RURAL ECONOMY

A Socio-Cognitive Basis for Strategic Groups: Cognitive Dissonance in Swine Genetics

Desmond Ng

Staff Paper 02-02

Staff Paper

Department of Rural Economy
Faculty of Agriculture, Forestry
and Home Economics
University of Alberta
Edmonton, Canada

A Socio-Cognitive basis for Strategic Groups: Cognitive Dissonance in Swine Genetics

Desmond Ng

Staff Paper 02-02

The author is Assistant Professor, Department of Rural Economy, University of Alberta, Edmonton, Alberta.

The purpose of the Rural Economy 'Staff Papers' series is to provide a forum to accelerate the presentation of issues, concepts, ideas and research results within the academic and professional community. Staff Papers are published without peer review.

Introduction

According to socio-cognitive models in organizational theory literature, managers share similar mental models or cognitive maps of the competitiveness of firms in an industry (Porac et al. 1993; Ginsberg,1994, 156; Reger and Huff, 1993). Managers are increasingly challenged to understand rapidly changing market settings, where their competitive position is continually evolving as competitor initiatives and business dynamics interact complexly. In well managed firms, considerable resources are expended routinely to monitor competitor actions and customer requirements. Over time, this and other information is summarized within the perceptions of managers as cognitive maps of the rivalry network in which their firm operates (Porac, et.al., 1993; Ginsberg 1994). More precisely, as Reger and Huff (1993) comment, that "while cognitive simplification and cognitive elaboration could lead to totally *idiosyncratic* groupings, strategists who work in the same industry environment are expected to develop shared perceptions of the competitive environment over time" (Reger and Huff, 1993, 106) (emphasis added). Cognitive maps are the result of individuals "organizing, simplifying, and interpret[ing] the mass of stimuli that constantly confront them" (Reger and Huff, 1993, 107)[1]. According to personal construct theory (Kelly, 1955), cognitive maps or constructs are defined "in terms of similarities and differences and are organized into systems of meanings which individuals use to develop theories about the environment, to make predictions and guide action"(Reger and Huff, 1993, 107). Although the cognitive map concept has been explored from the manager's perspective, such marketplace perceptions undoubtedly are not limited to the managers in charge of product sales in the market. It seems logical to expect that customers have perceptions of marketplace rivalry. In addition, intermediaries often exist who provide services associated with the product in question, whose activities naturally lead to the development of competitiveness perceptions. However to date, socio-cognitive models in organizational theory have explored little about the differences in cognitive maps outside these management groups.

[1]Another definition of cognitive maps is they serve "to organize complex issues and phenomena into simplified sets of categories and constructs" (Ginsberg, 1994, 156).

From a cognitive map context, the organizing and simplification of stimuli that result in the perceived idiosyncratic groupings of the competitiveness of firms has strong parallels to strategic group theory (Caves and Porter, 1977; Carroll and Swaminathan, 1992; Dranove et al., 1998 ; Tang and Howard, 1992; Thomas and Venkatraman, 1988). Strategic group theory posits that an industry consists of homogeneous clusters of firms whereby each group consists of firms that share similar "objective" firm attributes. However, a cognitive approach involves a re-orientation of this "objective" criterion. Prior studies of strategic group theory have clustered firms based on the "objective" criterion of supply side characteristics, such as "vertical integration and diversification and from operational or functional strategies, such as R&D expenditure, advertising intensity, and marketing channels"(McGee and Thomas, 149,1986). But, since the groupings of firms are based on the subjective interpretations of market participants (firms (swine genetic companies), intermediaries (veterinarians) and end consumers (farmer)), the criterion at which "strategic groups" are clustered reflects an important cognitive component. Hence, a "subjective" or cognitive criterion, as oppose to the "objective" or supply side criterion, is advocated[2]. Thus, from a cognitive context, strategic groups do exist because cognitive maps are the result of individuals "organizing, simplifying, and interpret[ing] the mass of stimuli that constantly confront them" (Reger and Huff, 1993, 107)[3] in which such organization and simplification of mass stimuli in terms of their similarities and differences (Kelly, 1955) serve to construct an individual's perception of how the competitiveness of a groups of firms are grouped or clustered. Therefore, the existence of strategic groups resides in social constructionist arguments. Strategic groups exist because they are perceived through the cognition of market
participants.

[2]This study is not concerned with addressing the current debate at whether "strategic groups exist?" rather this study takes as a point of departure that strategic groups do exist from a cognitive perspective.

[3]Another definition of cognitive maps is they serve "to organize complex issues and phenomena into simplified sets of categories and constructs" (Ginsberg, 1994, 156).

Given a cognitive approach to the existence of strategic groups, the purpose of this study is the examination of the existence of differences in cognition between market participants or "cognitive dissonance"[4] at a group level of analysis. More precisely, it involves the study of differences in cognitive maps of market participant (firms (swine genetic companies), intermediaries (veterinarians) and end consumers (farmer)) in the swine genetic firm value chain whereby the cognitive maps of each of these market participant groups refer to the beliefs or cognition of the competitiveness of swine genetic firms in the industry (i.e. firms' competitiveness). Since this study employs a cognitive approach, the notion of "strategic groups" is defined as a market participant group's perception of the competitiveness of firms in which firms that are perceived to be similar in certain competitive attributes (i.e. firm size, financial strength, price, consumer relations, and quality of products produced, such as sow productivity, health status of stock, consistency of product)[5] are clustered together, while those that are not grouped with other more similar firms. As a result, the classification of individual perceptions of firms based on similarities and differences comprise one's perceived orientation of "strategic groups". "Strategic groups" are in essence cognitive maps[6].

To achieve this objective of examining differences in cognition or differences in the perception of "strategic groups" between market participants, Cognitive dissonance theory (Festinger,1957, 1963; Comegys,1976; Cummings and Venkatesan, 1976; Akerlof and Dickens, 1982), Strategic Group theory (Caves and Porter, 1977; Carroll and Swaminathan, 1992; Dranove et al, 1998 ; Tang and Howard, 1992; Thomas and Venkatraman, 1988)), Information Economics (Arrow, 1974) and Structural Hole theory (Burt, 1992) are synthesized such that a

[4]For simplicity purpose, the quotation of "cognitive dissonance" refers to cognitive dissonance at the group level of analysis, while the absence of quotations, cognitive dissonance, refer to the individual unit of analysis.

[5]For a complete listing of firm competitiveness attributes see Table 1.

[6]"Strategic groups" in quotations refer to the cognitively defined notion of strategic groups, while the absence of quotations refers to the conventional view of strategic groups.

model of "cognitive dissonance" between market participants can be derived. In particular, this study defines "cognitive dissonance" as the differences in cognition of the competitiveness of firms in the swine genetic industry between groups of market participants (firms (swine genetic companies), intermediaries (veterinarians) and end consumers (farmer). The study of "cognitive dissonance", therefore, involves the study of how the perceived strategic groupings of swine genetic firms or cognitive maps differ between market participant groups.

Through the synthesis of these theories, this study's central argument is reminiscent of strategic group theory's predictions that group membership leads to systematic differences in group performance (Caves and Porter, 1977 ; Carroll and Swaminathan, 1992; Dranove et al, 1998 ; Tang and Howard, 1992; Thomas and Venkatraman, 1988). However, in a cognitive context, the central argument of this study is: due to cognitive mobility barriers and group interaction effects and tendencies for individuals to strive for cognitive consistency, systematic differences in the cognitive perceptions of strategic groups in the swine genetic industry exist. This study not only posits as a central tenet that differences in cognition among market participants or "cognitive dissonance" exists, but also posits that the degree of "cognitive dissonance" increases between market participant groups as one becomes further removed from the cognitive map of the managers (focal group).

In order to investigate this relation, this paper is divided into four parts. The first part provides a review of the psychologist (Festinger, 1957, 1963; Comegys,1976; Cummings and Venkatesan, 1976) and economic interpretation (Akerlof and Dickens, 1982) of the notion of cognitive dissonance, in which Strategic Group theory (Caves and Porter, 1977; Carroll and Swaminathan, 1992; Dranove et al., 1998 ; Tang and Howard, 1992; Thomas and Venkatraman, 1988)), Information Economics (Arrow, 1974) and Structural Hole theory (Burt, 1992) are also examined such that a synthesis of these theoretical perspectives provides a model of "cognitive dissonance". The second part briefly discusses cluster analysis techniques and their application for studying "cognitive dissonance" at the group level of analysis. The third part involves performing cluster analysis on survey data that describes each of the three market participant group's perception of the firms' competitiveness in the swine genetic industry. Lastly, the fourth part is the discussion of results and conclusions.

