A techno-economic analysis of the results of product diversification in household appliance durables—evaluating concreteness

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Abstract

The current tendency towards product differentiation in many areas of manufacturing is generally considered to be extremely positive. What we have attempted to do here is to verify the real degree of diversification that exists, by means of the measurement of the global performance of the most important household appliances, calculated using technical specifications available in the market.

The figures enable us to evaluate the actual degree of diversification, and to calculate the Price/Global Performance ratio, a real measure of the relationship between the global technical performance of a product and its price, in order to get a critical understanding of the technical and economic results of diversification. Furthermore, we have also carried out an analysis of correlation designed to support "empirical" evidence.
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1. Introduction

The current trend in consumer durable manufacturing is towards an ever-increasing diversification of production, designed to ensure greater market shares. This behaviour, which is in part dictated by the specific nature of demand in the industrialised world, could be justified from the commercial point of view in terms of the need companies have to differentiate their production and gain a secure position in already saturated markets. The production of differentiated goods, in fact, would guarantee a company its predominance over potential rivals, especially with regard to its specific product (Beath and Katsoulacos, 1991). As a result, companies are no longer solely interested in the tried-and-tested marketing strategy of creating an "apparent variety" of goods, but also in looking for new production mixes which tend to constitute a "real variety" of products once again considered to be of central importance within the modified competitive framework (Starr, 1982; Clark and Wheelwright, 1993).

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The production of a greater variety of goods, characterised by increased managerial and operational complexity, thus leads to the development of new productive strategies (Perera et al., 1999).

2. Aims and methodology

We have tried to analyse the nature of the correspondence between the commercial value (price) and the objective quality (assumed as defined by the global technical performance) of a wide range of the most important consumer durables. In order to do so, we have gathered figures for the main properties/performances that together contribute towards the definition of the global technical performance of the products (a brief discussion of the methods involved for all the individual goods taken into consideration is given later, although it should be said that standards of reference have not yet been uniformly established in all parts of the world (Bansal and Krüger, 1995; Meier and Hill, 1997; Turiel, 1997; Nadel, 1997), and their subsequent synthesis in a numerical index capable of expressing them in quantitative terms (Global Performance Index—GPI).

Briefly, this GPI can be calculated by considering all the product's technical properties and distilling them into a single figure by means of a standardisation procedure involving the transformation of the absolute figures for each property/performance into a percentage value, taking into account the maximum possible real range given by the following algorithm:

$$x_j^{(k)} = \left[x_{j,\min}^{(k)} - \sum_{i \in S(j,k)} \lambda_i^{(k-1)} \cdot R_{i,k-1} \cdot x_{i,\min}^{(k-1)} \right] + \sum_{i \in S(j,k)} \lambda_i^{(k-1)} \cdot R_{i,k-1}^{(j,k)} \cdot x_i^{(k-1)},$$

where $x_j^{(k)}$ is the value of index j at level k; $x_{j,\min}^{(k)}$ is the minimum forecasted value of index j at level k; $\lambda_i^{(k-1)}$ is the weight to be given to variable i at level $k-1$ in establishing the variable at the subsequent level; $S(j,k)$ is the set of indices of the "successors" of variable j at level k, and $R_{i,k-1}^{(j,k)} = (x_{j,\max}^{(k)} - x_{j,\min}^{(k)})/(x_{j,\max}^{(k-1)} - x_{j,\min}^{(k-1)})$ is the scale ratio between variables j at level k, and i at level $k-1$.

It should be noted that the weights $\lambda_i^{(k-1)}$ must satisfy the normalisation relation:

$$\sum_{i \in S(j,k)} \lambda_i^{(k-1)} = 1.$$

A more detailed description of the method used to calculate GPI can be found in specific studies describing and utilising it in various applications (Barbiroli, 1989; Barbiroli and Fiorini, 1992; Barbiroli and Focacci, 1999).

We should point out, at this juncture, that we have deliberately left out all those features (of importance when it comes to the consumer's final decision) linked to subjective evaluations (such as appearance or perceived quality) which, however, cannot be easily and uniformly appreciated and compared by the vast range of potential consumers (Barbiroli and Focacci, 2000).

Having calculated the GPI for the various goods (and for all existing varieties of model), it is then compared with the prices of the said goods (furnished directly by the main sales outlets, or taken from the manufacturers' price lists, or from specialised publications within the sectors in question) to give an idea of the relationship between the objective quality of the goods and their commercial price. As far as retail prices are concerned, a number of different considerations could be made taking in both the manufacturers' and the retailers' policies are concerned: however, we do not wish to venture into this area given that this is not the aim of the present work. The period of price gathering covered the months of April, May, June and September 2000, we were forced to resort to the price lists published in the specialised press (Dretzke, 2001; Harnett and Horrell, 1998; Kostecki, 1998).

One aspect that re-enforces the study in question is provided by the statistical analysis of the data. This analysis is based on a linear model, the best choice for correlating any correspondence between the quality of the goods (summarised in terms of performance) and their respective prices. The statistical method employed is one involving the regression of figures using the method of least squares; the elaboration of data then proceeded along the same lines as those seen when comparing the respective variations in GPI (different models