"Austrian" and Industrial Organization Perspectives on Firm-level Competitive Activity and Performance

Greg Young • Ken G. Smith • Curtis M. Grimm
North Carolina State University, College of Management, Raleigh, North Carolina 27695-7229
University of Maryland at College Park, College of Business and Management, College Park, Maryland 20742
University of Maryland at College Park, College of Business and Management, College Park, Maryland 20742

Abstract

Drawing on the Austrian school of economics and the structure-conduct-performance (s-c-p) paradigm of industrial organization, the authors present and test a dynamic model of competitive activity and performance. They examine the model in two stages. First, they explore the influence of industry-level and firm-level cooperative mechanisms on firm-level competitive activity. Second, they examine the effect of firm- and industry-level competitive activity on firm performance.

The authors use the dynamic model of competitive activity to examine the complex linkages between the firm's environment, its actions, and its performance outcomes. They report a longitudinal analysis of a sample of 1,903 competitive moves undertaken in the software industry. Hypothesis testing supports the relationships in the model argued from the Austrian perspective, but provides only partial support for those derived from the s-c-p paradigm. Firm-level cooperative mechanisms are found to increase the firm's competitive activity, and firm-level competitive activity is related positively to the firm's return on assets and return on sales. Contrary to expectation based on the s-c-p paradigm, industry-level cooperative mechanisms are not related to the firm's competitive activity or to its performance. Consistent with the IO paradigm, however, a measure of industry rivalry that directly captures industry-level competitive activity is related negatively to firm-level performance.

(*Austrian Economics*; *Dynamic Strategy*; *Hypercompetition*; *Industrial Organization Economics*; *Inter-firm Cooperation*; *Performance*)

That firm-level competitive action is at the core of business strategy and competitive positioning is well accepted (Chen et al. 1992, Mintzberg 1978, Porter 1980: ch. 5; Thompson and Strickland 1993: 77). Indeed, the dynamic strategy research stream focuses on the relationship between competitive action and competitive advantage (e.g., Bettis and Weeks 1987, Chen et al. 1992, MacMillan et al. 1985, Smith et al. 1992). The more recent hypercompetition concept builds on that dynamic view of strategy to address market environments characterized by extremely vigorous competitive action, in which sustainability of competitive advantage depends on the speed of action and the extent of competitive rivalry (D'Aveni 1994: 217).

Dynamic firm-level competitive action in hypercompetitive environments has three important characteristics. First, competitive advantage is short lived because frequent aggressive firm-level action disrupts causal linkages between competitive conduct and performance outcomes established in the market status quo. Second, firms must undertake series of actions to continuously recreate competitive advantage. Finally, in a hypercompetitive marketplace, firms with more competitive activity theoretically will have superior performance over time in relation to rivals with less activity (D'Aveni 1994: 12, 258, 364).

The key role of firm-level action in the hypercompetitive market is consistent with the emphasis on market processes described by the Austrian school of economics (see, e.g., Jacobson 1992, Kirzner 1976, 1979, 1992, Schumpeter 1934). According to Austrian economics, organizational action (1) constitutes the *critical* market process, (2) can disrupt linkages between competitive conduct and performance found in the status quo of the marketplace, and (3) can convert otherwise neglected opportunity to the advantage of the acting organization, and by diffusion to the larger marketplace.

The focus on organizational action and its role in market processes is a major contribution of the Austrian school that has informed the dynamic strategy

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research stream (Smith et al. 1992: 4) as well as the hypercompetition concept (D'Aveni 1994: 365). The strategy literature, however, has largely failed to subject the Austrian approach to critical empirical examination (Jacobson 1992: 784). Moreover, theoretical tension between the Austrian school and the structure-conduct-performance (s-c-p) paradigm of industrial organization (Bain 1951), a well-researched root discipline of the strategy field, lends urgency to the task of testing the propositions of the Austrian school.

The tension between the s-c-p paradigm and the Austrian school arises from the common focus of the two perspectives, namely the linkages between the market environment, competitive conduct, and performance outcomes. The perspectives diverge in several respects, but two important differences paramount to our present research concern (1) competitive conduct outcomes arising from cooperative mechanisms between rivals, and (2) performance outcomes expected from competitive conduct.