Literature Review:

Cognitive Dissonance Theory

The study of differences in cognition between market participant's perceived "strategic groups" relates to the psychologist's notion of cognitive dissonance. At the individual unit of analysis, psychologists have defined cognitive dissonance as "the existence of non-fitting relations among cognition" (Festinger, 4,1957; Comegys, 3,1976) in which Festinger defines cognitive to mean "any knowledge, opinion, or belief about the environment, about oneself, or about one's behavior"(Comegys, 2,1976). Cognitive dissonance, as stated by Akerlof and Dickens (1982) is: " persons are uncomfortable in maintaining two seemingly contradictory ideas" (Akerlof and Dickens, 308,1982). Hence, cognitive dissonance theory concerns an inconsistency in one's system of beliefs.

The basic tenet of cognitive dissonance, (Festinger, 1957; Comegys, 2, 1976; Akerlof and Dickens, 1982; Cummings and Venkatesan, 1976) is: individuals are motivated to create internal consistencies in one's belief system. Individuals contain clusters of ideas and have tendencies to render such ideas internally consistent or consonant because disconcordant ideas or cognitive dissonance creates psychological discomfort (Comegys, 1976) or anxiety (Menasco and Hawkins, 1978). Internally consistent beliefs also include consistency between one's beliefs and one's actions (Comegys, 1976). As noted by Comegys (1976), "if a person's actions are in - consistent with his beliefs, there is psychological discomfort. Because of this, the person will attempt to rationalize the inconsistency and again achieve consistency" (Comegys, 2,1976). Hence, the basic tenet of cognitive dissonance theory is a striving for consistency in one's set of internal beliefs and/or consistency between one's belief and one's actions.

Hence, give the basic tenet of cognitive dissonance that individuals have tendencies to reduce dissonance and achieve consonance or consistency (Festinger, 1957, 1963; Comegys, 1976; Akerlof and Dickens, 1982; Cummings and Venkatesan, 1976) and, subsequently, individuals have tendencies to avoid "situations and information which likely increase the dissonance"(Comegys, 3,1976). The hypothesis derived from the first tenet is: the greater the "magnitude of dissonance, the greater the pressure to reduce it" (Comegys, 3,1976). In addition,

the greater the importance or value to an individual of a belief (i.e. firms' competitiveness information), the greater pressures there are to resolve inconsistent beliefs or cognitive dissonance (Comegys, 1976; Cummings and Venkatesan, 1976). Both suggest that one can experience great degrees of cognitive dissonance, but not be motivated to strive for internal consistency because the beliefs that are inconsistent have a low value to the individual (Comegys, 1976). With respect to the hypothesis derived from the latter tenet, individuals exhibiting cognitive dissonance seek information that confirm's one's existing belief biases one's preferences and choices of belief in a manner that perpetuates one's prior belief (Akerlof and Dickens, 1982).

Economic Interpretation of Cognitive Dissonance

In addition to the psychologist conception of cognitive dissonance, an economic application of the psychologist's notion of "cognitive dissonance" is forwarded by Akerlof and Dickens (1982). In economist's terms, cognitive dissonance is represented by three propositions:

> "First, persons not only have preferences over states of the world, but also over their beliefs about the state of the world. Second, persons have some control over their beliefs; not only are people able to exercise some choice about belief given available information, they can also manipulate their own beliefs by selecting sources of information likely to conform to "desired" beliefs. Third, ...beliefs once chosen persist over time"(Akerlof and Dickens, 307,1982).

These three propositions are intricately related to the latter cognitive dissonance tenet that individuals have tendencies to avoid "situations and information which likely increases dissonance" (Comegys, 3,1976). This is emphasized in Akerlof and Dickens' (1982) third proposition. Driven by one's need to strive for internal consistency (Festinger, 1957, 1963; Comegys, 1976), the persistent nature of one's belief perpetuates (Akerlof and Dickens, 1982) one's preferences and choices of beliefs in a fashion that re-affirms one's prior beliefs (Comegys, 1976)[7]. For instance, given that one possesses persistent beliefs about states of the world (Proposition 3), such an inherent belief system influences the individual's preferences of what the state of the world is likely to be (Proposition 1). Hence given individual preferences over beliefs (Proposition 1), individuals exhibit "choice" through the valuation of the expected

[7]See Comegys (1976)'s Millerite example.

benefits and costs among one's set of beliefs (Proposition 2). However, due to the preferences of beliefs, the choice of a particular belief is inherently biased towards choices that reaffirm's one's prior beliefs. Therefore, even with similar information, "experiments show that groups of persons with the same information have systematically different beliefs that accord with natural theories about their preferences...[in particular]...the cognitive dissonance model not only predicts systematic differences in interpretation of given information but also systematic differences in receptivity to new information according to preferences"(Akerlof and Dickens, 309, 1982). As a result, the strive for internal consistency (Festinger, 1957, 1963; Comegys, 1976) results in a biasing of one's preferences (Proposition 1) and choices (Proposition 2) in a manner that perpetuates prior beliefs (Proposition 3).

Strategic Group Theory

Since the theory of cognitive dissonance is confined at the individual unit of analysis, Strategic Group theory (Caves and Porter, 1977; Carroll and Swaminathan, 1992; Dranove et al, 1998; Tang and Howard, 1992; Thomas and Venkatraman, 1988) is applied such that an extension of cognitive dissonance theory to a market participant group level of analysis can be made. Therefore, in order to demonstrate the existence of cognitive dissonance, theoretical constructs of strategic group theory, in particular notions of group interaction effects (Carroll and Swaminathan, 1992; Dranove et al., 1998) and mobility barrier (Caves and Porter, 1977) become relevant. Strategic group theory (Caves and Porter, 1977; Carroll and Swaminathan, 1992; Dranove et al, 1998; Tang and Howard, 1992; Thomas and Venkatraman, 1988) posits that an industry consists of homogenous clusters of groups of firms. Since these firms within a group share similar structural features and respond in a similar fashion to outside disturbance and exhibit degrees of interdependence, "profit rates may differ systematically among the groups making up the industry..."(Caves and Porter, 250,1977). As a result, firm performance is tied to group membership. This is termed the strategic group hypothesis. Underlying this prediction is the notion of "mobility barriers". As an extension to Bain's concept of "barrier's to entry" in the Industrial Organization literature, Caves and Porter (1977) identified the notion of "mobility barriers" for a strategic group level of analysis. Mobility barriers serve a similar functional role as "barriers to entry" , in which it restricts movements of firms from one group to another (Caves

and Porter,1977). It is because of these mobility barriers that prevent the equilibration of performance differences between strategic groups. As a result, systematic performance differences arise from the presence of mobility barriers. In addition to the performance differentiating aspects of mobility barriers, group interaction effects (Carroll and Swaninathan, 1992; Dranove et al, 1998) also plays such a role. Both Dranove et al. (1998) and Carroll and Swaminathan (1992) further develop the strategic group hypothesis by emphasizing the role of interdependence or interactions among firms within the group as a source of influence to group performance differences. In particular, by measuring group interaction in terms of group size, Dranove et al. (1998) emphasizes that the role of collusion increases profitability among groups. While Carroll and Swaminathan (1992) who use population size as a proxy for group interaction posits legitimacy processes reduces mortality rates. Consequently, given both mobility barriers and group interaction effects, systematic performance differences arise between strategic groups.

Economics of Information and Structural Hole Theory

In addition to Strategic Group theory, Economics of Information (Arrow, 1974) and Structural Hole theory (Burt, 1992) are also important considerations towards explicating differences in cognition of strategic groups between market participants. The Economics of Information concerns the value of information channels, while Structural Hole theory has implications towards the density of information channels. Both of which concern the dissemination of beliefs with in and between market participant groups and, thus serves to influence the extent of "cognitive dissonance" between such groups.

Economics of Information: Value of Information Channel

The value of information channels is based on the benefits and costs of information (Arrow, 1974,p38). Information is defined in the context of the perceived relative competitive positions (i.e. relative position of a firm i's attribute to other firms' attributes) of firms in the swine genetic industry. This is termed the information of firms' competitiveness. In particular, the benefits and costs, or net value, of information on firms' competitiveness differ across managerial, veterinarian, and farmer groups such that an uneven formation of information channels emerges.

