finance databases. The data include information on CEOs and firms in high-technology sectors by four-digit Standard Industry Classification (SIC) codes. The relevant SIC codes are those from 2812 to 2899, from 3570 to 3579, from 3612 to 3699, from 7370 to 7379, and from 8011 to 8099; these codes represent electronics-related and health sciences industries as high-technology sectors (Balkin *et al.*, 2000). The study focuses on these industries because examining similar sectors may minimize the interference from possible variations across different industrial realms. The study examines the most recent CEO succession event in each of the firms in the sample, and it collects the data for 6 years (3 years before and 3 years after the CEO succession event). The final sample comprises 122 unique companies.

3.2. Measures

3.2.1. Dependent Variables

The study collected the data for 3 years after the appointment of a new CEO for each firm and calculated the averages for these 3 years in order to measure the firm's post-succession performance in the focal strategic dimensions of persistence. In order to reduce concerns of multicollinearity in the analysis, the following variables are centered:

PE newness. To measure corporate PE newness, net PE is divided by gross PE.

Inventory. To measure corporate inventory, total inventories are divided by sales.

Non-production overhead. To measure corporate non-production overhead, the selling, general, and administrative (SGA) expenses are divided by sales.

Financial leverage. To measure corporate financial leverage, debt is divided by equity.

Advertising intensity. To measure corporate advertising intensity, advertising expenses are divided by sales.

R&D intensity. To measure corporate R&D intensity, R&D expenses are divided by sales.

3.2.2. Independent Variables

To examine the momentous force across a change of CEO, this study also collected the data for the same variables (i.e., PE newness, inventory, non-production overhead, financial leverage, advertising intensity, and R&D intensity) for 3 years prior to the appointment of a new CEO for each firm. Additionally, the study uses the averages for these 3 years to measure the firm's pre-succession performance in the focal strategic dimensions of persistence: previous PE newness, previous inventory, previous non-production overhead, previous financial leverage, previous advertising intensity, and previous R&D intensity. In order to reduce concerns about multicollinearity in the analysis, these variables are also centered.

This study controls for some firm-level variables. Consider, for example, R&D intensity, one of several measures of a firm's innovative performance. Investments in R&D can have an influence on investments in firms' innovative activities and thus on firm performance (Geroski *et al.*, 1993). The impact of innovative acts also suggests a relationship between financial performance and firm innovativeness; firms with greater innovative intensity should experience better financial performance (Roberts and Amit, 2003). Since financial performance may impact a firm's innovative performance, and since prior studies also suggest the inclusion of firm performance in the related studies (Shrader, 2001), this study controls for financial performance.

Moreover, since agency involves the ability to remember the past and imagine the future (Emirbayer and Mische, 1998), and since organizational routines reenact the past, "the performance of routines can also involve adapting to contexts that require either idiosyncratic or ongoing changes and reflection on the meaning of actions for future realities" (Feldman and Pentland, 2003, p. 95). West III and DeCastro (2001) also argued that a firm's path-dependent development depends on positions of weakness and strength, which suggests limits to firm growth. Hence, firm growth may impact firm behaviors and developments. Prior studies have examined sales growth in the related research (Shrader, 2001), and this study also controls for sales growth. Therefore, this study collects data for 3 years after the appointment of a new CEO for each firm, and it uses the averages for those 3 years for the following control variables:

Firm performance. To calculate firm performance, the return on equity (ROE) is used and the ROE is centered to reduce any possible multicollinearity in the analysis. ROEs are available in the Compustat database.

Sales growth. To calculate sales growth, annual sales changes are measured and centered to reduce any possible multicollinearity.

Furthermore, as previously indicated, Kelly and Amburgey (1991) suggested that "structural inertia varies with organizational size and age" (p. 594). Firm size relates positively with resistance to change (Hannan and Freeman, 1984); "organizational behavior becomes predictable, rigid, and inflexible" as organizations increase in size (Quinn and Cameron, 1983, pp. 34–35).

