Diversification Patterns : Theory and Evidence for the Food Industry in the U.K. and Italy

by

Magda Bianco

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(University of London)

London School of Economics and Political Science

Abstract

The thesis is organized around two closely interlinked questions: (a) At a theoretical level, is it the case that diversification activities driven by economies of scope should lead to a positive correlation between diversification and profitability? (b) Empirically, can a theoretical model account for observed patterns of diversification activities over time and across countries?

Following a general discussion of the main issues related to diversification in chapter 1, chapter 2 answers to the first question in the negative. In a model where diversification is induced by the presence of synergies, it is shown that diversified firms may be on average the less efficient firms on the market and may survive only due to the presence of synergies. This is consistent with the results of earlier empirical studies, showing no correlation between diversification and profitability. Therefore the empirical part of the thesis focuses on patterns of diversification rather than on the link with profitability.

Models that attribute diversification to the presence of 'economies of scope' suggest that diversification patterns are determined by technological factors, that are stable over time and over countries. In chapter 3 a specific sector (food and drink) is analysed in the U.K. over a long time period (1962-1986) and the U.K. experience is compared to that of Italy (in 1986) through a standard loglinear model and a separate analytical approach. The main results are as follows: (1) U.K. diversification patterns are remarkably stable over time; (2) Italian diversification patterns appear quite different from those of the U.K., whether in 1962 or in 1986. Since overall diversification levels for the U.K. in 1962 are similar to those in Italy in 1986, it seems that patterns of diversification may be induced by country specific factors.

In order to unravel the difference between U.K. and Italian experience in chapter 4 a series of case studies of specific industries and firms is carried out. They suggest that in the Italian economy, where the distribution sector is poorly developed, large firms can enjoy a strong advantage by building up their own distribution networks. While the case studies indicate the possible importance of several other factors, it is this factor that appears to be the single most important influence underlying the difference between the U.K. and Italy.

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Introduction

The present thesis is organised around two closely interlinked questions. Both are concerned with the use of a single theoretical model to explore both the way in which firms diversify their interests across different industries, and the possible links between such diversification activities and the profitability of the firm. Two questions arise:

(a) At a theoretical level, is it the case that diversification activities driven by economies of scope should lead to a positive correlation between diversification and profitability?

(b) Empirically, can a theoretical model account for observed patterns of diversification activities over time and across countries?

In chapter 2 we answer to the first question in the negative. In a framework where diversification is induced by the presence of synergies, formally described as cost correlation or economies of scope across industries, diversified firms may be on average the less efficient firms on the market. They would survive only due to the presence of synergies. (This result holds under particular assumptions on the underlying cost distribution of firms, and on the degree of "relatedness" among industries.)

The conclusion is that the theory is consistent with the null result familiar with earlier empirical studies, that there is no correlation between diversification and profitability. If any prediction can be derived from theory, it is of a conditional kind, and can be tested only with extremely detailed data of a kind which is not currently available. It was therefore decided to focus, in the empirical part of this thesis, on patterns of diversification and not on the link with profitability.

Models that attribute diversification to the presence of economies of scope suggest that diversification patterns are determined by technological factors, that are stable over time and over countries. The method used in chapter 3 is to analyse one sector (food and drink) in the U.K. over a long time period (1962-1986) and to compare U.K. experience to that of Italy (in 1986).

A large program of data collection and analysis was undertaken in order to obtain comparable datasets for the U.K. and Italy. The data are analysed in two separate exercises:

(a) The application of a standard loglinear model shows a fair degree of stability in the patterns observed in the data. However these results are only superficially satisfying, since they do not capture in a satisfactory manner the nature of the theoretical restrictions that emerge from the model of chapter 2.

(b) For this reason, a separate analytical approach was developed. The new procedure is to simulate the evolution of diversification patterns under the maintained hypothesis of the theory. This method turned to be more satisfactory than the loglinear analysis. The main results are as follows: (1) U.K. diversification patterns are remarkably stable over time; (2) Italian diversification patterns appear quite different from those of the U.K., whether in 1962 or in 1986. Since overall diversification levels for the U.K. in 1962 are similar to those in Italy in 1986, it seems that patterns of diversification may be influenced by country specific factors. It is to this question that we turn in chapter 4.

In order to unravel the difference between U.K. and Italian experience, a series of case studies of specific industries and firms were carried out. These suggest that in the Italian economy, where the distribution sector is poorly developed, large firms can enjoy a strong advantage by building up their own distribution networks. While the case studies indicate the possible importance of several other factors, it is this factor that appears to be the single most important influence underlying the difference between the U.K. and Italy.

The implications of this for the theoretical and empirical analyses of chapters 2 and 3 would appear to be the following:

(1) The present theory assumes (as do other currently available theories) that scope economies operate independently of the firm's size. Here the theoretical model falls short of providing an adequate description of these markets.

