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Strategic group identification using evolutionary computation

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ABSTRACT

This paper proposes to identify strategic groups among franchisors from a big set of franchisor variables. Genetic evolutionary computation was used to reduce a set of variables efficiently, and factor analysis was used to make up the strategic groups. Franchise 500 was used as database. The results suggest both that the general map of franchisor has changed since Carney and Gedajlovic's study, and that genetic evolutionary computation is a valid way to extract knowledge from a huge set of data. This paper proposes useful information for those retail firms considering internationalization via franchising. The originality of this paper is in the use of Genetic Algorithm to discriminate the final set of variables to be used for the identification of strategic groups instead of evaluating one by one the adequacy of each variable theoretically. The ability of evolutionary computation to create new knowledge is good to produce new insights into this topic.

1. Introduction

Franchise strategy refers to the outcome of the decision to operate and expand a business by franchising versus company-ownership (Chen & Ou, 2009; Falbe & Welsh, 1998).

Two major theoretical perspectives have been proposed to explain patterns of company-ownership versus franchisee-ownership: Resource Scarcity and Agency Theory (Alon, 2001; Carney & Gedajlovic, 1991; Combs & Castrogiovanni, 1994; Combs, Ketchen, & Hoover, 2004; Michael, 2003; Newkirk & Lederer, 2006; Paik & Choi, 2007). Both theories should be analyzed, as they determine the firm characteristics that are going to drive franchisors into strategic groups.

Advocates of the strategic group concept argue that industry members can be classified into groups along key characteristics, such as strategy and structure (e.g., Hatten & Schendel, 1977). In general, firms within an industry that follow a similar approach or strategy have been termed strategic groups (Porter, 1980), and strategic groups have been found to differ in performance (Ketchen, Thomas, & Snow, 1993). Opportunities are not evenly distributed across an industry; some strategies offer better profit potential than others. Firms may be tempted to change strategies to exploit opportunities as they arise, but shifting to a new strategic group can be risky because the necessary investment can be substantial and the perceived opportunities may be short lived (Patterson & Smith, 2003).

All firms do not adopt franchising for similar reasons, but rather groups of firms share similar approaches (Carney & Gedajlovic, 1991). If strategic groups exist among firms that franchise and these groups differ in performance, examining all franchising firms as a set cannot capture the true picture of the franchising–performance relationship (Combs et al., 2004).

The typical approach to strategic group identification consists of collecting detailed industry data, and then identifying groups through clustering or other grouping algorithms (Shanley & Peteraf, 2005; Sohn & Kim, 2008). The variables used to group will have much influence on the identified groups. A new perspective is proposed in this paper. Instead of theoretically evaluating one by one the adequacy of each variable, a big set of them is used. Using an appropriate fitness function, an evolutionary algorithm will discriminate the final set of variables to be used for the identification, as well as the resulting strategic groups. We have used Genetic Algorithms (GA) for this purpose. One of the key advantages of evolutionary computation is its ability to discover new knowledge. The evolving nature of the computation can establish new relationships considered never before (Nanni & Lumini, 2009).

The next section is devoted to the theoretical perspectives to franchising. Then, strategic groups and performance are introduced. After that, the evolutionary technique used in this paper (Genetic Algorithm) is shown: first, the basis of the methodology is described, and then the particular application to the strategic group identification problem is detailed. The obtained results are illustrated later. Finally, some conclusions have been drawn.

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2. Theoretical perspectives to franchising

Oxenfeldt and Kelly (1968) offered perhaps the first explanation of why the proportion of franchised outlets differs among franchisors. Under the Resource Scarcity view, franchisors use franchising as a way to overcome constraints to growth, including a lack of trained managers and a lack of financial capital (Doherty, 2007). Success requires financial, informational, and managerial resources, but these resources are hard to obtain in the short run (Dant, Kaufmann, & Paswan, 1992). The franchisee provides an infusion of capital through fees and royalties and offers the franchisor (relatively) inexpensive growth. However, subsequent research tended to focus on the fact that firms used franchising because they also needed human capital (Norton, 1968), managerial talent (Dant et al., 1992; Doherty, 2007; Falbe & Welsh, 1998), and local knowledge (Combs & Castrogiovanni, 1994).

Viewing franchising primarily as a means to access resources, a firm's propensity to franchise varies over time. An implied tenet of Resource Scarcity Theory is the belief that the firm is more likely to increase company-ownership of sites as franchise systems mature and accumulate resources. This is precisely one of the criticisms that the Resource Scarcity thesis has received. Combs and Castrogiovanni (1994) observed that in contrast to the predictions of Resource Scarcity Theory, larger firms actually used more franchising in their development. They also found a weak negative relationship between the age of the franchisor and the use of franchising, and no relationship at all between the growth of the franchisor and the use of franchising. Some corporate giants as McDonald's and Budget Rent-A-Car endorse this asseveration.