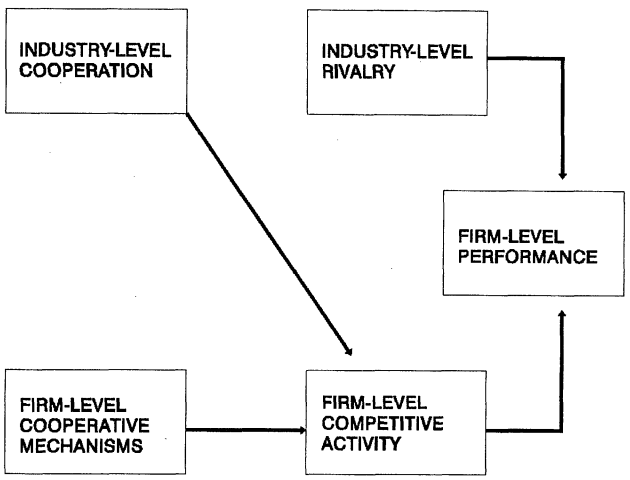
Drawing from the Austrian school, D'Aveni (1994: 333–341) argues that in hypercompetition firms use horizontal cooperative mechanisms, or relationships with rivals for mutual benefit (e.g., joint product development, joint distribution, product licensing), as a means to *escalate* their individual competitive activity. Conversely, according to the s-c-p tradition, horizontal cooperative mechanisms create interfirm linkages that allow *reduction* of rivalrous behavior (Stigler 1964).

According to D'Aveni (1994), firms in a hypercompetitive environment must undertake frequent competitive activity over time to create and recreate competitive advantage. A well-established stream of IO literature (see Scherer and Ross 1990), argued from the industry level of analysis, supports the opposite view that high levels of competitive conduct lead to lower performance of firms within an industry.

The theoretical tension between the Austrian school and the traditional industrial organization paradigm warrants efforts toward resolution. We examine the influence of horizontal cooperative mechanisms on firm-level competitive activity, and the relationship between firm-level competitive activity and performance outcomes. More specifically, we propose a dynamic model of competitive activity that relates cooperative mechanisms and competitive action at both the firm and industry levels of analysis and describes firm-level performance as a function of those multilevel dimensions.

A sample of 1,903 competitive moves undertaken over a nine-year period in the U.S. software industry was used to test our model. As suggested by D'Aveni (1994: 2), competitive conduct in the U.S. software industry provides a uniquely comprehensive view of the way competitors act to build their own advantage.

Figure 1 Dynamic Model of Competitive Activity



A Dynamic Model of Competitive Activity

We introduce a dynamic model of competitive activity that explicitly treats firm-level competitive action as a consequence of firm participation in cooperative mechanisms and as an antecedent of firm performance, within the larger context of industry cooperation and rivalry. The model, depicted in Figure 1, thus incorporates cooperative and competitive aspects of firm-level action with comparable concepts of cooperation and competition at the industry level. In Figure 1 we intentionally omit relationships between firm- and industry-level cooperation and between firm- and industry-level cooperation and industry-level rivalry and firm-level performance. We control for those relationships in hypothesis testing.

Our research segments conduct into two components, the cooperative and competitive activity of the individual firm and the cooperative and competitive activity of that firm's rivals (referred to as industry cooperation and competitor rivalry). Our focus, as represented by the arrows in Figure 1, is on the influence of firm- and industry-level cooperation on firm-level competitive activity and the influence of firm- and industry-level competitive activity on firm-level performance.

The multilevel framework allows integration of the Austrian school with the structure-conduct-perfor-

mance paradigm from IO economics. Importantly, the s-c-p paradigm treats the industry as the primary unit of analysis, whereas in our present model primary attention is on the individual firm. The change of focus from industry conduct to individual-firm activity is consistent with recent development in IO theory. For example, game-theoretic techniques that model rivalry have applied industry-level theory to the examination of competitive conduct at the firm level (Fraas and Greer 1977, Saloner 1991), providing additional support for the disaggregate perspective. Porter (1981) noted the shift in the unit of analysis in industrial organization research to include both the firm and the industry. That development should not be theoretically surprising, as the importance of market structure is that it induces firm-level conduct (Caves 1972).

Firm-level competitive activity is defined here as the total number of competitive actions a firm takes in a given year. That approach is consistent with D'Aveni's (1994), as well as with IO literature suggesting that competitive actions among industry incumbents are the fundamental core of competitive conduct (Caves 1984, Porter 1980). Drawing on literature concerning competitive moves and advantage (Caves 1984, D'Aveni 1994, Khandwalla 1981, Pennings 1981, Porter 1980, Salop and Scheffman 1983, Schmalensee 1978), we consider competitive activity to include product introductions and announcements, as well as marketing and promotion campaigns (including price cuts).

We define the level of competitive activity in the industry (industry-level rivalry) as the aggregation of firm-level competitive activity minus the competitive activity of the focal firm. When the number of competitive actions between all firms in the industry is high, rivalry will be intense. Our definition is consistent with the IO literature suggesting that rivalry be framed as a sequence of competitive moves among industry incumbents (Caves 1984, Porter 1980). Rivalry has been similarly defined in several recent studies (Schomburg et al. 1994, Smith et al. 1992).