Benefits and Costs of Rivalry Network Information

In order to support the above argument, one must justify why differences in valuation (benefits minus cost) of information on firms' competitiveness between the three market participant groups - managers, veterinarians, and farmers- exist. This study proposes that the valuation of information on firms' competitiveness is greatest for managers and the least for farmers. Veterinarians, the intermediary agents, value such information at a level between managers and farmers. That is, the value of information placed by these groups has the following order:

(Value of firm competitiveness information) Managers > Veterinarians > Farmers

Managers place the greatest value on firm competitiveness information because such information provides the managers an understanding of their firm's competitive position vis a vis to other firms and, thus, has important implications for strategy formulation. In addition, the managers' information or cognitive perception of its rivalry not only has importance to strategy formulation in terms of identifying competitors' relative strengths and weaknesses, but also such cognition or information is a form of human capital that can be a source of potential competitive advantage (Ginsberg, 1994). As a result, managers place the highest value on competitiveness information because, relative to other market participant groups, such information is most pertinent to the performance and survival of the organization. On the other hand, farmers place the least value on this information because the competitive position of rival genetic firms is not paramount to the successful operation of the farm. Rather, other forms of information that relate to farm performance and survivability are of greater importance, i.e swine husbandry practices, disease prevention, farm management etc. Veterinarians are intermediary agents whose services involve exchange relations to both swine genetic companies and farmers. This exchange relation to both parties places a unique informational role on the veterinarian, because the veterinarian not only provides services for the farmer, but he/she also plays an informational disseminating role, passing technical information on swine genetic companies' products to farmers. Hence, given the veterinary's intermediary role, their value of firm competitiveness information falls between the managers and farmers. The implication of these different valuations on firms' competitiveness between these market participant groups is it impacts the degree at which each group strives for consistency in beliefs. This group effect stems from the individual's motivation

to reduce cognitive dissonance. From cognitive dissonance theory, the greater the importance or value to an individual's belief, such as the information on firms' competitiveness , the greater pressures there are to resolve inconsistent beliefs or cognitive dissonance (Comegys, 1976; Cummings and Venkatesan, 1976) for a given group. Hence, through the aggregation of individual's striving for consistencies in beliefs, the managerial group has greater motivations, due to psychological discomfort, to reduce disconcordant perceptions on the competitiveness' of firms, while the veterinarian group has a moderate level, and lastly farmer groups have the least inclination to reduce disconcordant beliefs.

Structural Hole Theory: Density of Information Channels

Given the different valuations on the information of firms' competitiveness in the swine genetics industry, the formation of the density of information channels within groups should emerge in varying degrees. This view is consistent with the "structural hole" theory of Ronald Burt (1992) whereby a network of social relations around a group develop in response to access the benefits of information or "structural holes". Hence, increasing network relations or, in the context of this research, information channels emerge with increasing density as the valuations placed on information of firms' competitiveness increases. By coupling this "structural hole" argument with the value of information channels, one expects that a group who places a high value on information will create dense information channels with in its group. Therefore, since managers place the greatest value on firms' competitiveness information, one would, therefore, expect the formation of a dense array of informational channels within this group. By employing a similar argument for veterinarians, one would expect some "medium" level of density of information channels to emerge in this group. Lastly, by employing this argument to farmers, this group should have the least dense array of information channels. The implications of the varying densities of informational channels[8] with in each market participant group is that the greater the densities of informational channels with in the group the greater the degree at which information is disseminated. Consequently, the management group should have the greatest degree of information flow on firms' competitiveness and because of this, they are the focal

[8]Information channels are strictly referred to channels that transmit information about rivalry networks. Other forms of information channels also exist across and within groups.

group to which other groups are compared. Therefore, relative to the management group, the veterinarian group should have moderate information flows of firms' competitiveness and the farmer groups should have the least information flow on firms' competitiveness.

Cognitive Dissonance: Strategic Group theory, Information Economics, and Structural Hole Theory

Given the concepts from Strategic Group theory, Economics of Information (Arrow, 1974) and Structural Hole theory (Burt, 1992) a Cognitive Dissonance approach at a market participant group level of analysis can now be derived. In synthesizing these theories, one posits that group interaction in the form of the density of information channels based on a cognitive variant of "strategic groups"[9] and "cognitive mobility barriers" in the form of high costs of communication exchange across market participants gives rise to systematic differences in cognition or cognitive dissonance among market participant groups.

Group Interaction Effects and Structural Hole Theory

Unlike Carroll and Swaminathan (1992) and Dranove et al (1998) who define group interaction in terms of group size and population of a group, respectively, group interaction from a cognitive perspective concerns the dissemination of one's beliefs within a given market participant group. As result, the density of interactions, as highlighted by structural hole theory, plays the role in disseminating beliefs in a market participant group. These group interactions effects involve tendencies for the convergence of individual beliefs. More precisely, since the density of information channels influences the extent of the dissemination of beliefs with in a group, the greater the density of information channels, the greater the tendency for congruence among the beliefs of individuals[10]. This argument is consistent with cognitive dissonance theory. That is, since the density of information channel positively varies with the value of information, then according to cognitive dissonance theory, the greater the value of information the greater

[9]As oppose to the traditionally defined strategic groups, in the application of strategic group theory to cognition, this research defines a "cognitive strategic group" as participants in a group that share similar beliefs of particular states of the world. In this case, such beliefs concern the clustering of competitor firms.

[10]For instance, "group thinking" or "group myopia" are representations of such convergent tendencies. As in the case of manager groups, Porac et al (1993) finds manager's have tendencies to share similar mental models or cognitive maps of their competitive environment.

the tendency for individual's to reduce "non fitting cognition" or reduce cognitive dissonance. Through the aggregation of these individual tendencies, the distinct formation of group beliefs should, therefore, arise. Consequently, dense information channels facilitate the convergence of beliefs among individuals with in a group.

More over, not only does this group interaction effect create tendencies for convergence of beliefs among individuals in a group, but this effect perpetuates the continued beliefs of individual in this group. That is, since group interaction creates a convergence of beliefs, this effect serves to perpetuate biases in individual's preferences and choices such that the group interaction effects sustains the maintenance of one's prior beliefs and subsequently the group's prior beliefs. Therefore, the density of information channels with in a market participant group accentuates the group effects by not only creating tendencies for the convergence of individual beliefs, but also sustains the persistence of individual beliefs. Through the aggregate of these individual tendencies and persistent behaviors, group level convergence and persistence of beliefs of firms' competitiveness should arise. However, since different market participant groups reflect varying densities in information channels, due to differences in valuation of information on firms' competitiveness, these group interactions effects will vary across such groups. Therefore, similar to the group interaction effects of strategic group theory in generating systematic differences in performance across strategic groups, these cognitively based group effects yields systematic differences in cognition between market participant groups. In particular, due to the higher valuation of information on firms' competitiveness, the management group experiences the greatest group interaction effect or convergence and persistence of beliefs, while the veterinarian group experiences a moderate convergence and persistence of beliefs, and lastly, the farmer group experiences the least convergence and persistence of beliefs. Such differences in convergence and persistence underlie differences in cognition or "cognitive dissonance" between such groups.

Cognitive Mobility Barriers

In addition to group interaction effects, systematic differences in cognition between market participant groups are pervasive due to the high costs associated with the formation of between group informational channels. This high cost is reflective of a cognitive based variant of

the strategic group notion of " mobility barriers", termed "cognitive mobility barriers". That is, due to the high costs associated with the formation of between group formation of informational channels, these "cognitive mobility barriers" restrict the intrusion of new beliefs within a market participant group. To motivate this notion, within group formation of information channels are "cheaper" than between group formation of information channels because between group informational channels involves higher costs associated with uncommon experiences of different groups. Arrow (1974) comments that "information cost increases as it becomes further removed from ones own individual information and ability set" whereby the individual is perceived as "a bundle of abilities and accumulation of information" (Arrow, 1974, 41). Therefore, in relation to this research, the three market participant groups have a greater propensity to open information channels within their own groups because "he may find it cheaper to open certain information channel rather than others [groups] in ways connected with their ability and knowledge" (Arrow, 1974, 41). That is, managers, veterinarians and farmer groups have a greater tendency to open information channels and thus increase the density of informational channels of that group than forming between group information channels, because they incur greater costs of communication due to uncommon experiences. Socio-cognitive studies have also found support for such phenomenon. Porac *et al* (1993) state that "competitive ties within each cognitive group are at least twice as dense (sometimes denser) than ties between cognitive groups. Apparently a strong bias exists within the industry to focus competitive interactions on similar rather than dissimilar firms" (Porac et al., 1993, 35). This suggests that within-group interaction dominates between-group interaction. This is consistent with the economics of information channel that the formation of information channels is contingent on benefits and costs valuations of information. The implication of this high cost of cross-communication (i.e. between groups) or "cognitive mobility barriers" is: since there is a restriction of new beliefs from entering a particular group, these "cognitive mobility barriers" serve to perpetuate the existing beliefs within a group. Consistent with cognitive dissonance theory, individuals have propensities to reduce dissonance by selectively receiving information that is most concurrent with their prior beliefs. Consequently, given "cognitive mobility barriers", this barrier serves at a group level to selectively "filter" information - in the form of high costs associated with uncommon