(2) However, once this effect has been allowed for, the overall patterns of diversification obtaining in the Italian industry appear broadly similar to those seen in the U.K.

Chapter 1

Diversification. Theoretical Considerations and Empirical Applications: a Survey.

1. Introduction

The growth of a firm over time is often associated with an increasing degree of diversification in the firm's interests. Though a substantial literature has addressed the phenomenon, the analytical basis of studies of diversification is notoriously thin, and the problem of finding adequate models of the diversification process is acknowledged to be a difficult one. The aim of the present thesis is to explore a number of specific issues within this area.

In this survey, the literature on diversification is reviewed in the light of the aims of the present study. Most of the attention will be focused on the reasons for diversification and the relationship between diversification and firms' profitability.

Theoretical issues relating to the reasons for diversification are dealt with in section 2. The 'economies of scope' literature is concerned with defining conditions on the production technology which lead to the appearance of multiproduct firms. Models of the 'growth of firms', and transaction cost theory complement this approach, showing in particular how the development of excess capacity in an indivisible factor may induce diversification whenever there are obstacles to growth within the firm's own market. The empirical analysis developed in chapters 3 and 4 of this thesis is based on these theoretical ideas.

In section 3 of this chapter it is shown how further reasons for diversification emerge once we remove the assumption of perfect competition.

Product differentiation and welfare issues are reviewed in section 4 and 5 respectively. The product differentiation literature is concerned with the issue of incentives to produce multiple products. Though relevant to diversification issues, this theme will not be addressed further in the thesis. Welfare effect may be of concern if increases in corporate size and diversification induce anticompetitive behaviour, but in practice, the significance of this may be limited.

In section 6 some relevant empirical work is discussed. Here two main issues have been addressed, which will be central to the following chapters. A number of empirical studies have looked at reasons for diversification using regression analysis. Most of these have no clearly specified theoretical basis, and the results obtained are often not robust. In the present study, a different approach will be pursued.

Empirical studies of the effects of diversification on firms' profitability have not found any robust and unambiguous relationship. Case studies show that firms diversifying into "related" markets perform better, but only over a long period of time. In chapter 2 of this study, this issue is addressed from a theoretical point of view, and a possible rationale for these empirical findings is suggested.

2. Diversification

Throughout this study, I adopt a familiar definition of the industry as encompassing a set of products that are "strong" substitutes, i.e., the cross elasticities of demand within the industry are positive and large, whereas cross elasticities with products outside the industry are small.

A firm is called diversified if its products belong to different industries in this sense[1]. The usual underlying hypotheses are that each product market is homogeneous and that different markets are not related through demand interdependencies (the elasticity of substitution is close to zero). The questions concerning the reasons for entering new markets and the choice of the direction of expansion are treated in terms of technological incentives, while little attention is given to strategic considerations. Strategic effects are discussed in section 4 below.

Most studies of diversification in the 'business' literature concentrate on describing various diversification strategies followed by companies, and on measuring the degree of success achieved (in terms of profitability, say). The approach in the economics literature, on the other hand, has been essentially econometric. It is usual to posit a number of ad hoc hypotheses, rather than specify a formal model. For example, it is sometimes assumed that firms diversify to exploit synergies, or to obtain market power, and some implication for the relationship between profitability and diversification are tested.

In what follows, we begin by looking at some formal models.

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[1] In fact, a large number of definitions has been suggested for the diversification process: E. Robinson identified diversification with the "lateral expansion of firms neither in the direction of their existing main products, as with horizontal integration, nor in the direction of supplies and outlets, as with vertical integration, but in the direction of other different but often broadly similar activities"; M.Gort (1962) observed that diversification implies the "heterogeneity of output from the point of view of the number of markets served by that output"; in Connor et al. (1985) "a firm diversifies its operations when it begins to sell in more than one market"; M.Utton distinguishes between narrow spectrum diversification, which implies diversification into industries closely related to a firm primary production, and broad spectrum diversification. All of these definitions assume however that a market is a well defined concept.

2.1 Economies of Scope

The economies of scope approach, developed by Panzar and Willig in a series of articles (see, for example, Panzar and Willig (1981)), derives the conditions for the existence of a multiproduct firm in a competitive/contestable equilibrium.

Economies of scope are defined as cost savings resulting from production of several outputs in a single enterprise. They are generated by the presence of sharable inputs, which implies subadditivity of the cost function with respect to the services of the sharable input[2], if the market cannot efficiently allocate the services of the input[3].

Assume there are N products, and label as $(y_1,\ldots,y_n)$ the quantities produced of each. If S is a subset of N, define y_S as the vector of y_i's such that $y_i \geq 0$ if $i \in S$ and $y_i = 0$ if $i \notin S$. Let $C(y_S,w)$denote the cost of producing the vector $i \in S$ of products in the set S at factor prices w. If T is a partition of S, then there are economies of scope at y_S, at factor prices w, with respect to the partition T if:

$$\sum_{i=1}^{l} C(y_{T_i},w) > C(y_S,w)$$

Economies of scope are defined, then, for a certain subset of the total set of products, and for given factor prices.