The theory is also criticized by economists on the basis that capital can be raised more efficiently in the market. Although franchising may lower risk for the franchisor, it increases risk for the franchisee (Rubin, 1978).

Agency Theory explains the organization of relationships when one agent determines the work and another undertakes it (Mole, 2002; Shane, 1998). In franchising, the Agency Theory perspective discusses it as the relationship between one party (the franchisor) depending on another party (the franchisee) to undertake some action on the franchisor's behalf (Paik & Choi, 2007). Franchising encourages franchisees to maximize effort because, as owners, they must devote their own capital to build and operate outlets (Brickley & Dark, 1987). As a consequence, franchising lowers the cost of monitoring (Dant & Kaufmann, 2003; Pizanti & Lerner, 2003). Managerial talent and local knowledge are also eased by franchising because of the franchisees' risk to lose their upfront monetary investments if their outlets fail as a result of their own managerial inadequacies (Shane, 1998). Quite the opposite of the Resource Scarcity Theory, Lafontaine and Kaufman suggests that agency factors favour an increased use of franchising as a chain expands with maturity (Lafontaine & Kaufmann, 1994).

However, some agency problems are not solved by franchising. There are some situations in which the franchisee may be inclined to shirk by under investing and free riding at the expense of the chain's reputation (Michael, 2000). Although monitoring cost can be decreased, transferring specific knowledge to potential franchisees can also be costly (Jensen & Meckling, 1995).

Some authors have proposed a reconciliation of both theories. Martin and Justis (1993) found that short- and long-run incentives to franchise differ. Whereas resource scarcity reasons to franchise are most relevant for young franchisors seeking to expand, agency reasons become increasingly relevant with maturity (Castrogiovanni, Combs, & Justis, 2004).

3. Strategic groups and performance

Researchers have long suspected the presence within industries of subgroups of firms whose behaviours and results differ from those of the broader industry (Lee, Lee, & Rho, 2002; Porter, 1976, 1979). Currently, there are three theoretical perspectives regarding strategic group formation: the industrial organization, strategy, and cognitive/behavioural perspectives (Hoyt & Sherman, 2004).

The industrial organization perspective defines strategic groups as persistent features of the industry structure that result from entry and mobility barriers. Structural barriers impede new firms from entering new industries (Audretsch, Houweling, & Thurik, 2004). Firms may be tempted to change strategies to exploit opportunities as they arise, but shifting to a new strategic group can be risky because the necessary investment can be substantial, and the perceived opportunities may be short lived (Wheeler, Ibeh, & Dimitratos, 2008). Thus, firms generally choose not to change groups because it is unclear whether the performance enhancements gained will exceed the costs incurred (Mascarenhas & Aaker, 1989). This is a consequence of the empirically determined recognition that single groups are separated by barriers which restrict the strategic mobility of firms (Caves & Porter, 1977).

The strategy perspective is more internally focused and thus assumes that the firm's management makes decisions to configure internal resources, so as to establish a sustainable competitive advantage (Hirschsohn, 2008).

Finally, the cognitive perspective contends that strategic groups are formed by managers who partition their environment to reduce uncertainty and who possess bounded rationality (Peteraf & Shanley, 1997).

Based on strategic groups' theory as well as the evidence linking strategic groups and performance, we expect that some strategic groups among franchisors will have strategic profiles that are better suited to their environment than others. Nevertheless, identifying strategic groups involves more than just choosing initial groups and data sources. The variables used to group will have much influence on the identified groups. A detailed enumeration of nearly one hundred of such variables from prior studies has been detailed in Ketchen et al. (1993). Even if we were only concentrated in franchisor studies, the number of possible variables or indicators is huge. Insufficient consideration has been given to determine which variables are appropriate for the purpose of distinguishing strategic groups.

To avoid this, instead of theoretically evaluating one by one the adequacy of each variable, a big set of them will be used in this paper. Using an appropriate fitness function, an evolutionary algorithm will discriminate the final set of variables to be used for the identification, as well as the resulting strategic groups.

4. Methodology: Genetic Algorithms

To identify strategic groups, we must first identify the firm characteristics that are likely to drive franchisors into distinctive strategic groups. We have used Genetic Algorithms (GA) for this purpose. Genetic Algorithms (GA) have been used to solve a variety of optimization problems, such as natural gas pipeline control, structural optimization, image registration, job scheduling, path planning, product design, etc. (Fisco, 2003; Goldberg, 1989; Lee et al., 2002; Li, Deng, & Luo, 2009).

A Genetic Algorithm is a computational abstraction of biological evolution which can be used to solve some optimization problems. The technique was first introduced by Holland (1975) for use in adaptative systems. It is an iterative process applying a series of genetic operators such us selection, crossover and mutation to a