Organizational stability increases monotonically with age, since older organizations have had time to standardize their routines (Stinchcombe, 1965); "inertia also increases monotonically with age" (Hannan and Freeman, 1984, p. 157). Hence, radical change becomes less possible as the organization ages (Cyert and March, 1963). Since both size and age may impact organizational behaviors, this study not only controls for firm size and age when detecting firm behavioral momentum, but it also tests any moderating effect (i.e., whether firm size and age can moderate a firm's momentous forces).

Firm size. The firm's total assets are used to calculate the size of a firm. Total assets are available in financial reports and in the Compustat database. To control for the potential diminishing impact and skewness, firm size is measured in a logarithmic form.

Firm age. To calculate the age of a firm, the year of founding is subtracted from the year of a new CEO appointment. Data concerning the firms' ages are available in the Hoover and Yahoo Finance search databases. To control for the potential diminishing impact and skewness, firm age is measured in a logarithmic form.

3.3. Data Analysis

Firm data are pooled from the following SIC codes: from 2812 to 2899, from 3570 to 3579, from 3612 to 3699, from 7370 to 7379, and from 8011 to 8099. The final sample includes 122 unique companies. Statistical analysis is conducted using cross-sectional regression analyses to test the hypotheses. To minimize problems of heteroskedasticity, robust standard errors are used in the statistical models.

This study contains six models in order to demonstrate how firm behavioral momentum prevails and interacts with firm size and age under various dimensions. Model 1 focuses on momentum in PE newness and its interactions with firm size and age. Model 2 focuses on momentum in inventory and its interactions with firm size and age. Model 3 focuses on momentum in non-production overhead and its interactions with firm size and age. Model 4 focuses on momentum in financial leverage and its interactions with firm size and age. Model 5 focuses on

momentum in advertising intensity and its interactions with firm size and age. Model 6 focuses on momentum in R&D intensity and its interactions with firm size and age.

4. Results

Table 1 presents the overall descriptive statistics and correlation matrix of the variables used in Models 1 through 6. Key statistics prior to data transformation to logarithms indicate that the mean company size in the overall sample is about US$ 2.7 billion, and the mean company age is approximately 37 years old. The correlation matrix indicates no correlation between variables that are serious enough to influence multicollinearity on each tested model; furthermore, this study tests for serial correlation using Durbin's h test, and the results indicate no significant serial correlation ($p < .05$). Therefore, concerns about multicollinearity and serial correlation can be relaxed.

4.1. The Main Effect: Firm Behavioral Momentum

Table 2 and Table 3 present the results of six tested models for both the main effect and the moderating effects. For the main effect, the results of Model 1 support **H1a** (previous PE newness: $\beta = 2.266$, $p < .01$); this finding implies that firm behavioral momentum positively persists in PE newness. The results of Model 2 support **H2a** (previous inventory: $\beta = .683$, $p < .01$); this finding implies that firm behavioral momentum positively persists in inventory. The results of Model 3 support **H3a** (previous non-production overhead: $\beta = .568$, $p < .01$); this finding implies that firm behavioral momentum positively persists in non-production overhead. The results of Model 4 fail to support **H4a** (previous financial leverage: $\beta = 1.707$, n.s.); this finding implies that firm behavioral momentum does not persist in financial leverage. The results of Model 5 support **H5a** (previous advertising intensity: $\beta = .758$, $p < .01$); this finding implies that firm behavioral momentum positively persists in advertising intensity. Finally, the results of Model 6 support **H6a** (previous R&D intensity: $\beta = .812$, $p < .01$); this finding implies that firm behavioral momentum positively persists in R&D intensity.