If N=2, for example, and the factor market is perfectly competitive, we have economies of scope at production levels q_1,q_2 of products 1 and 2 if (suppressing w for ease of explanation):

$$C(q_1,q_2) \leq C(q_1,0)+C(0,q_2)$$

If this hypothesis is satisfied, it can be shown that in a competitive equilibrium there will be multiproduction (Panzar and Willig (1981)), i.e., economies of scope are necessary and sufficient for the presence of diversified firms.

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[2] An input is sharable between the productions of product sets S and T, if the joint production of these outputs allows some of the input to be conserved, with respect to separate production, while the use of the other inputs is not increased.

[3] An efficient market allocation of the services means that end users of the services face an input price equal to its marginal cost. In this case the effect of the economies of scope arises one step back, at the level of suppliers of sharable input services. With arbitrage problems (which do not allow different market prices for different users), in a competitive equilibrium there will necessarily be self-production of the sharable input services and multiproduction of final goods.

Economies of scope have become a fundamental concept to explain diversification, and can be considered as an abstract notion for the commonly used term "synergies".

Some examples that help in giving a content to the formal definition are the following (Bailey and Friedlaender (1982)):
(a) we have economies of scope when the joint production of two goods allows to use one input for both, and this is less costly than using it twice (economies of scope can arise even if scale economies are lacking): the ability to share the factor of production among products is however dependent on both prices and available technology;
(b) the presence of a fixed factor of production is another source of economies of scope. Suppose there exist an indivisible asset which leads to economies of scale, but at the current level of demand for a single product is not fully utilised: this might still generate economies of scope;
(c) economies of scope could be a consequence of economies of networking, where economies of scale advantages can be reaped only with larger scope of operations;
(d) the presence of a public input that can be reused for more than one product is another source of economies of scope.

Two major objections to the economies of scope approach have been raised. In the first place, the reference to economies of scope in explaining multiproduct operation is somehow tautological: when it is cheaper to produce more products in a single firm, then firms are diversified[4]. This would require an analysis of the conditions that make the hypothesis true. Second, the theory is static and does not explain the actual, dynamic diversification process.

These two points can be approached introducing considerations proposed in the literature on the growth of firms and in the literature referring to transaction costs.

2.2 Theories on the growth of the firm

The above definitions of economies of scope point to the presence of some form of excess capacity at given levels of demand. The literature on the growth of firms (Penrose (1959)) postulates precisely the idea that diversification is induced by the presence of excess capacity. It first explains

[4] Even if this is only shown to hold under the hypothesis of perfect competition.

first how excess capacity develops and, in a second step, finds conditions under which excess capacity leads to diversification. The development of excess capacity is the result of: (i) indivisibilities of fixed (physical) capital, (ii) accumulation of technological know-how within the firm (which can be used without the cost that should be supported if acquired on the market), (iii) a dynamic process of learning (and creation of routines) especially at the managerial level, which make "spare time" available for alternative uses[5].

The presence of excess capacity is not a necessary condition for economies of scope (and thus multiproduct operation). The firm has in fact the choice between (a) not using the excess capacity, (b) "reinvesting" the excess capacity in the current production line, (c) selling/renting it on the market, (d) diversifying, i.e., using excess capacity in a different market. The third possibility is excluded in the cases of high transaction costs (see below). Diversification is the preferred choice between alternatives (b) and (d) if some conditions relating to the relative profitability of the two alternatives hold. These are:

(1) The presence of particularly good profit opportunities in some markets. Penrose calls these specific opportunities and lists them as: a growing demand for specific products, discoveries and inventions, the exploitation of which seems particularly promising; or specific opportunities to obtain a better market position or achieve some monopolistic advantage.

(b) Conditions which reduce profit opportunities in the firm's own product market. Penrose refers to these as specific problems: temporary fluctuations in demand, which lead to periodic underutilization of resources, the presence of market imperfections that generate a decline in the profitability of the existing market as output increases (market demand is rigid, the main product of the firm is at a mature stage, or horizontal expansion is limited by the presence of antitrust regulations).

2.3 Transaction Costs

The presence of economies of scope is a necessary and sufficient condition for the existence of multiproduct firms only if the multiproduct cost function summarises both production and organisational costs. Otherwise, some relevant economic factors which influence the scope of the firm may be missed.

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[5] For a linear programming approach to Penrose theory, see P.Rubin (1973).

The transaction cost literature deals mainly with these organisational issues. According to Teece (1980, 1982) the presence of economies of scope is not sufficient to generate multiproduction, as firms could simply rent the services of the common input. A second necessary element is therefore the presence of high transaction costs which do not allow the establishment or the use of these rental markets.