We define firm-level cooperative mechanisms to be formal interfirm agreements including equity purchases, mergers, technology licenses, and participation in trade associations and technology consortia (Bresser 1988, Dollinger 1990, Harrigan 1985, Koh and Venkatraman 1991). That definition focuses on the linkages between organizations over which flow communication and resources. We recognize that some types of cooperative mechanisms may be difficult to distinguish from competitive action. For example, a cooperative mechanism may position a focal firm in some hybrid organization to compete in a broader scope of product-markets. The purpose of our article, however, is to examine the contrasting arguments about the relationship between horizontal interfirm linkages and competitive activity. Hence, it is important to focus on the theoretical distinction between the two constructs.

In the IO tradition, according to the s-c-p paradigm, the proliferation of cooperative mechanisms between all firms in an industry is an important dimension of industry structure (Bain 1951, Stigler 1964). We define the level of cooperative mechanisms in the industry (industry-level cooperation) as simply the aggregation of firm-level cooperative mechanisms minus those of the focal firm. That is, when the number of cooperative mechanisms involving firms in an industry is high, the level of industry cooperation will tend to be high.

The model depicted in Figure 1 thus reflects both the firm-level emphasis of the Austrian school and the industry-level focus of the industrial organization perspective. In the next section we develop hypotheses describing the relationships portrayed in Figure 1 in more detail. The hypotheses specify how, within the context of industry cooperation and competitor rivalry, the cooperative activity of the firm will influence its competitive activity, and how the firm's competitive activity will in turn influence its performance.

Hypotheses

The Influence of Industry- and Firm-level Cooperative Mechanisms on Firm-Level Competitive Activity

Cooperative mechanisms are actions of one firm that form connections or coalitions with other firms in the industry (Porter 1980: 88, 1985: 57). The consequences of cooperation differ with the level of analysis (industry vs. firm).

As is consistent with the s-c-p paradigm of the IO tradition and the industry level of analysis, we expect cooperative mechanisms to provide opportunities for industry participants to communicate and to learn about each other's goals and incentives (Stigler 1964). Scherer and Ross (1990) argued that firms can move their industry in the direction of greater overall industry cooperation by increasing the level of industry communication. One mechanism for achieving such communication is cooperative agreements between firms. Hence, as the number of cooperative agreements between firms in the industry increases, the ease of communication between firms would increase and the resultant social structure of the industry would become more cooperative.

The proliferation of cooperative mechanisms at the industry level increases opportunities for informal collusion or tacit cooperation between firms (Bresser 1988, Oster 1990, Stigler 1964) and decreases the vulnerability of firms to threats from competitor rivalry. As a result, firms can establish higher prices and achieve higher performance from any given portfolio of competitive activity than would otherwise be possible (Koh and Venkatraman 1991, Nielsen 1988, Scherer and Ross 1990: 213, 226). Further, formal cooperative agreements in an industry serve as rules for behavior that make competitiveness more predictable (Gottfredson and White 1981), thereby reducing the firm's risk associated with expected returns from competitive activity. Thus, in a cooperative industry context, firms can achieve performance objectives with fewer competitive actions than would be necessary in a less cooperative environment.

H1. *As the number of industry-level horizontal cooperative mechanisms increases, firm-level competitive activity decreases.*

Our expectation in H1 is that the industrywide proliferation of cooperative mechanisms will constrain or have a negative influence on each firm's competitive activity. In contrast, consistent with the Austrian perspective, we expect firm-level cooperative mechanisms to have a positive impact on each participant's tendency to undertake competitive activity (D'Aveni 1994, Kirzner 1976: 85, Rizzo 1982: 58–59). Horizontal cooperative mechanisms give participants access to both tangible and intangible complementary resources, including knowledge, technology, and/or physical assets (Koh and Venkatraman 1991, Mariti and Smiley 1983, Nielsen 1988). For example, a firm with strong product development skills but relative weakness in marketing may license its innovative products to a competitor with distribution strengths.

As Lenz (1980: 228) has argued, firm-level competitive activity is a function not only of the resources a firm directly owns, but also of resources it can access from relationships and interactions with other organizations in its environment. Cooperative mechanisms provide means whereby participating firms can compete for position more economically than firms that must acquire resources unilaterally. Thus, cooperative mechanisms enable each participant to undertake more competitive activity than is possible with the resources accessible to any participant alone (D'Aveni 1994: 338, Koh and Venkatraman 1991, Lenz 1980: 228, Mariti and Smiley 1983, Nielsen 1988).

H2. *As the number of horizontal cooperative mechanisms in which a firm participates increases, competitive firm activity increases.*

Following the dynamic model in Figure 1, we next develop hypotheses addressing the influence of industry- and firm-level competitive activity on firm performance.