Table 1
Descriptive Statistics and Pearson Correlations[a]

	Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	PE newness	1.5104	.38836															
2	Inventory	.1299	.35478	-.041														
3	Non-production overhead	.4823	1.09854	-.150	.349**													
4	Financial leverage	14.9559	69.96934	.173	-.011	-.016												
5	Advertising intensity	.0129	.03610	-.002	-.032	.008	-.022											
6	R&D intensity	.5516	2.39076	-.020	.856**	.190*	-.036	-.061										
7	Previous PE newness	.5487	.12443	.676**	-.058	-.033	.072	-.032	-.107									
8	Previous inventory	.1263	.26998	-.048	.508**	.901**	.001	-.027	.287**	.027								
9	Previous non-production overhead	.5828	1.94656	-.128	.366**	.988**	-.022	-.010	.210*	-.015	.921*							
10	Previous financial leverage	9.2193	29.47601	.049	-.021	-.043	.671**	.019	-.057	-.033	.002	-.038						
11	Previous advertising intensity	.0177	.04698	.014	-.013	.013	-.017	.832**	-.042	.044	.068	.027	.003					
12	Previous R&D intensity	.3942	1.37465	-.084	.392**	.776**	-.043	-.075	.395**	.009	.743*	.803**	-.065	-.049				
13	Firm size	2.8304	.72605	.072	-.168	-.183*	.363**	.146	-.225*	.001	-.194*	-.201*	.436*	.030	-.258*			
14	Firm age	1.4076	.38253	.054	-.032	-.179*	.201*	.169	-.187*	-.093	-.017	-.174	.313**	.091	-.261*	.410*		
15	Sales growth	.1804	.44253	.059	.072	.239**	-.058	-.060	.174	.052	.214*	.294**	-.091	-.020	.618*	-.224*	-.243**	
16	Firm performance	.2109	1.73693	.126	-.068	-.080	.010	-.018	-.064	-.052	-.073	-.071	.003	-.018	-.083	-.040	.050	-.016

[a] N = 122
** $p < .01$
* $p < .05$

After analyzing the main effect of momentum on six strategic dimensions, the findings reveal that momentum persists in most strategic dimensions (i.e., PE newness, inventory, non-production overhead, advertising intensity, and R&D intensity), but it does not persist in financial leverage.

4.2. The Moderating Effects of Firm Size and Firm Age

As far as the moderating effects are concerned, the results of the six tested models only support ***H1b*** (Model 1/***H1b***: $\beta = .607$, $p < .01$) regarding the moderating effect of firm size, and they support Hypotheses 3c and 5c (Model 3/ ***H3c***: $\beta = .443$, $p < .01$; Model 3/***H5***c: $\beta = .511$, $p < .01$) regarding the moderating effect of firm age. The findings imply that firm size can only moderate momentum's influence on the dimension of PE newness, whereas firm age can moderate momentum's influence on the dimensions of non-production overhead and advertising intensity. Figures 1-3 show the interactive effects, and reveal that firm size can moderate a firm's momentum in the case of PE newness, and that main effect is more positive in larger firms. In the cases of non-production overhead and advertising intensity, firm age can moderate a firm's momentum, and that main effect is more positive in older firms. Contrary to conventional wisdom, structural inertia may not always vary with size and age.

After analyzing the moderating effect of firm size and age on firm momentum, the results provide mixed support for the hypotheses, and further challenge some conventional wisdom regarding a firm's momentum and the influences of firm size and firm age. The next section concludes by addressing these issues and implications.

Table 2
Results of Cross-Sectional Time Series Regression Estimates

	Step 1	Step 2	Step 3		Step 1	Step 2	Step 3		Step 1	Step 2	Step 3	
	H1a		H1b	H1c	H2a		H2b	H2c	H3a		H3b	H3c
Previous PE newness	2.242**		.634	1.435								
Previous inventory					.701**		-.229	-.379				
Previous non-production overhead									.569**		.693**	.168
Firm size [a]		.039	-.314$^+$	.031		-.095$^+$	-.085	-.032		-.189	.058$^+$	.015
Firm age [b]		.047	.123	-.240		.057	-.097	-.178		-.238*	-.110**	-.214**
Sales growth	-.004	.075	.026	.026	-.040	.038	-.039	-.055	-.149$^+$	.514	-.144*	-.147$^+$
Firm performance	.037**	.029**	.035**	.036**	-.007	-.016	-.006	-.005	-.006$^+$	-.050	-.006*	-.007*
Firm size [c] / Firm age [d] x Previous PE newness			.607*	.616								
Firm size/ Firm age x Previous inventory							.634	1.140				
Firm size/ Firm age x Previous non-production overhead											-.093	.443**
Intercept	.277*	1.322**	.928	.491	.054*	.317	.347	.332	.186**	1.283*	.229**	.3718**
F	44.52**	12.24**	29.22**	28.41**	7.44**	3.34*	17.98**	14.53**	5406**	2.12$^+$	2416**	1893**
R-sq	.516	.029	.546	.537	.266	.040	.303	.289	.982	.096	.984	.984
N [e]	122	122	122	122	122	122	122	122	122	122	122	122