The relevance of transaction costs depends essentially on the input which generates the economies of scope i.e., which is sharable or has public good characteristics. They are higher when the common input is represented by indivisible and specialised physical capital or by human capital. If physical capital can be used only to produce a very limited number of products, the market for the services of capital might be very thin, and this can generate transactional difficulties. In the case of human capital, transaction costs could be very high due to the tacit component of organisational knowledge and to the problems of recognition and disclosure[6].

2.4 A Theory of Diversification?

Those three approaches complement each other and can be usefully combined. Such an approach will form the basis for the empirical work developed chapter 3. Suppose firms own some indivisible factors[7] and on which they have excess capacity (the factor may be managers, machines etc.). If the factor is specific to the market, the firm tries to expand in its original market, since there the factor earns higher rents. However there may be obstacles to this expansion (because the firm is large relative to the market, or because there are antitrust regulations etc.). If this is the case the firm might sell the capacity (if transaction costs allow), use it in other markets (if there are some markets that are 'close' to its original ones) or simply not use it. In this case diversification is driven by a push factor: the firm is forced out of its market. We should expect to observe this when the firm is growing more rapidly than its market and reaches some threshold market share (possibly 100%). The direction of diversification will be determined by the possibility of exploiting some economies of scope.

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6 These amount to problems of non recognition of the opportunity by other firms; problems of disclosure of value to buyers, in a way both convincing and such that does not destroy the basis for exchange; and possibly the necessity of a "consulting team" to assist the start up.

7 Which may be specific and unique to the firm (in this case the firm earns Ricardian rents on it) and/or to the market.

There may be cases where economies of scope are strong enough to induce diversification even in the absence of any push factor: this will occur if the firm has an advantage over incumbents and potential entrants in some market due to its ability to exploit scope economies. This might arise for example if there are by products of some production process that can be used in other lines. In this case diversification is driven by a pull factor.

3. Imperfect Competition

3.1 A Cournot Example

In an imperfect competition framework, additional incentives for multiproduct operation may arise. Wolinski (1986) introduces demand side considerations[8]. In his analysis imperfect competition could be in itself an incentive to diversify. He considers a model in which two products can be produced with two different technologies: each technology allows one product to be produced more efficiently than the other. Technologies are such that the cost function exhibits diseconomies of scope (two firms with different technologies, each producing one product, are more efficient than one firm with a single technology producing both products)[9]. It is not therefore surprising that Wolinski is able to show that in perfect competition (price taking behaviour) firms are specialised. The interesting result is that with imperfect competition (Cournot competition), profit maximising firms in equilibrium might be diversified.

The result is driven by the presence of a sort of "excess capacity", generated by the self imposed restraint in production that Cournot competition generates. Prices exceed marginal costs and it might be profitable to sell also in the second market, even if the technology owned is less efficient. In general the result will depend on the cost function and on the equilibrium number of firms in a free entry equilibrium (which in turn is a function of the fixed entry costs). The smaller is the number of firms, the higher are the incentives to produce in the second market as well, given that price cost margins are higher.

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8 Dixon (1992) presents a very similar model and reaches analogous conclusions.

9 Dixon (1992) considers the possibility for firms to choose between a flexible technology, which allows them to produce both commoditites, and a dedicated technology, which allows to produce only a single commodity. There are diseconomies of scope, so that flexibility may imply a loss of efficiency in terms of marginal costs as well as fixed costs.

Wolinski claims that excess capacity is a sign of the presence of economies of scope[10]. However, this statement is somewhat misleading. I shall show in what follows how excess capacities arising through imperfect competition lead to diversification even in the presence of diseconomies of scope. The idea is similar to that of reciprocal dumping argument of Brander and Krugman's (1981) international trade model. The transport costs in that model translate here into the costs of adapting a technology to another product.

Assume there are two different products, A and B, and two firms, 1 and 2. Cost functions for the two products exhibit diseconomies of scope:

$$C(q_A, q_B) > C(q_A, 0) + C(0, q_B)$$

where:

$$C(q_A, 0) = aq_A$$
$$C(0, q_B) = bq_B$$
$$C(q_A, q_B) = aq_A + bq_B + tq_B$$

Let t denote the cost of adapting the technology to a different production. Assume the firms face identical linear demand schedules in each market, as follows:

$$P_A = A - BQ_A$$
$$P_B = A - BQ_B$$

Then, if each firm is active only in one market (the one in which it is more efficient, say), we have at equilibrium:

$$q_A = q_B = \frac{A-a}{2B}$$

$$P_A = P_B = \frac{A+a}{2}$$

$$\pi_1 = \pi_2 = \frac{(A-a)^2}{4B}$$

However, if the price in the second market (where production is less efficient) is higher than the marginal cost of the product, each firm will also produce for the second market. This is the case if:

$$t < \frac{A-a}{2}$$

i.e., if t is not too large, both firms have an incentive to be active on both markets, and it is easily shown that in a Cournot-Nash equilibrium:

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10 This would imply that there are diseconomies of scope at the competitive equilibrium level of production and economies of scope at the Cournot equilibrium level of production.

$$q_{A1} = q_{B2} = \frac{A-a+t}{3B}$$
$$q_{A2} = q_{B1} = \frac{A-a-2t}{3B}$$
$$P_A = P_B = \frac{A+2a+t}{3}$$

with:

$$\pi_1 = \pi_2 = \frac{2(A-a)^2 - 2(A-A)t + 5t^2}{9B}$$

(which is lower than the monopoly profits).

This simple example shows, in the spirit of the 'reciprocal dumping' results, that imperfect competition generates further incentives to diversify into other markets as long as the additional costs are not too large. Thus the imperfectly competitive setting generates a further source of inefficiency (as compared to a perfectly competitive framework) due to the existence of multiproduct firms, despite the cost advantages of specialisation.

3.2 Other Strategic Considerations

In an imperfectly competitive framework Lal and Matutes (1989) identify incentives to multiproduction when consumers differ in income and transportation costs. This allows price discrimination by means of a bundling strategy. Consumers with low reservation price and low transportation costs shop around, while consumers with high reservation prices and high transportation costs prefer to buy bundles of goods at the same time. In a (pure strategy) Nash Equilibrium (when it exists), firms set the same price for the bundle of goods but different prices for each of them. One firm sets a lower price for good 1, and a higher price for good 2, while the other firm reverses this procedure in order to extract consumer surplus from rich consumers. In a 2-stage game, where firms first choose how many products to sell and then the prices to charge (fixed locations), it is never in the interest of any firm to withdraw any product (assuming a pure strategy Nash equilibrium exists).

3.3 Uncertainty, Asymmetric Information, Incomplete Contracts

The previous discussion related to a world without uncertainty. In a framework characterised by the presence of uncertainty (on the demand side), other types of incentive to diversification arise. These are mainly associated with the idea of risk spreading. A sizeable literature addresses this issue.

If demand fluctuations occur, firms producing different goods, the demand for which is uncorrelated, will enjoy lower variance about their expected rate of return. It has been argued that this provides a motive for diversification. This argument has been subjected to some criticism. If capital markets are perfect and if firms maximise market values, then a separate rationale for firm diversification does not exist. The market value criterion implies that the sole concern of managers is with the stream of expected profits, and considerations of stability of returns may be left to shareholders, who can diversify their own investment portfolios.

Some of the responses to this criticism have been: (a) to assume that firms do not maximise shareholders' welfare, and to assume instead a separate managerial objective function which includes a risk variable, (b) to assume that capital markets are imperfect. If shareholders experience wealth constraints or high capital and transaction costs, then firm diversification might be rationalised on the grounds of lowering the market price or risk to shareholders and reducing the probability of corporate bankruptcy.

However, the (relatively limited) empirical evidence does not support these theories: no significant negative link between diversification and the variability of returns is in fact observed[11].

In general, the level of risk is associated more with the product life-cycle rather than the span of the product portfolio. The best strategy involves diversifying into "new generation products" which can offset declining sales or profitability of the old ones (see Rumelt, 1974).

Further reasons for diversification may arise due to asymmetric information and agency problems[12]. When ownership and control of firms are separated, managers may pursue strategies to further their own interests at the expense of the firm's owners. Mergers, particularly conglomerate mergers, may be a convenient vehicle for doing so[13]. Besides the empire building reason, other motives have been proposed to explain why a self-interested manager might pursue excessive expansion. A manager might direct a firm's diversification in a way that increases the firm's demand for his or her particular skills (managerial entrenchment). Moreover, as said above, managers may try to pursue diversified expansion as a means of reducing total firm risk, thus improving

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11 See Beattie (1980) for references and the evidence in Marshall, Yawitz and Greenberg (1984).

12 See Montgomery (1994) for a survey.

13 See Jensen's "free cash flow" theory.

their personal position while not necessarily benefiting the firm's stockholders[14]. These possibilities arise as a consequence of the asymmetry of information between insiders (managers) and outsiders (shareholders) and the impossibility of devising contracts covering all possible events.

4. Product Differentiation and Multiproduct Firms

The incentives to expand production within the same market (i.e., into products with high elasticity of substitution with respect to the initial product set) are of a different kind and are more directly related to demand interdependencies.

One incentive to multiproduct operation within the same industry is to deter entry and reduce competition. Schmalensee (1978) explains product proliferation as a rational entry deterring strategy (his example refers to the ready to eat breakfast cereal industry)[15]. In a model with increasing returns at the brand level, spatial competition and some costs of repositioning brands, an optimal entry deterrence strategy implies high prices, brand proliferation and some degree of overspending in advertising.