experiences- that are most consonant to the group's existing beliefs. Since this "cognitive mobility barrier" serves such a information distilling role, the magnitude of cognitive dissonance experienced by an individual within the group is attenuated. That is, the role of "cognitive mobility barriers" in "filtering" new information from other market participant groups reduces the degree of disconcordance or 'nonfitting relations among cognition" of individuals. This results in not only reducing the magnitude of cognitive dissonance among individuals within a group and , thus, reduces pressures to strive for internal consistency of beliefs, but also by "filtering" information "cognitive mobility barriers" perpetuates these individuals' preferences and choices of beliefs in a fashion that is most congruent to the group's prior beliefs. As a result, "cognitive mobility barriers", not only foster the selective reception of information by manager, veterinarian and farmer groups, but also these barriers serve to perpetuate the group's prior beliefs. Hence, based on these arguments of "cognitive mobility barriers", one should expect sustainable differences in cognition between market participant groups, to thereby give rise to "cognitive dissonance" at a strategic group level of analysis.

As a result, given that group level interaction effects breeds congruence and persistence of beliefs among individuals and "cognitive mobility barriers" further prevents the entry of new beliefs into a group, both theoretical constructs serve to create systematic differences in cognition between market participant groups. Consequently, in a cognitive context, group level interaction effects and "cognitive mobility barriers" facilitate the convergence and persistence of group's belief such that systematic differences in cognition or cognitive dissonance at a strategic group level arises. The sum of these arguments lead to the following propositions:

Proposition 1a: Cognitive dissonance or differences in cognition of firms' competitiveness between market participants (firms (swine genetic firms), intermediaries (veterinarians), and producers (farmers) exist.

In particular, to account for the relative valuations of information on firms' competitiveness, a subsequent proposition is:

Proposition 1b: The degree of cognitive dissonance or differences in cognition of firms' competitiveness between groups increases as one becomes further removed from the

cognitive maps of the manager group or focal group.

Methodology

Data Section

To test propositions 1a and 1b, a survey was conducted with the three market participant or respondent groups[11] in the swine industry. The survey required each respondent to name the swine genetics firms with which they were familiar. Then, for each of these firms, the respondent rated the firm on a ten point scale across 16 attributes. These 16 attributes describe a firm's competitive characteristics of size, financial strength, price, consumer relations, etc and also the qualities of the products it produces (i.e. sow productivity, health status of stock, consistency of product). A complete listing of the attributes is shown in Table 1.

Table 1. Product and Firm Characteristics Used for Data Collection

1. Firm Size
2. Genetic Potential of Animals Sold (sows, boars) for Leanness
3. Sow Productivity
4. Herd Health
5. Ability to Innovate in Bringing Traits to Market
6. Price
7. Consistency of Animals Sold
8. Ability to Meet Market Demand
9. Financial Soundness of Firm
10. Quality of Service
11. Commitment to the Industry
12. technical Support
13. Responsiveness to Customers
14. Promotional Budget
15. Quality of Personnel
16. Firm Reputation

The list of attributes was obtained by using the repertory grid technique described by Reger (1990). A group of 24 veterinarians that had either specialized swine practices in the Midwest or were employees of swine health or swine genetics companies were asked to list the

[11]In this methodological section, the terms market participant groups and respondent groups are interchangeable.

swine genetics firms with which they were familiar. After this bounded sample of firms was elicited, two researchers led the group through the process of eliciting the constructs, or attributes, over which rival firm's performance differed. One researcher placed the names of three firms on a whiteboard and posed the question, "Which two of these firms are most alike and which firm is most different from the other two?" When the group proposed the answer, the researcher asked, "Why do you say this?" Open discussion followed and the characteristics that defined similarity and difference in the minds of the group was recorded by the second researcher. The list of constructs was discussed until consensus was approached and the process was repeated with another set of three firms. The triads were repeated until a significant proportion of the triads available from the bounded sample was covered. The attributes that were used to distinguish among the firm triads were collated and presented back to the group as a list. Discussion followed regarding the inclusiveness of the list. Some additional attributes of products and the swine genetics companies were added and the group agreed that the final list (1) covered the important characteristics of firm structure and behavior and of product performance, and (2) was clearly worded so that managers in the swine genetics industry, veterinarians, and swine farmers would understand the constructs.

The survey form was prepared using these 16 constructs, printed, and mailed out to each of the participating veterinarians. Each veterinarian completed the survey form for up to eight swine genetics firms with which they were familiar. After completing the survey themselves, they administered the survey to up to six commercial swine producers from their practice. One veterinarian was a member of the top management team of a large swine genetics firm. He administered the survey to five other members of his top management team.

The survey forms were mailed back to the researchers for coding and analysis. The data were recorded on a spreadsheet and analyzed with the SPSS statistical package.

In the analysis of this data, we assume an individual respondent’s ratings on each of the rated firms are independent. That is, the ratings of a given firm are not dependent on the initial set of 8 firms identified by the individual respondent. Table 2 shows the number of total surveys received, the number of surveys for each respondent group, and the number of different firms identified by each respondent.

Table 2: Number of Surveys by Respondent group

Respondent Type	Number of Surveys Received.	Number of Total Firms identified by respondents from Survey.	Number of different Firms identified by respondents.
Manager Group	6	45	12
Veterinarian group	21	150	33
Farmer	111	599	84
Total	138	794	88

Cluster Analysis Techniques

Cluster analysis is particularly appropriate to this study because it is a method for organizing, simplifying and interpreting large multi variate data sets. That is, the organizing and simplifying of large multi variate attributes of the competitiveness' of firms serves to derive cognitive representations of strategic groups for each respondent group. For each respondent group, cluster analysis groups the firms into clusters on the basis of their degree of similarity or dissimilarity in attribute ratings. For instance, suppose two respondents within the manager group perceive two firms to have highly similar ratings on the 16 attributes. These firms will be clustered within the same group.

To elicit the manager respondent group's cognitive perception, as opposed to the individual manager's perception, the mean values for all 16 attributes of the firms identified by all individual respondents in the three groups (managers, vets, farmers) were calculated. Specifically, the mean response for each firm's attribute is the sum of the ratings for each attribute divided by the total number of times this firm has been identified by the respondent group. This process of calculating a firm's mean attribute is repeated for all its 16 attributes for all firms in this respondent group. The cluster analysis procedure is then performed on these mean values for all firms identified by the respondent group. The resulting clusters of firms reflect the respondent group's cognitive map. In particular, the cluster solution for each respondent group reflects the group's perception of strategic groups in the swine genetics industry. Based on these three cognitive maps, the degree of cognitive dissonance can be found

by analyzing the differences in cluster solutions across these respondent groups.

HA Classification Procedure

In order to conduct cluster analysis on each of the respondent groups, it requires the specification of a classification procedure. This classification procedure is the mechanism that gives rise to the formation of clusters. A Hierarchal Agglomerative (HA) classification procedure is specified and applied to the mean attribute values of each firm for each respondent group such that the formation of clusters of firms, based on these mean values, can emerge. The HA procedure is an algorithm that involves progressing "through a series of steps that build a tree like structure [dendogram] by either adding individual elements to [i.e. agglomerative] or deleting them from [i.e. divisive] clusters." (Ketchen and Shook, 1996,445). That is, for each respondent group, under a HA procedure, each firm is initially classified to its own cluster and through a series of agglomeration procedures, each initial (one firm) cluster is added to another initial cluster to form a larger cluster. The formation of this larger cluster is based on the degree of similarity of the ratings of the attributes of the combining clusters groups [one-firm cluster]. The process is repeated until all firms are agglomerated into a single cluster.