The Influence of Industry Rivalry and Firm-level Competitive Activity on Firm-level Performance

Framing firm performance as a consequence of firm action is consistent with IO literature suggesting that rivalry be framed as a sequence of competitive actions among industry incumbents (Caves 1984, Porter 1980). Importantly, the s-c-p paradigm of IO posits that the conduct of firms in an industry will in turn affect performance. Researchers in that tradition, however, usually infer rather than directly measure rivalry (Porter 1981).

According to the s-c-p paradigm of IO economics, an industry characterized by high levels of rivalrous competitive conduct has negative consequences for firm performance. Intense rivalrous competition in an industry can drive up the acquisition costs of scarce resources or spur suppliers to extend distribution to rivals (Barney 1991, Mahoney and Pandian 1992, Peteraf 1993). In addition to competition for resources, there may be competition for product/market positioning as rivals attempt to respond to or deter competitive action.

The IO perspective is that firm-level activity may provoke industry rivalry that dissipates potential performance outcomes in a competitive battle. Strategy scholars also have used game theoretic formulations of the prisoners' dilemma model to demonstrate that high levels of rivalry lead to low profits for competitors (Bettis and Weeks 1987, Porter 1980, Schomburg et al. 1994, Smith et al. 1992). Too much activity, in the aggregate, hurts firm-level performance.

In short, the level of industry rivalry affects profitability prior to strategy implementation (ex ante) by increasing the costs of resource acquisition and affects it after implementation (ex post) by increasing the cost of defending against product/market rivals. Thus, the threat of competitive retaliation reduces the expected benefit associated with competitive action, thereby reducing the profit incentive to undertake competitive activity (Astley and Fombrun 1983, Khandwalla 1981, Scherer and Ross 1990, Stigler 1964).

A rich array of IO empirical studies have found inferential support for that notion by showing a positive linkage between industry concentration and industry profitability (Scherer and Ross 1990: 422–423). Although the degree of rivalry was not measured directly in those studies, the s-c-p paradigm implies that high concentration produces lower levels of rivalry and thereby higher profits.

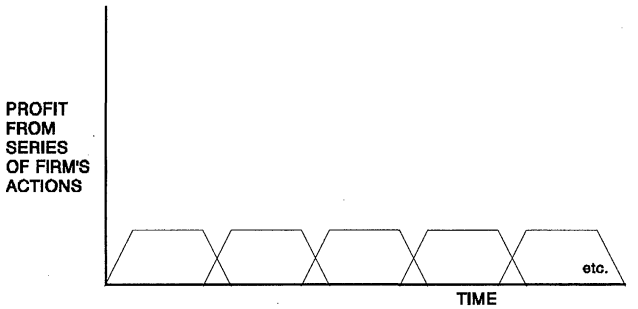
A more recent line of strategy research has operationalized the conduct construct, affording a direct test of the relationship between rivalry and performance. Schomburg et al. (1994) found a negative relationship between rivalry, defined as the frequency of new product introductions by industry participants, and profitability in the beer, telecommunications, and personal computer industries. Similarly, Smith et al. (1992) demonstrated that competitor rivalry, defined in terms of the frequency of competitive action, was related negatively to industry profitability in the airline industry.

H3. *The greater the level of industry-level competitive activity, the lower the firm-level performance.*

D'Aveni (1994: 10–12) argues that, in a hypercompetitive environment, firm performance is an outcome of a series of competitive actions. That conceptualization is consistent with the Austrian school, which emphasizes that opportunity for profit is the most important incentive for a firm to undertake competitive action (Kirzner 1976, 1979, 1992, Schumpeter 1934). The Austrian school's emphasis on aligning the firm's action with opportunity is well accepted in the strategy field (e.g., SWOT analysis). "Austrian" roots also are evident in the hypercompetition perspective of a firm's performance as an outcome of a series of competitive actions (D'Aveni 1994: 10–12). For example, product introductions and marketing moves are typical strategic thrusts that companies use to seize the initiative in their markets (see Porter 1980: 159, Schomburg et al. 1994), whereas product announcements can create market disruption by unsettling opponents (D'Aveni 1994: 279).

Competitive activity of the firm creates internal organizational assets in the form of skills, routines, and knowledge as well as assets that cross the organizational boundary such as contracts, relationships, brand images, and networks (Nelson and Winter 1982: 99, Porter 1991: 102). Maintaining or enhancing the productive asset base of the firm requires undertaking activities (Porter 1991: 103). In building on asset strengths, the cost of taking action is lower for the firm that has efficiencies derived from a rich history of prior activity. Importantly, the firm with a rich history of activity-derived learning not only has lower costs of supporting superior performance, but also is capable of undertaking more activities in a given time period.