The Schmalensee paper raises a number of questions as to what kind of factors lead, within this type of model, to 'multiproduct firms' outcomes as opposed to 'single firm' outcomes. The factors involved include (a) demand side factors, (b) cost side factors, (c) the form of price competition assumed and (d) the presence or absence of the kind of strategic asymmetries captured by 'sequential entry' as opposed to 'simultaneous entry' formulations.

The role of demand side factors was raised in Scherer (1982) and in Wolinski (1986), which has already been discussed above. Other treatments include Brander and Eaton (1984). Shaked and Sutton (1990) attempt a general characterisation of results in this area. Their analysis is couched in general terms, independent of the form of price competition (Bertrand/Cournot), and is applied to both the simultaneous entry and sequential entry settings. Within the simultaneous entry setting, the set of equilibrium outcomes depends on two effects: a competition effect and a market expansion effect. The first effect refers to the degree of substitutability between products: the closer are the

[14] See Montgomery (1994). However, as stated above, this theory has received limited empirical support.

[15] Reverse results are obtained by Judd (1985) who shows that, if multiproduct firms could in fact exit in response to entry, this might attract further entry and product proliferation might not be credible. This is of more relevance if goods are better substitutes, if entry costs are low, and as competition in the market is more intense.

products the higher is the competition and therefore the incentives for a firm to enter the second market. The market expansion effect concerns the new demand that the introduction of new product creates: for a given intensity of competition, a higher expansion effect makes it more profitable to allow a second firm on the market.

These models, as they stand, do not address the diversification issue. In principle, the introduction of cost considerations into this kind of framework might open the door to some interesting questions. If tough price competition in the core industry makes diversification more attractive, then the question of which industry the firm diversifies into becomes central. The models developed in Chapter 2 may be seen as an attempt to begin such an investigation.

5. Welfare Effects of Diversification

One of the main concerns generated by the increase of corporate size, which is generally accompanied by an increase in diversification levels, has been about possible anti-competitive behaviour.

The relationships between diversification and market power or, more generally, between diversification and welfare, have been studied by Encaoua, Jacquemin and Moreaux (1986) and Waterson (1983). These relationships are shown to exist only when products are linked by substitutability/complementarity on the demand side.

Waterson (1983) uses a framework developed by Spence (1976) and Dixit and Stiglitz (1977) to explore the welfare aspects of the trade-off between the exploitation of market power and economies of scope.

Perfect contestability guarantees that private incentives to exploit economies of scope generate socially optimal market configurations. However, if markets are imperfectly competitive, it might not always be the case that attaining economies of scope is optimal from a social welfare viewpoint. In general a trade-off exists between market power and a better exploitation of economies of scope.

This may be the case if economies of scope arise between products which are to some extent substitutable on the demand side. When products are complements or alternatively have no relationship on the demand side, multiproduct operation is always "better" in terms of social welfare.

A formal illustration may be helpful here. Waterson uses two models to analyse the question. The first considers only two product markets, where no entry is allowed. Here, the author compares a monopolistic configuration where one firm produces both products with a duopoly where each firm produces one product. The second model assumes monopolistic competition with free entry and compares a one-product firm equilibrium with a two-product firm configuration.

In both models market demand for product i is given by:

$$p_i = a - 2bx_i - 2d\sum_{j \neq i} x_j \qquad\qquad b > d$$

The cost function is given by:

$C(1) = cx_i + f$ if the firm produces only one product,

$C(2) = cx_h + cx_k + 2f(1-\frac{e}{2})$ if the firm produces two products together,

where e is a positive parameter measuring economies of scope (it is assumed that economies of scope are shared between at most two products).

It is easily shown that the net surplus arising from the production of the industry as a whole is:

$$S(n,x;1) = n(ax - bx^2 - d(n-1)x^2) - ncx - nf$$

with a single product firm configuration, and

$$S(n,x;2) = n(ax - bx^2 - d(n-1)x^2) - ncx - nf(1-\frac{e}{2})$$

with a two product firm configuration.

The welfare analysis distinguishes two cases:

Case (i):

If no entry is allowed on the market, the net surplus when a monopolist jointly produces two products is:

$$S(1,x;2) = \frac{3(a-c)^2}{8(b+d)} - 2f(1-\frac{e}{2})$$

If two duopolists each produce one product, the net surplus is:

$$S(2,x;1)=\frac{2(a-c)^2(3b+d)}{(4b+2d)^2}-2f$$

The results of this comparison are sensitive to the parameters of the model; it can be shown that a monopoly is desirable:

- if competition in duopoly is not too strong, e.g., if the duopoly is collusive, a two product monopolist is socially better;
- if fixed costs are relatively high (in the model a fixed proportion of them is shared across products);
- if b is high (a high own price elasticity somehow limits the exploitation of monopolistic power);
- if d is low (d measures the degree of substitution between products: if d is high, the monopolist has an incentive to produce too little of each product);
- if e is high.