There are 5 common HA algorithms used in cluster analysis research. They are single linkage, complete linkage, UPGMA, centroid, and Ward's method (Ketchen and Shook, 1996,445)[12]. Each of these algorithms yields differing clustering solutions[13] on the same data set because each algorithm has its own biases (Ketchen and Shook, 1996, 445). According to literature on cluster analysis methods, there is no general consensus on the appropriate algorithm to be used (Ketchen and Shook, 1996). In this research, this issue of choosing the appropriate HA algorithm is of lesser importance. Because this study's objective is to investigate the presence and degree of "cognitive dissonance" -as defined by the existence and magnitude of differences in cluster solutions across respondent groups- then the *consistent* application of one

[12]For further information on these five HA procedures refer to Romesburg (1990) and Aldenderfer and Blashfield (1984).

[13] A cluster solution is the result of the cluster analysis whereby each case firm is assigned uniquely to one cluster. By definition, cluster membership identifies which firm belongs to which cluster number and the terms cluster solution and cluster membership are used interchangeably.

HA algorithm is of greater importance than the choice of HA algorithm. However, the "appropriate" choice of HA algorithm does lead to more robust cluster solutions. Because the performance of HA algorithms are specific to the data set in question (Romesburg, 1990; Aldenderfer and Blashfield, 1984), the use of an "appropriate" HA algorithm for each respondent group's data is not a simple decision. Thus, this lack of consistency in HA algorithms will create difficulties in testing our propositions of cognitive dissonance across these respondent groups.

Of the three most reliable cluster algorithms (UPGMA, complete linkage, Ward's method), the UPGMA method was chosen over others because there is a "greater match between the algorithm [UPGMA] selected and the underlying structure of focal data (i.e. sample size, distribution of observations, and what types of variables are included -nominal, ordinal, ratio or interval) ." (Ketchen and Shook, 1996). This matching of an appropriate algorithm with "focal" data is the general criterion by which the UPGMA algorithm was chosen. Reger and Huff (1993, 109) comment "this method [UPGMA] tends to join clusters with small variances and is slightly biased towards producing clusters with the same variance." This bias towards clustering of firm with small variances is consistent with this research's view. One expects each respondent group to share similar cognitive representations of firms' competitiveness. This is particularly relevant for the managerial respondent group because, due to their higher density of information channels, the greater exchange of information provides a greater similarity in the perception of firms' competitiveness. Because the manager respondent group has the greatest similarity in the perception of firms' competitiveness, one expects the variance on the firm attributes to be small. The management respondent group had the smallest relative standard deviation values among the respondent groups (data not shown).

Resemblance Coefficient

In addition to the choice of HA algorithm, a similarity index or resemblance coefficient needs to be also specified. This resemblance coefficient serves to compare the similarity or dissimilarity of firm i's attributes (i.e. the means of firm i's attributes) to firm j's attributes (i.e. means of firm j's attributes) within a respondent group. Although there are many types of resemblance coefficients[14], the traditional Euclidean squared distance measure is used here.

[14]See Romesburg (1990) and Aldenderfer and Blashfield (1984).

Similar to the differences in HA algorithms, the diversity of resemblance coefficient measures provide different cluster solutions on the same data. The consistent application of one resemblance measure to all three respondent types is more pertinent to investigating cognitive dissonance than the choice of appropriate resemblance measure. High values for this measure denote large statistical distances and therefore reflect high degrees of dissimilarity among cases [firms]. Likewise, low values for this measure denote small distance and therefore reflect low degrees of dissimilarity [high similarity] among cases. The Euclidian square distance measure is as follows:

$S_{xy} = \Sigma_i(x_i - y_i)^2$, where

X_i is the value of the ith attribute for firm (case) X and

Y_i is the value of the ith attribute for firm (case) Y.

Number of Clusters in the Solution

A hierarchical agglomerative clustering algorithm shows all possible sets of cluster membership between two extremes: all firms are clusters of one and all firms are in a single cluster. The specification of the number of clusters involves some degree of subjective assessment by the researcher. This is one of the criticisms expressed about cluster analysis. Although cluster analysis is a useful tool to organize and simplify large multi attribute objects, "the main problem is that cluster analysis's reliance on researcher judgement makes the validity of results subject to serious doubts." (Ketchen and Shook, 1996, 453). Although this is a major concern for cluster research, these subjective issues of specifying the appropriate cluster cut-off is, again, of secondary importance to the study of "cognitive dissonance" in this study. In reiterating the previous arguments for the choice of HA algorithm and resemblance coefficient, the consistent application of a specified cluster cutoff (number of clusters in cluster solution) across each of the respondent groups is necessary to make appropriate comparisons of cluster solutions between these groups such that measures of "cognitive dissonance" can be assessed.

Although this study acknowledges the importance of validation issues[15], due to the researcher's subjective assessments, an *a priori* specification of number of cluster groups or cluster cut-off is made. For reasons discussed below, this research specifies a 3- and 4-cluster solution.

To elaborate this discussion of the choice of the appropriate cluster cut off, although one can employ factor analysis to determine tendencies in the data that provide general guidelines for the appropriate cluster cut-off (Punj and Stewart, 1983; Hair et al, 1998), this was not pursued. Even though, such a procedure would provide greater validation of cluster membership results, this procedure is not pursued because the objectives of this study concerns largely the empirical explication that there are differences in cognitive maps between respondent groups or "cognitive dissonance" at a group level of analysis. Hence, rather than emphasizing the appropriate cluster cut off, this study is only concerned with specifying a *consistent* cluster cuff off value across all respondent groups as a means towards identifying the existence of "cognitive dissonance". However, with respect to proposition 1b, the use of factor analysis may be more relevant. Since proposition 1b is concerned with identifying the degree and not the existence of "cognitive dissonance" between respondent groups, the specification of cluster cut off values influences the magnitude of "cognitive dissonance". But such a procedure is problematic because the manager respondent group contains only six responses (see table 3) and, therefore, even if one were to conduct factor analysis to determine the appropriate cluster cut off values, the small sample of the manager respondent group raises the empirical reliability of the result. That is, improving the reliability of the cluster solutions through the use of general guidelines (Punj and Stewart, 1983; Hair et al, 1998) does not provide empirical support of the cluster solutions, because we are still confronted with the limits of the sample size of the manager respondent group. This argument is based on the fact that "cluster analysis depends substantially on the representativeness of the data (Hair et al. 1998) in which even if improvements in the reliability of the cluster solutions can be afforded by employing factor analysis, the limited size of the manager group is not representative of managers perceptions on a whole. Therefore, in spite improvements in terms of

[15]See Ketchen and Shook (1996) and Romesburg (1990) for validation techniques.

reliability of cluster solutions, the resulting solutions cannot (dis) confirm empirical support for our propositions. As a result, a 3 and 4 cluster solution is maintained.

Given a 3 and 4 cluster cut off, in order to obtain a statistical measure of the similarities and differences among the three cognitive maps of the respondent groups, a common basis for comparison must be developed. In order to examine "cognitive dissonance" between the 3 respondent groups, one needs to find the "intersection" of firms that are common to all respondent groups. A set of 11 firms out of 88 different firms was identified in this data set that was common to all three respondent groups. Not only does this identification of the "intersection" of firms enable the appropriate comparisons between these respondent groups, but also the identification of this smaller sample of firms offers potential advantages in the performance of the cluster algorithm. That is, as Punj and Stewart note, "as a cluster algorithm includes more and more observations [number of firms]; its performance tend to deteriorate, particularly at high levels of coverage, 90% and more. This effect is probably the result of outliers beginning to come in to the solution" (Punj and Stewart, 143, 1976). Hence, by employing the reduced number of intersecting firms, one averts the deteriorating performance of the cluster algorithm[16]. Table 3 shows the number of survey responses for each respondent group for the intersection of the 11 firms.

As a result, since only 11 firms out of 88 different firms were common to all respondent groups, a 3- and 4-cluster solution was specified, *a priori*. With this small number of sample firms (11 firms) and coupled with the above arguments on the appropriate cluster cut off, an increase in cluster solutions (i.e. 5,6,7... cluster solution) will yield small clusters of firms that will not lead to an empirically meaningful cluster solution.

Table 3: Number of Survey by Respondent group for the Intersection of firms (11 firms)

[16]Although, the Punj and Stewart (1983) further note, "K means procedure [a classification proceedure] has shown less decrement in performance as coverage increases than have the hierarchal methods" (Punj and Stewart, 144, 1983), the intersection of firms between these respondent groups do not constitute a significant level of coverage (i.e. 90% of 88 different firms identified) that would deteriorate the performance of our HA classification proceedure.

