Product diversification in the computer industry: a structural analysis

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Abstract

The current tendency towards product differentiation in many fields of manufacturing is generally considered to be a positive phenomenon. What we have attempted to do here is to verify the real degree of diversification that exists within the computer industry, by means of the measurement of global performance for the most widely spread models, calculated using technical specifications available from the market. The available data enable us to evaluate the actual degree of diversification, and to calculate the price/global performance ratio. This ratio is a measure of the relationship between the global performance of any given product and its price, and provides a critical insight into the technical and economic results of product diversification.
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1. Introduction

The current trend in the manufacture of consumer durables is towards an ever-increasing diversification of products designed to guarantee greater market shares.

As economic literature would suggest, this increasing diversification may be identified in the overall characteristics of manufactured goods, even though, as an analysis more closely connected to the empirical nature of the market will show, the most evident feature is the varieties of models available within a specific group of products, or the considerable number of brands proposed to consumers. This latter aspect, which is particularly striking if the proliferation of brands is also pursued by the same company that leads the market, does not, however, necessarily reflect any real variety in output die to the different perception potential consumers have of these brands.

However, the incentive towards product diversification, which is in part dictated by the demand for products that are differentiated (to a lesser or greater degree), could be justified from the commercial point of view in terms of the need companies have to gain a secure position in already saturated markets. As Pindyck and Rubinfeld (1996) pointed out the majority of consumers appreciate being able to choose from a wide variety of similar products and brands that differ from various point of view.

Companies may base their actions on the output obtained by means of two different kinds of choice (choosing either both at the same time or one rather than the other):

- the tried-and-tested creation of an 'apparent degree of variety';
- the creation of new product mixes which tend to constitute a 'real variety' of output (Starr, 1982; Clark and Wheelwright, 1993).

As far as the choices to be made regarding the adoption of the most suitable production system given the increase in final variety is concerned, we can say that the choice of a more flexible approach (in terms of both volumes of production and of variety of specific characteristics, and thus of global performance with the resulting wider variety in both 'apparent' and 'real' terms), leads to greater managerial and operational complexity (Lei et al., 1996; Perera et al., 1999; Knot et al., 2001).

Furthermore, it remains to be seen if and how an increase in the range of products leads to an overall reduction in production costs (Scazzieri, 1993; Kikuchi, 1996; Landesmann and Scazzieri, 1996). Nevertheless, it would seem certain that as production technology approaches perfection, companies adopt a series of procedures and techniques that inevitably lead to the levelling out and standardisation of an output that was previously

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differentiated to a much greater degree. The consequent achievement of greater overall levels of production, which in turn means a significant saving of resources, allows further investment in the development of new products and technology (Abernathy and Utterback, 1975, 1978; Sahal, 1981, Metcalfe and Gibbons, 1989).

2. Real and apparent variety of goods

One fundamental objective of economic analysis is to decide whether current trends towards diversification and the adoption of flexible manufacturing systems lead to real or apparent variety of goods. The reason for this is that the availability of a real variety of goods in the market influences the attitude of consumers on the one hand, and the structure of the economy on the other (Pasinetti, 1981, 1990; Saviotti, 1996).

We should point out here that diversification can be seen at two different levels: the diversification of products manufactured by different companies and that of products manufactured by the same company. Furthermore, the degree of diversification may depend on all the properties/performance that contribute to determining the global quality of goods, and as a result, their type and degree of utilisation.

This specification now requires a further one to be made: properties/performance may be either quantifiable or non-quantifiable. Of course, the latter are subjective and therefore may be evaluated in different ways by consumers, whereas the former have to be accepted by all consumers, even if they are often not taken into consideration or fully understood (in the case of many consumers). This very often means that choices are irrational and lead to an inappropriate form of utilisation. For this reason, quantifiable properties should become increasingly important when assessing goods. As previously mentioned, the strategic move toward diversification made by companies in order to increase (or maintain) their competitive position in the market, should be analysed in terms of the effective results achieved in diversifying production. As a matter of fact, a careful observation of the goods currently available on the market raises the doubt that the above-mentioned degree of diversification is not a well-known phenomenon, mainly because the attention of customers/users is drawn towards characteristics that are not of fundamental importance to a good's global quality (Barbiroli, 2000). For instance, shape rather than life-span in the case of all durables, or the more general aspects of car safety instead of specific data regarding crash tests, or generic indications concerning eco-compatibility during utilisation and at the end of life instead of data concerning emissions and all the other environmental features of a good, or generic information about the ease-of-use instead of specific details about maintainability and ease-of-repair, etc.

In order to carry out a useful assessment of a good real data, an objective properties/functions must be considered a priority in order that different types of the same good may be objectively compared, any real quality differences may be pointed out, and conclusions about the real degree of diversification may be drawn. Of course, subjective factors can also be taken into consideration in a global assessment, but they cannot be allowed to prevail over objective ones: otherwise it would be impossible to formulate any rational evaluation of such goods.

One important aspect of this question is the effective contribution made by product variety to economic development, in particular, in those markets characterised by a considerable degree of imperfect competition (as we find in real economies throughout the world in fact). Economic analysis possesses two extreme positions in those of Hotelling (1929) and Chamberlin (1933): the first sees the behaviour of companies in such market conditions as leading to the minimum degree of overall product variety, whereas the latter, on the contrary, underlines the consequent maximisation of product variety. However, subsequent studies have criticised such conclusions as being incomplete (Eaton and Lipsey, 1975; Dixit and Stiglitz, 1977; Lancaster, 1979; Salop, 1979).

For example, Saviotti (1996) states that the degree of product diversification required for long-term growth has steadily increased during the course of growth itself, thus pointing to an inverse relationship with economies of scale and the substitutability (at various levels) of goods, and a direct relation with the overall size of the market and the relative importance of the product itself within the market (with regard to the latter point, there is a certain similarity with the central thesis of Smith's work from 1776 in which the economist claims the existence of a direct relationship between market size and an increase in the parcellisation of labour).

Such claims are also supported by Pasinetti (1981, 1990) and by the clearly visible situation that has arisen in both the telecommunications and transport sectors, where the increase in efficiency and productivity, by allowing an increase in the range of services/products on offer, has in the end raised the overall level of overall present. Thus, the development of a high degree of product diversification has had clear repercussions on the entire economic system, and exercises an even more important role than of the process of substitution.

Nevertheless, the effects of this increase in product variety remain to be seen, in particular, the added cost involved in achieving it (both for companies and for society as a whole), as do the other resulting external effects. Particular attention needs to be paid to the marked difference between the diffusion process—which is more uniform in its distribution (Mansfield, 1961; Prigogine and Stengers, 1984; Girifalco, 1991; Griliches, 1997)—and the actual increase in variety (Dosi et al., 1990) which, on the contrary, comes about in a completely asymmetric