Case (ii):
Here free entry is allowed on monopolistic competitive markets. A configuration with single product firms and one with two-product firms are compared with a social optimum, where the number of products and output levels are chosen simultaneously and economies of scope are exploited.
It is shown (using numerical examples) that again d is a relevant parameter in the comparison. A configuration with two-product firms implies a lower output of each product, with a larger total number of products (and a smaller number of firms) than the single product firm case. If d is large, even if economies of scope are substantial, it is likely that a one-product firms configuration is socially preferred. The level of fixed costs has instead a limited impact.

Those results of the comparisons which are relevant to competition policy issues depend essentially on the parameter d and of its relationship with the value of b (own price elasticity). The closer the degree of substitution between the products the higher the distortions introduced by joint production, i.e. firms reduce production of each good below its socially optimal level. The larger this effect is, the stronger must economies of scope be in order to offset it.

The results of Encaoua et al. (1986) are based on the same sort of argument: they identify the relationship between an aggregate index of diversification from industry j to industry k[16] and an aggregate Lerner index

[16] As defined by Berry (1975). They define the aggregate index of diversification from industry j to industry k as:

(used as a measure of market power expressed in terms of the ability to maintain a price above marginal costs) in a Cournot setting. If diversification occurs between substitute products, diversification reduces competition; economies of scope amplify the effect.

If firms diversify into industries whose products are complementary, the market power index is reduced. Finally, if industries are "unrelated" on the demand side, no link with the Lerner index exists.

In summary, when markets are not perfectly contestable, and economies of scope arise between substitute products, the positive effects of economies of scope must be compared with the distortions generated by the increase in market power. These imply a lower than optimal level of production and higher prices (with a reduction in total welfare). If products have no relationship on the demand side (except through income effects), the impact of the presence of multiproduct firms on welfare is dominated by the effect of scope economies.

A number of authors have considered the way in which private incentives to diversify relate to welfare considerations. For example, in Wolinski (1986) diversification may occur in the presence of diseconomies of scope. If this is the case, a welfare trade-off arises because diseconomies of scope are a source of inefficiencies when firms produce multiple products, but these may be compensated for by a reduction in market power with respect to the situation of complete specialisation (monopoly on each market).

Bernheim and Whinston (1990) identify further conditions under which diversification may be associated with negative welfare effects. They consider the impact of multimarket contact of conglomerate firms encountering each other in various markets: this may improve firms' abilities to sustain collusive behaviour. In particular they show that, if the number of firms or their discount factors differ across markets, there are potential gains from multimarket contact.

$$D_{jk} = \frac{\sum_{i=1}^{N} D^i_{jk}(p_j q^i_j + p_k q^i_k)^2}{\sum_i (p_j q^i_j + p_k q^i_k)^2}$$

where: p_j = price of product j

q^i_j =quantity of product j produced by firm i

$$D^i_{jk} = 1 - \frac{(p_j q^i_j)^2 + (p_k q^i_k)^2}{(p_j q^i_j + p_k q^i_k)^2}$$

In these cases collusion might take place in markets where, in isolation, it would not occur. Moreover, if firms have different efficiency levels, multimarket contact allows the development of 'spheres of influence'. Each firm specialises in some subset of the market, where it is more efficient, and this may help to maintain high prices. In cases where collusion would arise in a single market, multimarket contact improves welfare as the movement towards spheres of influence reduces costs and prices. If collusion would not arise in single markets, then welfare decreases with multimarket contact. The same type of results occurs when there are fixed costs of production (economies of scale) which induce some sort of specialisation.

In summary, the positive effects of diversification in terms of higher efficiency (when it is induced by the search of synergies) may be more than compensated by negative welfare effects arising either through the demand side - incentives to produce less than the optimal quantity - or through anticompetitive behaviour.

6. Empirical Evidence[17]

6.1 Empirical Analyses of Determinants of Diversification

Much of the empirical literature on the determinants of diversification explores the relationship between diversification levels and various candidate explanatory variables. A limited number of these studies looks also at patterns of diversification.

The literature appears to have achieved some degree of consensus regarding the relevance of a small number of factors which seem to affect the level and pattern of diversification. These factors include[18]:

(1) the characteristics of the industry where diversification originates (origin industry);
(2) the characteristics of the industry into which where diversification occurs (target industry);
(3) the degree of relatedness between the two industries.

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17 Issues of measurement are dealt with in the Appendix to this chapter.
18 Following the distinction made by Lamelin (1982) and MacDonald (1985).

While the various studies reach broad agreement on the relevance of such factors, they do so on the basis of a number of *ad hoc* hypotheses rather than on the basis of any theoretical model. Typical of many studies is the remark of MacDonald (1981), who notes that the choice of candidate explanatory variables relies "to some extent on previous case studies of firms and statistical analyses of diversification" (MacDonald (1981)).