RespondentRespondent Type	Number of surveys received containing at least one of the identified intersection of 11 firms.
Manager Group	6
Veterinarian Group	21
Farmer	105
Total	132

Goodman and Kruskal lambda and tau Tests:

In order to test for differences and magnitudes in cognition between respondent groups, comparisons of the cluster solutions across these respondent groups are made with the Goodman and Kruskal tests (GK-tests)[17]. The Goodman and Kruskal tests are "associational" statistics that serve to measure the degree of similarity in group membership. Traditional associational statistics (Yule coefficient, coefficient of contingency, and the Tschuprow coefficient) based on the chi-square statistic were not employed because they did not convey the necessary information about the relative cluster memberships between the maps of the three respondent groups. The Goodman and Kruskal lambda and tau, are based on the calculation of proportional reduction in error (PRE)[18]. The PRE is a statistic describing the degree of association between two categories. That is, given an X category [independent variable] that predicts some Y category [dependent] variable, the PRE of the dependent variable Y is defined as follows:

PRE: $\lambda y =$ (probability of error in case 1) - (probability of error in case 2)

[17]For details of the derivation of the Goodman-Kruskal lambda and tau tests refer to Reynolds (1984).

[18]See Goodman and Kruskal (1954), and Reynolds (1984) for further reference.

(probability of error in case 1)

where probability of error in case 1 => no information on prediction of y, and

probability of error in case 2 => given information about X to predict Y

The GK-tests have a range of values between 0 and 1. A GK-test value of 1 denotes that two cluster solutions have a perfect overlap or perfect association. That is, if each firm in the cluster membership X (i.e. cluster membership of a given respondent group) "corresponds to one and only one firm" in a different cluster membership Y (i.e. cluster membership of a second respondent group), then "knowing an X category [a particular cluster group in X] permits guessing the Y category [a particular cluster group in Y] exactly " (Reynolds, 1984, 49). Conversely, if each firm in cluster membership X does not correspond to "only and only one" firm in cluster membership Y, then "knowing an X category [a particular cluster group in X] does not permit guessing the Y category [a particular cluster group in Y]" at all (Reynolds, 1984, 49). In the extreme case of non-overlapping cluster memberships, the GK-test takes a value of 0.

These tests can measure either symmetric or asymmetric tests of association between categories of X and Y. The symmetric case is that categories X and Y (two different maps) jointly predict each other. The asymmetric case assumes that membership in group X predicts membership in group Y. For instance, if one cluster solution X (e.g. the managers' cognitive map of swine genetics firm rivalry) is used to explain the degree of association of another cluster solution Y (e.g. the farmers' cognitive map of swine genetics firm rivalry), the GK-test statistic will test if the cluster membership Y is dependent upon the cluster membership **X**. Due to the *a priori* specification of the causal relation of information flow, the asymmetric forms of the Goodman-Kruskal measures are of particular interest. We exploit the proposed causal relation of information flow on firms' competitiveness to begin from the management respondent group, and flowing through the veterinarian group to the farmer respondent group. This assumption is consistent with the concept of the direction of firms' competitiveness information flow expressed in proposition 1b. However one should note that the GK-test can be used only on a pair of different cluster memberships at a time. That is, the cluster memberships of each of the respondent groups have to be based on a pair-wise comparison. This pair wise comparison is

particularly appropriate because propositions 1a and 1b concerns the examination of the existence and degree of "cognitive dissonance" *between* these respondent groups.

The asymmetric tests are based upon the following pairwise relations developed in the earlier sections of the paper:

1)Veterinarians' information on firms' competitiveness = F (Managers' information on firms' competitiveness)
2)Farmers' information on firms' competitiveness = F (Veterinarian's information on firms' competitiveness)
3)Farmers' information on firms' competitiveness = F (Managers' information on firms' competitiveness)

Given these assumptions on the causal direction of firms' competitiveness information flow, we focus on the GK-test asymmetry statistic that conveys these causal relations. One should further note, these assumptions have to be maintained because one cannot use a Grainger causality test (Kinnucan and Forker, 1987) to empirically verify the causal relationship of network information flows within a cluster analysis framework.

The G-K tests measure the degree of association from 0 (none) to 1 (complete). The GK-test can be converted to reflect the degree of cognitive dissonance between respondent groups. This can be achieved by subtracting the value of tau or lambda computed for each pairwise relation from 1 as a measurement of the degree of incongruence between the cluster solutions or cognitive maps between the respondent groups. Thus, this simple conversion will measure the degree of cognitive dissonance among respondent groups.

Results and Discussion

Cluster Analysis

The UPGMA algorithm was used to identify both 3- and 4-cluster groups that reflect how each of the three respondent groups see how the 11 firms compare to each other. The squared Euclidian distance across the sixteen attributes measures the similarity or resemblance among the eleven firms. Firms in a cluster are seen to be strategically "close" to other members in the cluster, relative to those that are "distant" and are in other clusters. The cluster solutions, based on the mean values of firm's attributes (i.e. firms' competitiveness information), denote the perceived strategic groupings or cognitive map for each respondent group.

Table 4 shows the 3- and 4-cluster solutions to the UPGMA algorithm for the three respondent groups. The results from Table 4 require some elaboration. In using the veterinarian

respondent group and the 3 cluster solution as an example, one observes the veterinarian respondent group clusters the swine genetics firms Babcock, Farmer's Hybrid and GIS into one group identified by cluster 1. These firms are in the same cluster because the veterinarians perceive these firms to have similar ratings on firm attributes. In addition to cluster 1, the veterinarians find Cotswold, DanBred, DeKalb, Premier and Seghers Hybrid also to be similar and are grouped into cluster 2. Lastly, the veterinarians find Geneti Pork, Newsham and PIC to be similar and are grouped into cluster 3. This cluster solution represents the cognitive map of the veterinarian group. Repeating this process for the other respondent groups, one observes the cognitive maps of the farmers and the swine genetics firm managers. We repeat this procedure for the 4-cluster solution, as Table 4 shows. However, in general, the differences between the 3- and 4-cluster solutions for each respondent group are marginal.

Table 4: Cluster Analysis Solutions (Cluster Memberships)

Company	**Veterinarians' Map**		**Farmers' Map**		**Managers' Map**	
	3 Cluster Solution	4 Cluster Solution	3 Cluster Solution	4 Cluster Solution	3 Cluster Solution	4 Cluster Solution
Babcock	1	1	1	1	1	1
Cotswold	2	2	2	2	1	1
Danbred	2	2	2	2	1	1
Dekalb	2	2	2	3	2	2
Farmer's Hybrid	1	1	1	1	3	3
Geneti Pork	3	3	2	2	2	4
GIS	1	1	1	1	1	1
Newsham	3	3	2	2	1	1
PIC	3	4	3	4	2	2
Premier	2	2	2	2	1	1

Seghers Hybrid	2	2	2	2	1	1

Goodman-Kruskal Lambda and Tau tests (GK-test):

Since the GK-test measures the degree of association between each firm of one cluster membership with another cluster membership, the GK-test only can be used on a pair of different cluster memberships at a time. Given this pair-wise comparison, the process of testing the degree of cognitive dissonance between respondents is as follows:

1) Cluster membership of Veterinarians vs. Farmers
2) Cluster membership of Farmers vs. Managers
3) Cluster membership of Managers vs. Veterinarians

The GK lambda and tau statistics for the 3- and 4-cluster solutions are derived. Since this research is interested in the existence and degree of cognitive dissonance between respondent groups, the GK-test values are converted to show the existence and degree of cognitive dissonance by subtracting the test statistic from 1. These "converted" GK-test values are shown in Tables 5 and 6.

According to the results of the GK-tests in Tables 5 and 6, proposition 1a is partially supported. Proposition 1a states that the “cognitive dissonance” or differences in cognition of the strategic groups between respondent groups exists. Looking at the first row of both tables, we see that there are significant differences in the cognitive maps perceived by veterinarians and farmers in both cases, when we use the symmetric lambda statistic. This statistic says that these two maps do not predict each others' memberships in the computed clusters. In the case of the 4-cluster solution, the same result exists for pairwise comparison of managers and farmers and of managers and veterinarians. That is, there are significant differences in these pairs of maps. As a result, at a 3 cluster solution, we find partial support for the existence of cognitive dissonance between the veterinarian and farmer respondent groups, but not for the pairwise comparisons between the manager and veterinarian respondent groups and the manager and farmer respondent groups.