[a] Logarithms   [b] Logarithms   [c] Firm size x previous strategic dimensions to test for Hypotheses B.   [d] Firm age x previous strategic dimensions to test for Hypotheses C.   [e] N= # of companies
$^+$ $p < .1$ * $p < .05$ ** $p < .01$

Table 3

Results of Cross-Sectional Time Series Regression Estimates

|	Step 1	Step 2	Step 3		Step 1	Step 2	Step 3		Step 1	Step 2	Step 3	
	H4a		H4b	H4c	H5a		H5b	H5c	H6a		H6b	H6c
Previous financial leverage	1.770$^+$		.104	3.896								
Previous advertising intensity					.762**		.247	-.097				
Previous R&D intensity									.857**		.058	-2.942
Firm size [a]		33.990$^+$	7.560	7.468		.004	.001	-.004$^+$		-.392	-.370	-.206
Firm age [b]		14.311*	-3.667	-1.383		.013	.001	-.010**		-.647$^+$	-.271$^+$	-.778
Sales growth	-.302	5.357	.587	1.459	-.004	-.001	-.003	-.002	-1.108$^+$	.296	-1.835$^+$	-1.585
Firm performance	.348	.865	.456	.548	-.001	-.001	-.001	.001	-.031	-.082	-.029	-.041
Firm size [c] / Firm age [d] **x** Previous financial leverage			.362	-1.200								
Firm size/ Firm age **x** Previous advertising intensity							.182	.511**				
Firm size/ Firm age **x** Previous R&D intensity											.526	4.137
Intercept	.727	-102.793*	-14.026	-18.502	.002	-.016	-.001	.004	.345$^+$	2.465	1.771	1.893
F	1.81	2.05$^+$	3.35**	3.78**	39.22**	1.76	32.41**	20.66**	3.62*	1.97	7.56**	2.98**
R-sq	.497	.142	.503	.505	.834	.035	.871	.900	.191	.053	.227	.236
N [e]	122	122	122	122	122	122	122	122	122	122	122	122

[a] Logarithms [b] Logarithms [c] Firm size x previous strategic dimensions to test for Hypotheses B. [d] Firm age x previous strategic dimensions to test for Hypotheses C. [e] N= # of companies
$^+$ $p < .1$ * $p < .05$ ** $p < .01$

Figure 1

Regression Lines for Pre-succession Performance in PE newness
Explaining Post-succession Performance in PE newness for Firm Size[2]
(+1 and −1 Standard Deviations from the Mean)

Larger firms

Post-successio
n Performance
in PE newness

Smaller firms

Pre-succession Performance in PE newness
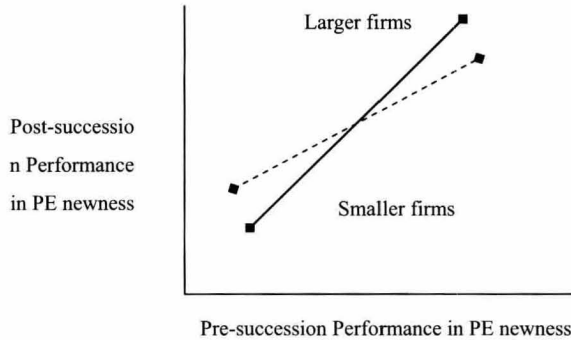
Figure 2

Regression Lines for Pre-succession Performance in Non-production
Overhead Explaining Post-succession Performance in Non-production
Overhead for Firm Age[3]
(+1 and −1 Standard Deviations from the Mean)

