Introduction

This paper analyzes the price-setting behavior of multiproduct firms in a differentiated product market. The structure considered is one where large companies offer either a set of close substitutes or a set of distant substitutes. The key feature of the model is the possibility for multiproduct companies to choose their internal organizational structure. Each company, consisting of n divisions, may either set prices from the above in order to maximize the joint profits (as in the traditional approach), or alternatively, it may assign an independent product manager to run each division. In other words, product managers of the same company may behave either independently or cooperatively.

The modelling strategy of the paper is to allow for two different elasticities of substitution: while δ represents the intra-group (intra-company) elasticity of substitution, σ is the inter-group (inter-company) elasticity of substitution. Then, the product line of companies may consist of either a set of close substitutes (market segmentation) or a set of distant substitutes (market interlacing). Within this set-up, from the one side each brand competes more intensively with closer substitutes and less intensively with distant substitutes; from the other side two kinds of interactions must be considered: that among products of the same multiproduct firm, and that among the latter and the brands produced by rivals.

As is well known, multiproduct firms are typically established in order to exploit economies of scope or economies of scale in production. Moreover, they may be the outcome of a merging process between firms aimed at removing the main market constraints, and at reducing competition between them on the demand side. It must be stressed that the literature mainly concentrated upon the supply-side foundations of multiproduct firms, while the interactions on the demand side have not received the same attention. Exceptions are due to Katz (1984), Brander-Eaton (1984), Raubitschek (1987) and Ju (2003). While Katz (1984) examines the effects of competition on the price-quality schedule, Brander and Eaton (1984) analyze multiproduct firms under market segmentation and market interlacing. As far as market structure is concerned, Raubitschek (1987) studies multiproduct firms under monopolistic competition; Ju (2003) models multiproduct firms under oligopoly.

However, Raubitschek's assumption of monopolistic competition is not innocuous. It amounts to assuming that each Product Manager (PM) believes that all other PMs (including the PMs of the same large company) will react to an individual unit expansion in output by a total reduction of the same amount [1]. Therefore, given a large number of varieties in the market, firms exhibit the

[1] In footnotes 3 and 4, Raubitschek assumes competitive conjectural derivatives in

standard Cournot behavior [2], but since they neglect whatever effect on the industry quantity-index, the equilibrium has the properties of the traditional Dixit-Stiglitz (1977) model of monopolistic competition. While Raubitschek's conclusions are obviously correct given her assumptions, it must be stressed that in the framework of the analysis of multiproduct firms these assumptions seem to be questionable for at least three reasons. First, why should the PMs of different companies react in the same way? Second, is it reasonable that multiproduct firms decisions are taken as negligible for the market? Finally, is it sensible to assume that the elasticity of substitution across products of the same firm does not differ from that across products of different firms, thus limiting the scope for product interaction on the demand side?

Ju (2003) does not suffer from these criticisms. He allows for a oligopolistic market structure and he takes into account both the industry price-index effect and the interactions on the demand side, distinguishing between the inter-firm and the intra-firm elasticity of substitution. Another important difference between the above contributions concerns the decisional center in the first stage of the game. While Ju assumes that the PMs of the same firm behave cooperatively, Raubitschek allows for independent PMs. In other words, the price decisions come from a centralized General Direction (GD) in Ju's paper, and from independent PMs for each variety in Raubitschek's model.

In the analysis of multiproduct firms' organizational structure it is common to assume that the GD is responsible for two basic preliminary decisions. The first is the so-called proliferation decision: how many varieties to produce. The second concerns the product line selection: which kind of variety to produce. The key issue, however, is the definition of the decisional center responsible for the price/quantity decisions. Should they be delegated to PMs or should they be centralized in the GD? Which is the best corporate organization at this decision level?

The main purpose of this paper is to provide a microfounded answer to this question. While our model does not consider either the proliferation or the product-line selection decisions, it deals with multiproduct firms' price decisions under oligopolistic competition, providing useful insights about the question of whether and when a system of PMs decentralized decisions is better than a mechanism with a centralized GD. The paper describes a differentiated product market where goods are produced at constant and identical marginal costs. The degree of competition is characterized through the use of conjectural variations. To keep the analysis simple, for each PM we shall

quantities ($\frac{\partial x_{hk}}{\partial x_{ij}} = -\frac{1}{n-1}$, $\forall k \neq j$ and $\forall i, j$; where x denote quantities and n denotes the total number of variety in the market). Note that, differently by us, she solves for quantities instead of prices equilibrium.

[2] For $n \to \infty$, $\frac{\partial x_{hk}}{\partial x_{ij}} = -\frac{1}{n-1} \to 0$.

assume symmetric conjectures λ on the reaction of the PMs of the same multiproduct firm, and symmetric conjectures μ on the reaction of the PMs of rival firms. Different values of the conjectural variations λ are equivalent to different internal organizational structures.

The paper is organized as follows. Section 1 describes the demand side of the model starting from a *compound* CES utility function. Under the assumption that each brand is produced by a mono-product firm, the market equilibrium is derived in section 2 through the use of different conjectural variations. The results are reinterpreted in section 3 in terms of optimal price-setting behavior of multi-product firms, where the organizational structure of the corporate firm is endogenous. In particular, it is shown that under market interlacing, independent PMs may be more profitable than a centralized GD. Some conclusions are gathered in section 4.

1 Preferences

Consider an economy with identical households. The economy produces a numéraire homogeneous good and $M \geq 1$ groups of differentiated goods. Each group consists of $n_i \geq 1$ $(i = 1, ..., M)$ varieties or brands (indexed by $j = 1, ..., n_i$, $\forall i$), so that the total number of varieties in the industry is $N = \sum_{i=1}^{M} n_i$.

Preferences are identical for all consumers. The representative household maximizes the utility function $U = U(x_0, V)$, where x_0 is the numéraire good and $U(\cdot)$ is homothetic in its arguments. Given this property, the utility maximization problem can be decomposed into two steps (Spence 1976). In particular, we assume that V has a *compound* CES functional form:

$$V(x_i) = \left[\sum_{i=1}^{M} x_i^{\alpha} \right]^{\frac{1}{\alpha}} \tag{1}$$

$$x_i(x_{ij}) = \left(\sum_{j=1}^{n_i} x_{ij}^{\beta} \right)^{\frac{1}{\beta}} \tag{2}$$

where x_{ij} is the quantity consumed of the *j-th* product of the *i-th* group and x_i represents the quantity index of the *i-th* group. Concavity of $V[x_i(x_{ij})]$ requires that $0 < \alpha < 1$ and $0 < \beta < 1$[3]. This utility function implies a

[3] The love for variety could alternatively be modelled in a slightly different framework, by extending preferences over a continuous product space (Grossman and Helpman, 1989; Krugman, 1980).