With respect to the 4 cluster solution, there is stronger support for the existence of “cognitive dissonance” between these 3 respondent groups. However, in spite of this stronger

support, these results can only be interpreted as partial support for the existence of "cognitive

Table 5: Converted GK Lambda and Tau statistics for a 3-cluster solution

GK Lambda and Tau Tests	Veterinarians.(1) vs. Farmers(2)	Farmers(2) vs. Managers(3)	Managers(3) vs. Veterinarians (1)
Lambda (Symmetric)	0.300*	0.75	0.7
Lambda [dependent]	0.333* Vets. (1)=dep.	0.750 Farmers (2)=dep.	0.750 Managers(3)=dep.
Lambda [dependent]	0.250* Farmers (2)=dep.	0.750 Managers(3)=dep.	0.666 Vets.(1)=dep.
Tau [dependent]	0.403* Vets.(1)=dep.	0.743 Farmers(2)=dep.	0.757 Managers(3)=dep.
Tau [dependent]	0.237* Farmers(2)=dep.	0.743 Managers(3)=dep.	0.752 Vets(1)=dep.

Notes:
1) Null Hypothesis is cluster memberships are independent or perfectly un associated
2)* denotes significance at 5%
3)** denotes significance at 10%
4)When employing the asymmetric GK-tests, the dependent variable in question is found under the value of the test statistic.

Table 6: Converted GK Lambda and Tau statistics for a 4-cluster solution

GK Lambda and Tau Tests	Veterinarians.(1) vs. Farmers(2)	Farmers(2) vs. Managers(3)	Managers(3) vs. Veterinarians (1)
Lambda (Symmetric)	0.273*	0.556*	0.700*
Lambda [dependent]	0.333* Vets. (1)=dep.	0.600** Farmers(2)= dep.	0.750 Managers(3)=dep.
Lambda [dependent]	0.200* Farmers(2)=dep.	0.500** Managers(3)=dep.	0.666** Vets.(1)=dep.
Tau [dependent]	0.358* Vets.(1)=dep.	0.573 Farmers(2)=dep.	0.656 Managers(3)=dep.
Tau [dependent]	0.238* Farmers(2)=dep.	0.500** Managers(3)=dep.	0.671 Vets(1)=dep.

Notes:
1) Null Hypothesis is cluster memberships are independent or perfectly un associated
2)* denotes significance at 5%
3)** denotes significance at 10%
4)When employing the asymmetric GK-tests, the dependent variable in question is found under the value of the test statistic.

dissonance". The reason is, since cluster analysis depends substantially on the representativeness of the data (Hair et al, 1998), the small sample of the manager respondent group limits our conclusion that cognitive dissonance exists for the pairwise comparisons between the manager and veterinarian respondent groups and the manager and farmer respondent groups. Nevertheless, the GK-tests for the pairwise comparisons between the veterinarian and farmer respondent groups for both the 3 and 4 cluster solutions provide an empirically more reliable support for the existence of "cognitive dissonance". The reason being, unlike the small sample of the managerial respondent group, both the sample sizes for the veterinarian (21 survey responses) and, especially, the farmer respondent groups (105 survey responses)[19] provide a significant representativeness of the data at which cluster analysis depends upon. Therefore, one concludes from the GK tests that, at the least, there is empirical support for the existence of cognitive dissonance between the farmer and veterinarian respondent groups at both the 3 and 4 cluster solution, while only tentative support for cognitive dissonance for the pairwise comparisons between managers and veterinarians respondent groups and managers and farmer respondent groups.

According to the logic in proposition 1b, that states, the degree of "cognitive dissonance" or differences in cognition of firms' competitiveness in the swine genetic industry increases as one becomes further removed from the cognitive map of the manager group or focal group. We test that (1) the managers' map does not predict well the veterinarians' map, (2) the veterinarians' map does not predict well the farmers' map, and the transitive result (3) that the managers' map does not predict the farmers' map. We use the asymmetric GK-lambda and the asymmetric G-K tau statistics to test this hypothesis. For the 3-cluster solution, the only hypothesis which is accepted is the second: there is cognitive dissonance between the veterinarian and the farmer respondent groups. This is shown in the third and fifth cells of the first column , where the small values of $1-\lambda$ and $1-\tau$, 0.250 and 0.237 respectively, are significant at the 5% probability level.

[19] See table 4.

For the 4-cluster solution, there is more evidence that "cognitive dissonance" exists in the asymmetric tests. Based on the G-K lambda statistic, the veterinarians' cognitive map does not predict the farmers' map ($1-\lambda = 0.200$) at the 5% confidence level and the managers' cognitive map does not predict the veterinarians' cognitive map ($1-\lambda = 0.666$) at the 10% confidence level. The transitive result holds as well at the 10% confidence level in column 2: ($1-\lambda = 0.600$). For the G-K tau statistic, the only significant level of "cognitive dissonance" ($1-\tau = .238$) exists in the one-way test that the veterinarians' cognitive map does not predict the farmers' cognitive map.

One possible explanation for the above results is that the economic roles of the manager, veterinarian and farmer respondent groups and, in particular, the economic relationships between these respondent groups maybe structured in a manner that does not lead to "additive" cognitive dissonance between the swine genetics firms and the end users, the swine farmers. That is, both groups have imperfect agreement between their 4-cluster cognitive maps, as measured by the symmetric lambda test, but that the informational "distance" between the managers and the farmers is not significantly "greater" than the "distance" between the managers and the veterinarians. As a result, the information perceptions are distorted about equally, though not uniformly significantly, between the managers and the end users and the managers and the information agents, the veterinarians. Because we get strongly differing maps between the veterinarians and the farmers in all tests, it appears that the biggest gap in the overall information network occurs between these two sub-networks. In sum, both the vets and the farmers have an incomplete understanding of the competitiveness of firms perceived by the managers, but their perceptual differences are greatly different.

Hence, the GK-tests do not provide support for proposition 1b. More so than in proposition 1a where only differences in cognition are emphasized, the determinants of the magnitude of "cognitive dissonance" between these respondent groups is particularly confounded by the small sample of the managerial respondent group. That is, since proposition 1b concerns the magnitude of cognitive dissonance and not its existence (proposition 1a), the representativeness of the managerial sample becomes important for cluster analysis to determine the validity of the degree of "cognitive dissonance" between these respondent groups. As a

result, the GK-test pairwise comparisons between the manager and veterinarian respondent groups and manager and farmer respondent groups cannot, in spite of their statistical significance, be interpreted as reflective of the degree of "cognitive dissonance" between these pairwise respondent groups. Consequently, due to the small sample of the managerial respondent group, we do not find conclusive support for proposition 1b.

Nevertheless, in spite of the lack of empirical support for the above result, one may tentatively interpret this finding that swine genetic companies may not be effectively using veterinarians to disseminate information of the firms' attributes, in particular, attributes pertaining to swine genetic products that farmers consume. This has obvious implications on a firm's marketing strategy because this tentative result could imply that normative conclusions an increase in information dissemination will influence end user (farmers) behavior to purchase the swine genetic firm's products. However, this conclusion should be tempered when considered in the context of this study's cognitive dissonance framework. As noted by Akerlof and Dickens (1982), individual beliefs are persistent in which these persistent beliefs are further exacerbated by "cognitive mobility barriers" and group interaction effects. That is, both such mechanisms bias individual preferences and choices of individual's conception of the competitiveness of swine genetic firms in a fashion that perpetuates beliefs that are consistent with one's natural theories. In addition, both "cognitive mobility barriers" and group interaction effects not only perpetuate these prior beliefs, but also they reduce the magnitude of "cognitive dissonance" among individuals within a group such that there is less striving for cognitive consistency. Cummings and Venkatesan (1976) note that the magnitude of cognitive dissonance does not have any effect on information seeking behavior, but does have a substantial effect on attitude change (i.e. post purchase consumption behavior). But since, cognitive mobility barriers and group interaction effects temper the magnitude of cognitive dissonance, it is unlikely that information disseminating and/ or attitudinal influencing marketing strategies would be effective.