Figure 2 **A Series of Competitive Actions Adds to a Firm's Total Performance Outcome**
(adapted from D'Aveni 1994: 12)



To illustrate the beneficial effect of undertaking more action in a given period of time, Figure 2, adapted from D'Aveni (1994: 12), portrays a series of firm-level actions and their associated cumulative profitability over time. Reflecting the arguments of the Austrian school, each trapezoid in Figure 2 represents a firm's action to exploit a specific opportunity, and its volume represents profits earned by the firm for having acted to seize that opportunity.

The greater the number of trapezoids (actions) and the larger their volume (profits), the greater the firm's performance over time. In a hypercompetitive environment, the erosion of profit for each action (the declining right leg of each trapezoid) comes very soon in time. Thus, in a hypercompetitive industry, the firm that undertakes more actions generates a higher level of performance. We summarize the preceding discussion in the form of a testable hypothesis.

H4. *As competitive firm activity increases, firm performance increases.*

Methods

To test the hypothesized relationships, we constructed a dataset for publicly owned firms in the computer software industry (SIC 7371, 7372, 7373) from two sources. In building the sample, we used information on individual firms, industry structure affecting all firms, and longitudinal dynamics of competition.

Sample

The sample consisted of publicly owned single-business firms in the U.S. computer software industry during the period from 1983 to 1991. Those years were formative ones, for the software industry emerged from the computer hardware industry as a distinct market around 1980 (Standard and Poor's Industry Surveys 1977, 1980, 1984). As *Fortune* noted, "until the Eighties, the computer software business was dominated by vertically integrated companies... that made every element of their products, from silicon to software" (Sherman 1993). Moreover, computer software is a singularly important domestic U.S. industry, one that sets the direction for the global computer industry (Manasian 1993). An example of the dominance of the U.S. industry is evident in Europe: of the top ten independent software vendors operating there, seven are U.S. firms (McCormick and Greenbaum 1992).

Limiting the sample to firms primarily in a single industry ensures that all firms are exposed to the same environment, an important consideration in any strategy research. Unique industry characteristics may be critical in explaining the relationship among important variables (Hansen and Hill 1991), and the components of competitive advantage in one industry may not be appropriate in other industries characterized by different environments. For research on hypercompetition, it is extremely important not to sample unintentionally from more passive industry environments.

For continuity over the period 1983 to 1991, we considered firms to be in the computer software industry if their primary SIC assignment was any of the computer software codes (7371, 7372, or 7373).[1] Such an approach is consistent with the assumption in the literature that organizations in a four-digit standard industry category are horizontally interdependent and share one market (Kim et al. 1985, Palepu 1985, Pennings 1981: 434).

We took a conservative approach to defining software firms and accepted only those identified by both the Standard and Poor's Corporate Directory and the Disclosure database of SEC filings. Firms for which the primary SIC assignments were in agreement in the two sources were accepted as a consensus list of firms in the computer software industry. That approach resulted in 365 firm-year observations for the period from 1983 to 1991.

One firm was dropped from the sample because it appeared in only one year and reported accounting losses equal to more than six times sales. After we dropped 19 other firms because of missing data, the final sample consisted of 345 firm-year observations with 1,903 actions over the period 1983 to 1991.

Notably, the final sample encompassed more than 63% of all industry sales for the 1983–1991 period (based on all 10-K and annual reports classified with the software SIC codes by Disclosure); hence, most of the industry economic activity was captured in the sample. In addition, annual firm profitability, quick ratio test of liquidity, and year-to-year industry growth did not differ significantly between the research sample and the industry norms published by Dun and Bradstreet, as indicated by pairwise t-tests. We therefore concluded that the research sample was representative of the industry.

Firm- and Industry-level Competitive Activity

The focus of our study was on competitive firm activity. Our measure of firm activity followed the recent stream of strategy research on dynamic competition (Bettis and Weeks 1987, Smith et al. 1992), which has introduced a direct measure of competitive actions undertaken by the firm.

Competitive actions were identified by a structured content analysis of published articles (Jauch et al. 1980), a technique used in other studies of dynamic strategy (e.g., Chen et al. 1992; Smith et al. 1991, 1992). We applied a comprehensive, multiple source method and examined citations of the sample firms appearing in the Predicasts F & S Index for the 1983–1991 period. We coded all cited moves of product introductions, product announcements, and marketing/promotion campaigns, typical strategic thrusts that companies use to seize the initiative in their markets (e.g., see D'Aveni 1994: 279; Porter 1980: 17, 76; Schomburg, Grimm, and Smith 1994).

