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Analysing industry profitability: A ''complexity as cause'' perspective

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Summary We investigate how the competitive complexity of an industrial sector affects its profitability. For that purpose, we developed a set of simulations representing industries as complex systems where different firms co-evolve linked by multiple competitive dimensions. We show that increases in the complexity of an industry, resulting from increases in the number of players and in the number of competitive dimensions linking them, damages industry performance. We also found that the negative impact on performance resulting from a higher number of competitive dimensions decreases as the number of players in the industry increases and that the decrease in industry performance associated to big increases in the number of players is mediated by the number of competitive dimensions linking them.

Introduction

The analysis of the structure of industrial sectors has been at the forefront of the strategic management field during the last three decades (Porter, 1980). This analysis has been mostly based on the structure-conduct-performance (S-C-P) paradigm (Mason, 1939; Bain, 1956) originally developed in Industrial Organization Economics. The S-C-P paradigm suffers, however from some limitations, notably the employment of static analysis focused on equilibrium conditions and the assumption of homogeneity of firms within the industry (McWilliams and Smart, 1993). In this paper we address those two limitations by adopting a systemic and longitudinal perspective to analyze how the dynamics of competitive interaction evolve within an industrial sector. More specifically, we focus on how the structural complexity associated to the number of competitors in the industry and the number of competitive dimensions that characterize their interaction, affect the industry's performance across time. In order to illustrate these ideas we develop a set of agent-based simulations representing industries characterized by different number of players who interact along different numbers of competitive dimensions.

This paper is organised as follows. We begin with a discussion of industrial sectors as complex systems composed by firms that interact along multiple activities. We then develop an agent-based model that captures the competitive

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interaction of multiple firms at the level of their activities. Finally, we analyze our results and discuss their implication for the debate on competitive strategy.

Industrial sectors as complex systems

From a systems theory perspective (Forrester, 1968) an industrial sector can be characterized as a *complex system*. A complex system has been usually described as ''one made up of a large number of parts that have many interactions'' (Simon, 1996, p. 183). Following this definition we can say that the complexity of an industrial sector, as a system composed by firms (the ''parts'' of the system) that interact with each other, derives from two different but related sources. The first is the *number* of firms competing in such an industry. As this number increases, the ability of each firm to anticipate and even notice their competitors' moves decreases making competitive interaction more complex. The second arises from the number of dimensions that characterize interactions between firms. Operationally, firms do not interact along a single dimension — as institution vs. institution — but along several activities, such as advertising, manufacturing, quality control, customer relations, logistics, and customer service each of which contributing towards the creation of the overall value proposition of the firm. The activities that are subject to competitive interaction in an industry constitute the *competitive dimensions* (Porter, 1980) within their industry.

The literature on competitive strategy has documented extensively the impact of the relationship between the first of these sources of industry complexity, the number of firms competing within an industry, and its profitability (Porter, 1980; D'Aveni, 1994). This work was rooted on the structure-conduct-performance (S-C-P) paradigm of Industrial Organization (IO) Economics. Its basic tenet is that economic performance of an industry is a function of the conduct of buyers and sellers which, in turn, is a function of industry's structure (Mason, 1939; Bain, 1956). The higher the number of competitors pursuing similar strategies in an industry, the more intense competition becomes as firms improve their value propositions in their attempt to gain customers' favour. Instead, in an oligopoly market, competitive intensity fades as the leader(s) tend to assume a coordinating role in the industry imposing discipline in the market, for instance, through their pricing policy (Tirole, 1988).

Less attention has been paid, however, to the impact on industry's performance associated to the number of competitive dimensions chosen by firms to pursue their value propositions. As firms formulate their strategies around a wider range of competitive dimensions the complexity of competition within such industry increases as the variety of possible changes in firms' value propositions grows exponentially increasing the potential of competitive clashes. Such complexity makes more difficult for firms to plan ahead in the long run, as their competitive landscapes are likely to suffer frequent alterations, damaging the performance associated to their current strategies. This situation hampers firms' ability to improve performance by exploiting current knowledge incrementally within the boundaries of their current strategy, forcing them to explore alternative strategic directions.

A complete understanding of the structural drivers of industry profitability calls for a specific analysis of how shifts in the path of firms' strategic evolution, as a response to changes in their competitive landscapes derived from decisions from other firms along several different competitive dimensions, affect their profitability — and therefore that of the industry — across time.

Competitive dimensions in practice

Porter (1980) states that firms position themselves strategically within the industries according to some sort of broad ''game plan''. These game plans have been labelled in the literature, as generic strategies (Porter, 1980), value propositions (Treacy and Wieserma, 1995) or strategic options (Hax and Wilde, 2001). While these generic strategies are usually characterized rhetorically, for example, as ''cost leadership'' or ''customer intimacy'', operationally they are the result of a set of specific policy choices and routines followed by the firm. For instance, a ''cost leadership'' strategic position is the result of a set of consistent policy choices and routines aimed at increasing the firm's cost efficiency such as, for instance, highly standardized manufacturing, narrow product portfolios, a mature technology base and a ''lean and mean'' organizational culture. Each of these policy choices makes its specific contribution to the overall value of the firm's value proposition. When different firms choose to compete along the same policy choices these become interdependent, representing the competitive dimensions of that industry. For instance, global leading manufacturers of eyeglasses, such as the two Italy-based firms Luxottica or Safilo, pursue ''differentiation'' strategies, built around several competitive dimensions such as a strong in-house product design, high profile marketing campaigns and control (through ownership or licensing) of a strong portfolio of sophisticated brands (Box 1).

Box 1 Competitive dimensions in premium sunglasses frames.

The market of frames for prescription and sunglasses had polarized into two sharply differentiated segments in the last years: high-end products and low-end products. By 2005 the global leaders at the high end of the market, based on brand name and design, were two firms of Italian origin: Luxottica and Safilo. These two, besides their own brands, owned licenses to use some the world's most prestigious names. Luxottica sold frames by Bulgari, Chanel, Emanuel Ungaro, Ray-Ban, Versace, Dona Karan and Vogue. And Safilo had the Gucci, Polo Ralph Lauren, Giorgio Armani, Dior, Pierre Cardin, Burberry and Max-Mara brands. Controlling those brands gave the two firms access to other distribution channels apart from opticians, mainly stores selling products of the same brands.

The tendency for manufacturers to purchase licenses for well-known, medium-high to high-end brands had increased notably in recent years. Luxottica