Post-succession
Performance in
Non-production
overheads

Older firms

Younger firms

Pre-succession Performance in Non-production
Overheads

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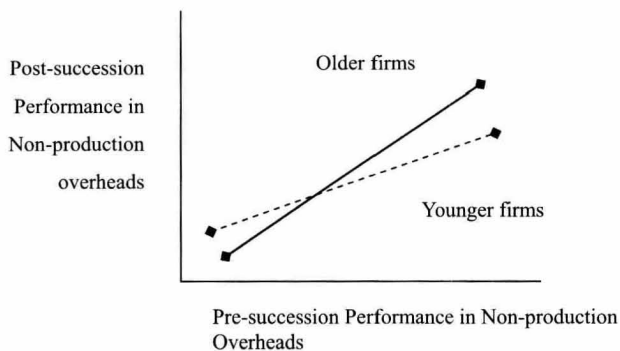
[2] Larger firms: the solid line
[3] Older firms: the solid line

Figure 3
Regression Lines for Pre-succession Performance in Advertising Intensity
Explaining Post-succession Performance in Advertising Intensity for
Firm Age[4]
(+1 and −1 Standard Deviations from the Mean)

Pre-succession Performance in Advertising intensity
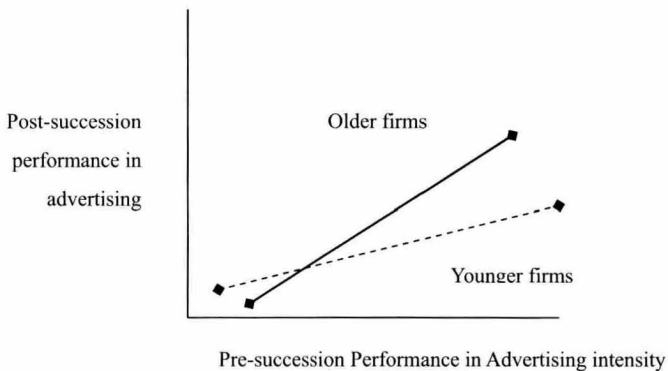
5. Conclusions and Discussion

Does behavioral momentum prevail in a firm? Can firm size and firm age moderate that momentum? Having centered the analysis on these two main research questions, this study concludes as follows.

A firm's momentum in PE newness, inventory, non-production overhead, advertising intensity, and R&D intensity is found to be significant. That is, a firm's routine-based behaviors can be found in a firm's persistence in these strategic dimensions. On the other hand, a firm's momentum is found to be insignificant for financial leverage; even if a firm's behaviors are routine-oriented, those behaviors do not apply to the firm's persistence in financial leverage.

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[4] Older firms: the solid line

Overall, does a firm's momentum matter in responding to a firm's prior behaviors? The results of this study reveal an important focus, from the perspective of the routine-oriented approach (i.e., whether organizations learn or unlearn; Tsang and Zahra, 2008). Based on the present analysis, momentum's influence is most significant in the strategic dimensions of persistence (i.e., PE newness, inventory, non-production overhead, advertising intensity, and R&D intensity). The findings, which provide mixed support for the hypotheses of firm behavioral momentum, indicate that firms' responses to their prior behaviors may involve both organizational learning and unlearning. Moreover, organizational learning may be limited by various factors that can encourage anti-learning and routines (Salaman, 2001).

Firm size can only moderate momentum's influence on PE newness, whereas firm age can moderate momentum's influence on non-production overhead and advertising intensity. Hence, can firm size and firm age moderate a firm's momentum? Based on the present analysis, the moderating impact of firm size and firm age on momentum's influence over the strategic dimensions of persistence is limited; it only has a significant role in PE newness (for firm size) and non-production overhead and advertising intensity (for firm age).

The results of this study reveal another important focus, from the perspective of structural inertia; this further complements the rather rich body of studies that focus on the one-dimensional investigation of business activities. The findings, which provide mixed support for the hypotheses concerning the moderating impacts of firm size and age, may counteract the conventional wisdom or theories about structural inertia. The current study challenges the common belief that structural inertia generally increases with firm size and firm age. Thus, the present analysis is devoted to studying these expectations, based on theoretical arguments regarding different dimensions under various structures, to investigate such impact on a firm's momentum.