Our method identified *a total of 1,903 rivalrous actions* in the computer software industry for the 1983–1991 period. We selected a random subsample of 2 percent of the 1,903 competitive moves to assess the validity of the published citations observed for the sample. Fifty-eight percent of the subsample had multiple sources. In each and every case in the subsample, agreement between multiple sources was 100%.

The measure of firm-level competitive activity was expressed quantitatively as the annual sum of each firm's moves, an approach that captures the series of competitive activities typically found in a hypercompetitive environment (see Figure 2). The industry-level measure of competitor activity (industry-rivalry) was expressed as the aggregation of firm moves to the industry level minus the focal firm's own competitive activity. Our approach was consistent with that of

Kwoka (1979), who aggregated sample market share data to construct industry concentration values.

Firm- and Industry-level Horizontal Cooperative Mechanisms

Horizontal cooperative mechanisms are business moves undertaken jointly by competitors. We included only cooperative moves that create mechanisms for interfirm communication but are not directly tied to a competitive activity. Building on previous work, we defined horizontal cooperative mechanisms to be equity arrangements, mergers, technology licenses, and participation in trade associations and technology consortia (Bresser 1988, Dollinger 1990, Harrigan 1985, Koh and Venkatraman 1991). Each Predicasts F & S Index citation of such a move in the software industry was counted as one cooperative mechanism for each of the participating firms in the sample. Thus, the measure captured the influence of cooperation for each participating firm without any definitional overlap with competitive activity. The industry-level measure of cooperative mechanisms was expressed as the aggregation of firm-level cooperative mechanisms to the industry level minus the focal firm's own cooperative activity.

Firm Performance

We used two commonly accepted financial measures of firm performance, return on sales and return on assets. The data were collected from annual SEC filings as reported by the Disclosure database. Because the legal requirements associated with SEC filings mandate accurate reporting that fairly reflects business conditions, that data source is highly reliable.

Control Variables

Following prior research, we controlled for the size and age of the firm, which may influence the firm's flexibility of action (Aldrich and Auster 1986; Baker and Cullen 1993; Buzzell, Gale and Sultan 1975; Buzzell and Wiersema 1981; Cool et al. 1989; Fombrun and Ginzberg 1990; Nelson and Winter 1982: 310; Smith et al. 1989). The size of the firm was measured by the dollar sales of the firm, as reported in the Disclosure database of SEC filings. That measure is transformed with a log function. The age of the firm was measured in years since original corporate founding, as reported in Standard Corporate Descriptions (S & P 1992) and the Corporate Technology Directory (Corptech 1991).

In addition, we controlled for industry rivalry when examining the influence of industry cooperative mechanisms on firm-level competitive activity. When examining the influence of industry rivalry and firm-level competitive activity on performance, we controlled for industry- and firm-level cooperative mechanisms.

Correlated error terms are common in studies with longitudinal data (Kennedy 1985, Smith et al. 1991). Following Fombrun and Ginzberg (1990), we corrected serial correlation by including as a separate independent variable the dependent variable lagged one period. Table 1 displays correlations for all major variables.

Tests and Data Analysis

We tested hypotheses by applying multiple regression analysis, a typical approach to estimating economic models of firm conduct (Scherer and Ross 1990: 413). Independent measures were lagged one time period behind dependent measures to account for causal relationships implied by the hypotheses.

The dependent variable for H1 and H2 was the number of competitive actions of the focal firm in a year of observation, a continuous measure of firm competitive activity. The entire model was lagged one year to examine directly the causal linkage hypothesized between firm activity and performance. The following hypothesized research model for H1 and H2 was specified for regression analysis.

$$\begin{aligned}\text{Firm-level Competitive Activity}_{t-1} &= b_0 + b_1\ \text{firm-level cooperative mechanisms}_{t-2} \\ &\quad + b_2\ \text{industry-level cooperation}_{t-2} \\ &\quad + b_n\ \text{control variables}_{t-2} \\ &\quad + e \qquad (1)\end{aligned}$$

where b_1 = parameter to be estimated, t_{-n} = years lagged, and e = error term.

H3 addresses the influence of competitor rivalry on firm performance, and H4 examines the influence of the firm's competitive activity on its performance. We tested those hypotheses with a second model similar to that specified in equation 1. Both competitive firm actions and competitor rivalry were specified as the independent variables of interest, and firm performance (measured by return on assets and return and sales) was the dependent variable of interest. Firm- and industry-level cooperative mechanisms were included as controls.