Conclusions

Previous socio-cognitive research in organizational theory literature has found that managers share similar mental models or cognitive maps of attributes of the competitiveness of

firms in an industry (Porac et al. 1993, Ginsberg, 1994). This paper has provided additional insight to this area of literature by studying the cognitive maps of groups outside a given industry's management cognition. We have investigated the phenomenon of differences in cognition between groups in an industry from the standpoint of theories in Cognitive Dissonance, Strategic Groups, Information Economics, and Structural Hole theory, by exploring the degree of "cognitive dissonance" between managers' (focal group), veterinarians' (informational agents), and farmers' (consumer group) perceptions of the competitive positions of swine genetic firms. In investigating this phenomena, the central argument forwarded by this study is: due to "cognitive mobility barriers" and group interaction effects and tendencies for individuals to strive for cognitive consistency, systematic differences in the cognitive perceptions of strategic groups in the swine genetic industry exists. From this central argument, proposition 1a finds that "cognitive dissonance" between respondent groups' perceptions of the clustering of the competitiveness of firms in the swine genetic exists. The GK-test statistics provide support for the existence of "cognitive dissonance" between the farmer and veterinarian respondent groups for both the 3 and 4 cluster solutions. With respect to cognitive dissonance for the pairwise comparisons between the manager and farmer respondent groups and manager and veterinarian respondent groups, "cognitive dissonance" was present at the 4 cluster solution. However, due to limits on the sample size of the managerial respondent group, these latter pairwise comparisons only provide tentative support for the existence of cognitive dissonance between these groups.

A corollary to proposition 1a, proposition 1b posits that the degree of "cognitive dissonance" or degree of differences in cognition of firms' competitiveness in the swine genetic industry increases between groups as one becomes further removed from the cognitive maps of the managers (focal group). The results from this empirical application did not find conclusive support for this proposition. While partial support for dissonance existed between the cognitive maps of the three respondent groups, the degree of dissonance was not significantly greater between farmers and industry managers than between veterinarians and industry managers.

Given this tentative result, the implication of the above result is that the quality of information about the products and firm characteristics of genetics firms held by swine

veterinarians is not better than the quality of information about swine genetics firms held by farmers. Thus, a model of marketing strategy that exploits swine veterinary practitioners as an information conduit between genetics firms and end consumers -- farmers -- would be flawed. The veterinarians do not have the necessary inter-group information channels in place to act as a resource for their clients in making choices about genetics. The empirical results above are borne out in discussions with the sample group of specialist veterinarians; they admit to frustration about their lack of knowledge of the firms and products in the swine genetics industry beyond one or two firms.

In addition to the lack of intergroup information channels, cognitive mobility barriers and group interaction effects may also prohibit changes in the belief or cognition of the competitiveness of swine genetic firms by the farmers (end users). Therefore even, if inter-group information channels were constructed to support veterinarian's information disseminating efforts, the "cognitive mobility barriers" and group interaction effects prohibits or tempers the information disseminating effectiveness of the veterinarian respondent group. Hence, attempts to change farmers consumption behavior of swine genetic firm's products becomes confounded not only with information disseminating difficulties, but also obstacles to changes in individual behavior due to "cognitive mobility barriers" and group interaction effects.

This was an exploratory study into the development of the logic of cognitive mapping beyond within-firm analysis or within the "dominant logic" of horizontally-related industry rivals. By comparing the cognitive map of firm competitiveness held by managers in the focal industry, swine genetics, against those maps perceived by decision-makers that operate downstream in the value chain from providers of genetics, we can test the usefulness of the cognitive map in making strategy to reach end users. This type of comparison has not been done previously in the literature and represents a unique extension of the technique.

Certainly, there should be further research that exploits a larger data set, especially with a larger sample of managers from different swine genetics firms. This would provide greater empirical support for the pairwise comparison between the manager and veterinarian respondent groups and manager and farmer respondent groups. As well, a more comprehensive sample could (1) control for regional differences that may exist in the genetics market and (2) expand

the set of firms that appear in all three separate cognitive maps. The former would permit the analysis of the competitive positions of firms that operate locally or within a single state. The latter would permit a more comprehensive map with perhaps more clusters that engender meaningful differences than can be captured in only three or four clusters.

Bibliography

Akerlof, George A. and Dickens, William T. "The Economic Consequences of Cognitive Dissonance" *The American Economic Review*. Vol 72, Issue 3 (Jun.,1982), 307-319.

Aldenderfer, Mark S. and Roger K. Blashfield. *Cluster Analysis/ Series: Quantitative Applications in the Social Sciences* (New York: Sage Publications Inc.), 1984.

Arrow, Kenneth J. *The Limits of Organization* (New York: W.W. Norton & Company), 1974.

Burt, Ronald. *Structural Holes: The Social Structure of Competition* (Cambridge: Harvard University Press), 1992.

Carroll, Glenn R. and Swaminathan, Anand. "The Organizational Ecology of Strategic Groups in the American Brewing Industry from 1975 to 1990" Industrial and Corporate Change. Vol 1, 1992, 65-97.

Caves, Richard E. and Porter, Michael E. "From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrived Deterrence to New Competition" *Quarterly Journal of Economics*. Vol 91, 1977, 241-262.

Cummings, William H. and Venkatesan, M. "Cognitive Dissonance and Consumer Behavior: A Review of the Evidence" *Journal of Marketing Research*. Vol XIII, (August 1976), 303-308.

Comegys, Charles. "Cognitive Dissonance and Entrepreneurial Behavior" *Journal of Small Business Management*, Vol. 14, No.1 (1976), 1-6

Dranove, David., Peteraf, Margaret., and Shanley, Mark. "Do Strategic Groups Exist? An Economic Framework for Analysis" Strategic Management Journal. Vol 19, 1998, 1029-1044.

Festinger, Leon. *A Theory of Cognitive Dissonance* (Stanford: Stanford University Press), 1957,1963.

Ginsberg, Ari. "Minding the Competition: From Mapping to Mastery" *Strategic Management Journal,* vol. 15 (1994), 153-174.

Goodman, L and Krukal, W. "Measures of Association for Cross Classification" Journal of the American Statistical Association, Vol 49 (1954), 265-268

Hair, Anderson, Tatham and Black. *Multvariate Data Analysis*, Prentice Hall, 1998.

Johnson, Douglas R. "Testing for Intraindustry Structure: Do Strategic Groups exist?" *Working Paper*. 1998.

Ketchen, David J. Jr. and Christopher L. Shook. "The Application of Cluster Analysis in Strategic Management Research: An Analysis and Critique" *Strategic Management Journal* vol. 17 (1996), 441-458.

Kinnucan, Henry W. and Olan D. Forker. "Asymmetry in Farm-Retail Price Transmission for Major Dairy Products" *American Journal of Agricultural Economics* (May 1987), 285-297.

Menasco, Michael B. and Hawkins, Del I. "A Field Test of the Relationship between Cognitive dissonance and State Anxiety" Journal of Marketing Research Vol. XV (November 1978), 650-655.

McGee, John. and Howard, Thomas. "Strategic Groups: Theory, Research and Taxonomy" *Strategic Management Journal*. Vol. 7, 1986, 141-160.

Porac, Joseph F. et al. *The Cognitive Organization of Competition: The Case of Scottish Knitwear*. Faculty Working paper no. 93-0148 Bureau of Economic and Business Research College of Commerce and Business Administration University of Illinois at Urbana-Champaign (July 1993), 1-62.

Punj, G. and Stewart, David W. "Cluster Analysis in Marketing Research: Review and Suggestions for Application" *Journal of Marketing Research*, Vol XX (May 1983), 134-148.

Reger, Rhonda K. "The Repertory Grid Technique for Eliciting the Content and Structure of Cognitive Constructive Systems" *Mapping Strategic Thought* ed. Anne Sigismund Huff. (New York: John Wiley and Sons), 1990, 301-309.

Reger, Rhonda K. and Anne Sigismund Huff. "Strategic Groups: A Cognitive Perspective" *Strategic Management Journal,* vol. 14 (1993), 103-124.

Reynolds, H.T. *Analysis of Nominal Data/ Series: Quantitative Applications in the Social Sciences* 2nd edition (Newbury Park: Sage Publications, Inc.), 1984.

Romesburg, H. Charles. *Cluster Analysis for Researchers* (Malabar: Krieger Publishing Company), 1990.

Tang, Ming-Je and Howard Thomas. "The Concept of Strategic Groups: Theoretical Construct or Analytical Convenience" *Managerial and Decision Economics*, vol. 13 (1992), 323-329.

Thomas, Howard and N. Venkatraman. "Research on Strategic Groups: Progress and Prognosis" *Journal of Management Studies* vol. 25:6 (November 1988), 537-555.