This study helps clarify the impact of firm size and age on firm behaviors. The implications lean toward the conclusion that the anticipated impact of firm size and age is mythical because structural inertia may be significant only in the persistence of PE newness, non-production overhead, and advertising intensity.

Hence, overall, the influence of firm size and age is limited and should not be a major concern regarding organizational change.

Therefore, in terms of managerial implications, first, the present study provides important findings from the main-effect examination; it reveals that a firm's momentum does not particularly persist in financial leverage, which implies that a CEO change may disrupt a firm's behavioral momentum only on financial leverage, while momentum on the other strategic dimensions (i.e., PE newness, inventory level, non-production overhead, advertising intensity and R&D intensity) remain prevalent, regardless of a CEO change. That is, a new CEO may not necessarily change a firm's behavioral momentum. These findings provide boards of directors with evidence as to how CEO succession matters as a strategic tool in a firm's behavioral change. Second, the present study also provides important findings from the moderating-effect examination; it reveals that larger firms can strengthen a firm's behavioral momentum on PE newness, while older firms can strengthen a firms' behavioral momentum on non-production overhead and advertising intensity. That is, firm size and age matters to firm behavioral momentum under limited circumstances. These findings provide evidence to boards of directors as well as to managers in larger or older firms in terms of how their efforts to moderate behaviors can pay off.

With regard to theoretical implications, first, from the perspective of the main-effect examination, the current findings may encourage more discussions about the applicability of path dependency in a more practical manner, if firm behaviors are actually path-dependent and routine-based. From an evolutionary perspective, momentum should exist in a firm, and firms' current activities should be a function of their historical patterns. However, the empirical findings are contrary to conventional wisdom and theoretical arguments, and further highlight that firm behaviors may involve organizational learning and unlearning. Second, from the perspective of the moderating-effect examination, this study provides researchers and business practitioners with evidence-based findings concerning the possible influence of firm size and age on managing firm behaviors. In the case of PE newness, firm size can moderate a firm's momentum, and that main effect is more positive in larger firms. In the cases of non-production overhead

and advertising intensity, firm age can moderate a firm's momentum, and that main effect is more positive in older firms. That is, these findings imply that firm size and firm age may be important, but not influential enough to counteract or moderate a firm's momentum in many cases, which can be contrary to the theory of structural inertia. These findings serve to dissolve the arguments about whether organizational momentum exists in a firm and whether structural inertia affects firm behaviors. Hence, this study provides insightful thoughts from multi-faceted perspectives to develop further dialogue for future research, which will be discussed in the next section.

6. Limitations and Directions for Future Research

This study, like any study, suffers from some limitations. First, the present study examines firms in high-technology sectors and does not include firms from other sectors. Hence, the empirical findings may only have meaning for the particular sectors under study, which may limit their explanatory power or generalizability for other sectors. In future research, this study should be extended to other sectors in order to validate further the explanatory power of the current findings.

Second, this study analyzed firm behavioral momentum in formal institutions. Future research may extend the study to examine informal institutions such as trust and culture, since informal institutions are also thought to be path-dependent (North, 1990; Wan, 2005).

Third, this study uses 6 years of financial data, covering both pre- and post-succession periods, to study the strategic dimensions of persistence. Data collection may be expanded to a longer time frame, due to the nature of some of the variables; for example, it may take more than 6 years to realize the return from R&D investments.

Fourth, even though the sample size meets the guidelines suggested by Bentler (1985), larger sample sizes that cover a wider variety of industries on a comparative analysis and that cover longer time periods are recommended in order to enhance and improve the validity of the findings.

Last but not least, the present study can be modified to further examine whether firm size and firm age can each affect a firm's behavioral momentum, and how such relationships can be moderated by a firm's strategic dimensions to advance our understanding of factors that may affect momentum from different perspectives.

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