Table 1 Pearson Correlation Coefficients of Major Variables[a]

Variables	Mean	S.D.	1	2	3	4	5	6	7
Firm Level									
1. Competitive activity	5.35	12.19							
2. Cooperative mechanisms	.42	.78	.46***						
3. Return on assets	.06	.32	.22***	.17**					
4. Return on sales	.06	.24	.24***	.20***	.77***				
Industry Level									
5. Competitor rivalry	264.55	99.69	-.02	-.03	-.05	-.04			
6. Cooperative mechanisms	20.64	5.63	.02	-.09	-.00	-.03	.86***		
Controls									
7. Firm size (*natural log*)	11.01	1.53	.43***	.35***	.33***	.35***	.12*	.10	
8. Firm age	12.83	7.48	-.13*	-.06	-.01	-.01	.12*	.10	.23***

[a]Two-tailed test of significance. $N = 345$.
*$p < .05$, ** $p < .01$, ***$p < .001$

$$\begin{aligned}\text{Firm-level Performance}_t &= b_0 + b_1 \text{ firm competitive activity}_{t-1} \\ &\quad + b_2 \text{ industry rivalry}_{t-1} \\ &\quad + b_3 \text{ firm cooperative mechanisms}_{t-1} \\ &\quad + b_4 \text{ industry cooperative mechanisms}_{t-1} \\ &\quad + b_n \text{ control variables}_{t-1} \\ &\quad + e \qquad (2)\end{aligned}$$

Results

H1 and H2

Table 2 reports the statistical results for H1 and H2, in which industry- and firm-level cooperative mechanisms at time $_{t-2}$, respectively, are independent variables of interest and competitive activity at time$_{t-1}$ is the dependent variable. H1 is not supported. That is, cooperative mechanisms at the industry level are unrelated to a firm's competitive activity. In contrast, H2 is supported. As the cooperative mechanisms in which the firm participates increase, competitive firm activity increases (beta = .08, $p < .05$).

H3 and H4

Table 2 also reports the regression results for the models that examine the influence of competitor rivalry (H3) and competitive activity (H4) on firm performance. In those models, firm competitive activity and industry competitor rivalry were entered as the principal independent variables of interest. Return on assets was the dependent measure of firm performance in the first model and return on sales was used in the second.

As argued in H3 the competitor rivalry measure is significant and negative (beta = $-.22$, $p < .05$ for ROA, beta = $-.21$, $p < .05$ for ROS). H4 also is supported, as the influence of firm competitive activity on relative firm performance is positive and significant (beta = .22, $p < .01$ for ROA; beta = .22, $p < .01$ for ROS).

Note that the results are stable despite the collinearity between firm-level horizontal cooperative mechanisms and competitive activity observed in our sample ($r = .46$, $p < .001$, Table 1). The relationships between industry-level competitive activity and firm performance (H3) and between firm-level competitive activity and firm performance (H4) reported in Table 2 are the same when firm-level horizontal cooperative mecha-

Table 2 Results of Regression Analysis[a]

Variables	Competitive Activity[b]	Performance[c] ROA	Performance[c] ROS
Firm Level			
Competitive activity		.222**	.222**
		(.001)	(.001)
Cooperative mechanisms	.075*	-.001	.027
	(.526)	(.018)	(.016)
Industry Level			
Competitor rivalry	-.115	-.221*	-.209*
	(.012)	(.000)	(.000)
Cooperative mechanisms	.055	.122	.146
in the industry	(.161)	(.004)	(.004)
Firm Level Controls			
Size (*natural log*)	.030	-.091	-.074
	(.375)	(.011)	(.011)
Firm age	-.059*	-.008	-.084
	(.067)	(.002)	(.002)
Competitive activity (*lagged*)	.877***		
	(.041)		
Performance (*lagged*)		.452***	.376***
		(.051)	(.054)
Adjusted R^2	.89	.29	.22
F	196.88***	14.04***	10.23***

[a]Standardized regression coefficients reported; one-tailed test of significance. Standard error is in parentheses.

[b]Dependent variable is the firm's competitive moves (product introductions plus marketing and promotion moves) for $year_{t-1}$. Independent variables are for year $_{t-2}$. $N = 148$.

[c]Dependent variable is the firm's performance (either return on assets or return on sales) for $year_t$. Independent variables are for $year_{t-1}$. $N = 229$.

*$p < .05$, **$p < .01$, ***$p < .001$

nisms are not included in the regression model. Further, firm-level horizontal cooperative mechanisms do not become significant when firm-level competitive activity is removed from the model.

Discussion

The purpose of our study was to test hypotheses about competitive firm activity that were derived from the Austrian school of economics and industrial organization economics. We developed a model of competitive activity to examine the influence of industry- and firm-level cooperative mechanisms on firm-level competitive activity, and the link between industry- and firm-level competitive activity and firm performance. Importantly, we found evidence that engaging in firm-level cooperative mechanisms has a positive effect on the firm's competitive activity and that competitive firm activity is related positively to firm performance. Three of our four hypotheses are supported.

