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Multiproduct firms and market structure: An explorative application to the product life cycle

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Abstract

The paper extends the standard Dixit–Stiglitz model of imperfect competition to allow for multiproduct firms, fully endogenising market structure by determining both the number of varieties per firm and the number of firms in the industry. The model is used to explore the proposition that shakeout in some industries may result in a shift from a fragmented market structure with many firms each offering a small range of products to a more concentrated equilibrium with fewer large firms each offering many products.

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1. Introduction

Markets for many manufactured goods are in differentiated products rather than in homogeneous commodities, and firms producing in these industries typically offer not one but a range of varieties of the same product to cater for the diversity of consumer tastes. Market outcomes with multiproduct firms may range from *fragmented equilibria*, with a

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large number of firms each offering a small range of products, to *concentrated equilibria*, with a small number of firms each offering many products. In this paper, we explore the proposition that changes in process technology and product characteristics may serve in some industries to induce a shift from a fragmented equilibrium in the early stages of the industry development to a more concentrated equilibrium in the mature industry.

It is a commonly accepted stylised fact of industry evolution that the number of producers in many new industries first increases to a peak, and then, despite continuing growth in the size of the market, falls sharply until it finally reaches a stable level (see [Sutton, 1997](#) for references). In the majority of models proposed in the literature (e.g., [Utterback and Suarez, 1993](#); [Klepper, 1996, 2002](#)), the explanation for this shakeout in the number of firms rests on the basic proposition that it stems from the exploitation of economies of scale, which emerge in production, research and development, marketing or distribution. The resulting changes in the scale of firms' output lead to a reduction in the number of firms that can survive in the industry.

Changes in the scope of firms' output have not been central to the analysis of shakeout, despite empirical evidence that product proliferation may be associated with the shakeout phase. For example, [Raff and Trajtenberg \(1997\)](#) document how the early development of the United States automobile industry was characterised by a rise in the number of models (varieties) on offer, more through entry than through model proliferation, but that after 1910 the number of firms in the industry fell (from an average of 153 between 1910 and 1920 to an average of 30 in the 1930s), while the number of models offered by the surviving firms rose substantially (from an average of 5.1 body models per firm in the 1910s to 18.4 in the 1930s). [Brander and Eaton \(1984\)](#) observe that a fairly common historical pattern is for firms to expand the scope of their product offerings and compete more directly with each other as the market grows. We argue that a full analysis of the evolution of market structure over the product life cycle should therefore allow for the possible role played by the product range decisions made by individual firms.¹

We develop a multiproduct version of the standard Dixit–Stiglitz ([Dixit and Stiglitz, 1977](#)) monopolistically competitive model to derive the short- and long-run equilibrium properties of the industry. A crucial feature of our analysis is that it endogenously determines both the equilibrium numbers of firms and varieties per firm. We use the model to consider whether the stylised changes in both process technology and product characteristics that are observed over the course of the product life cycle may serve in some industries to induce a shift from a fragmented equilibrium, in the early stages of the industry development, to a more concentrated equilibrium in the mature industry.

The structure of the paper is as follows. The monopolistic competition model is set out in Section 2 and the symmetric free-entry equilibrium is derived in Section 3. Section 4 explores whether the emergence of multiproduct firms is likely to be a contributory factor in the shakeout phenomenon. Section 5 concludes the paper.

¹ Product proliferation is recognised in the literature (e.g., [Schmalansee, 1978](#)) as a possible form of strategic entry deterrence in mature differentiated-goods oligopolies. But what is not clear from this literature is the extent to which changes in the scope of firms might also be instrumental in the process leading to the mature industry stage (though see [Sutton, 1991](#) on the specific case of the ready-to-eat breakfast cereals industry).

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