Our results show that firm performance increases as competitive firm activity increases, but declines as the intensity of competitor rivalry in the industry increases (see Table 2). An examination of the coefficients, however, shows that unless competitor rivalry provoked by a move is extreme the positive effects of the competitive move will outweigh the possible negative consequence of competitor rivalry.[2] The relative importance of the competitive activity coefficient versus the competitor rivalry coefficient (an industry measure adjusted for the focal firm) highlights the significance of firm action for performance. In particular, it suggests that firm action, for which managers have significant control, can be vital to achieving superior performance even in the face of competitive rivalry.

Recent strategy literature (e.g., D'Aveni 1994, Schomburg et al. 1994, Smith et al. 1992) has encouraged managers and scholars to consider competitor rivalry in terms of the intensity of competitive action and counteraction. Consistent with IO literature, our study empirically demonstrates the negative relationship between industry rivalry and firm performance. Thus, the dynamic action model provides an approach for examining the sources of firm performance in the presence of competitor rivalry.

The model could be extended to examine more comprehensively the determinants of firm competitive activity and industry-level rivalry, as well as to include a link between the amount of firm activity and the level of competitor rivalry. More specifically, firms are not independent in the marketplace; they are affected by each other's actions and are prone to react (Porter 1980, Smith et al. 1992). In addition to the positive effect of competitive activity (observed in the test of H4), there could be a negative aspect if competitive activity leads to increased competitor rivalry.

We are encouraged by the results of our study, but recognize the resource-based argument that sustainable superior performance is associated with moves dominated by the use of imperfectly mobile resources (Barney 1991, Peteraf 1993). Also, the Austrian school has argued that the rate of firm activity depends on variations across firms in luck and the distribution of skills (Kirzner 1979: 135, 154). For example, the ability to anticipate and exploit profit opportunities, a core concept of the Austrian school, is a valuable resource that may be relatively immobile. Researchers could usefully draw on Hall's (1993) framework of linkages

between intangible resources and sustainable competitive advantage to examine imperfectly mobile resources as they relate to competitive activity. The amount of explained variance in our study suggests that unspecified, perhaps intangible, variables influence firm activity.

We examined the dynamic model of competitive activity within the context of the software industry. Future research should explore the generalizability of the model to other environmental contexts. For example, the role of cooperative mechanisms in fast-paced and complex high-tech industries may be different from that in more stable and simpler low-tech industries. Further, Smith and Grimm (1987) found a significant relationship between types of strategy and performance outcomes after, but not before, deregulation in the railroad industry, suggesting that firm action influences performance more when regulatory constraints are removed.

The relationship between firm activity and performance outcomes may also be linked to the number of markets in which firms face each other in competition. For example, software firms may compete in more than one market as the software industry becomes more segmented by customer group and computer platform. Multimarket competition makes the cooperative and competitive interconnections between firms more complex, and competitive activity may be less attractive if rivals have multiple loci for retaliation (Gimeno and Woo 1996). The dynamic model of competitive activity proposed here could be extended to consider the effects of multimarket competition.

Future research also could usefully consider the association between industry structure, firm resources, and firm performance in the context of the individual firm's portfolio of competitive move types and sequencing. For example, some set or sequence of competitive activity may yield more performance benefits or evoke more rivalrous countermoves.

Conclusion

We draw on the Austrian school of economics and the structure-conduct-performance paradigm of industrial organization to add insight to our understanding of the antecedents and consequences of firm-level competitive activity. Our study results indicate that the competitively active firm is likely to participate in cooperative activities. Importantly, we find that competitively active firms outperform less active firms. We submit that the dynamic model of competitive activity provides a framework that is grounded in theory, empirically supported, and particularly suited to the examination of how competitors act in the marketplace to build their own advantage.

Endnotes

[1] Prior to 1987, such firms were identified by a single four digit SIC segment, computer programming (7372). After 1987, the computer programming industry was divided into three SIC codes: computer programming services (SIC 7371), prepackaged software (SIC 7372), and computer integrated system design (SIC 7373). Firms in the original (pre-1987) SIC 7372 later appeared in any of the three new classifications.

[2] For example, the coefficients when firm performance is measured by return on sales indicate that a unit change in the competitive activity variable has a .222 effect on the dependent variable, whereas a unit change in the competitor rivalry variable has a $-.209$ effect on the dependent variable. However, in interpreting the relative magnitude of the coefficients, it is important to recall that standardized betas are reported. The standard deviation of the firm activity variable is 12.19, whereas the standard deviation of the competitor rivalry variable is 99.69. Thus, the positive effect of an individual move is more than eight times the negative effect of a theoretical single rival competitive move, which might be in response to the firm's move.

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