Here we give a brief account of the relevant variables introduced rather than describing each study in turn.

The first group of variables refer to characteristics of the origin industry. Notice that these are in nearly all cases measured at industry level. They are[19]:
(a) the size of diversifying firms (Berry (1975); Lamelin (1982); MacDonald (1981,1985); Sembenelli et al. (1995)): firms of larger size are supposed to have access to better financial resources which allow investments in new activities. This variable is found to be significant in all these studies.
The motivation for introducing this variable lies in the theory of growth of firms: when firms grow, they might be constrained by the size of the market, due to rigid demand. If this is the case, the best use for the excess capacity developed might be diversification. However, it is not the firms' size by itself which determines diversification, but its relationship with the size of the firms' core market: this issue is not usually considered.

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[19] The indices of diversification and the datasets used in the studies are the following:
Berry (1975) : diversification index = $-\sum p_i^2$ where p_i is the share of firm's sales in industry i;
dataset = 460 of the 494 largest U.S. companies included in Fortune Plant and Product Directory, 1960, 1965.
Gorecki (1975): diversification index = non-primary to total employment of firms in the industry considered;
dataset = Census data, 1958 and 1963, U.K. Manufacturing sector.
Hassid (1975): diversification index = proportion of output of enterprises classified in a SIC order, accounted for by activity in other orders;
dataset = Census data, 1963 and 1968, U.K. Manufacturing sector.
Teece (1980): diversification index = number of activities the firm is engaged (within the same area);
dataset = oil producers in Fortune's 500, 1975.
Lamelin (1982): he studies "patterns" and uses a dummy which takes value 1 if the firm is involved in more than one 4-digit U.S. SIC activity;
dataset = Canadian manufacturing sector (D&B dataset), 1974/75.
MacDonald (1981): diversification index = entropy index;
dataSet = 200 largest U.S. food manufacturers' sales, 1975.
MacDonald (1984): diversification index = Δemployment in the industry of companies whose main activity is outside the industry/total employment of the industry = expansion of diversification;
dataset = Enterprise statistics of the Census of Manufacturers, 1972 and 1977.
MacDonald (1985): dummy which takes value 1 if a firm is active in more than one industry;
dataset = Enterprise Statistics of the Census of Manufacturers, 1963 and 1977.
Sembenelli et al. (1995): diversification index = they study patterns and use a dummy which takes value 1 if firm i, whose primary activity is in industry j, is diversified in industry k;
dataset = top 5 European manufacturing firm in at least one 3-digit industry.

(b) the number of firms: It is sometimes postulated that the presence of a larger number of firms in a market should increase the probability of diversifying outside. The variable is generally found to be not significant (Lamelin (1982)). This is not surprising: from a theoretical viewpoint, it has little basis. Wolinski (1986), for example, predicts the opposite result, namely that higher diversification should be expected when concentration is higher.

(c) the share of exports: it is sometimes suggested that exports may represent an alternative to diversification, if the latter is driven by constraints on domestic market demand. Under this assumption exports should be negatively related to diversification. However a large share of exports might also be correlated with large firms size, and would induce a positive impact on diversification. In the data a positive significant relationship is usually found (Lamelin, 1982).

(d) inbound diversification in the industry. It has been argued that a high level of diversification into the industry should lead to more diversification out of the industry. While Lamelin reports a positive coefficient, no model is specified. The theoretical rationale for any relationship here is unclear.

(e) the profitability of the industry: Berry (1975) believes that more profitable firms tend to diversify more; MacDonald (1981) on the other hand, suggests that low (ex-ante) profitability in a firm's principal activity leads the firm to reallocate inputs and production away from that industry, which ultimately leads to an increase in the diversification index. MacDonald finds a significant negative relationship. Notice that profitability is measured at the industry level. Again, there seem to be no theoretical reason for expecting any relationship. Testing this hypothesis, moreover, is usually problematic, both in terms of measurement issues relating to profitability, and in regard to econometric problems associated with unravelling the direction of causality.

(f) the growth of the industry: a low rate of growth should induce outside diversification; on the other side it might be correlated with poor financial resources. Again what matters is the relationship between the growth of the firm and the size of the market. The variable is usually found to be insignificant (Gorecki (1975)).

(g) R&D investment: R&D generates new knowledge which represents an indivisible asset, which is difficult to transfer through the market. There is general agreement on the plausibility of this hypothesis, and the variable is usually found to be significant (Gort (1962); Gorecki (1975); Hassid (1975); MacDonald (1985); Lamelin (1982); Teece (1980)). The use of the variable is derived from theoretical findings (economies of scope and transaction costs theory): R&D investments are a source of excess capacity of the type that may induce diversification. Severe problems arise in testing this hypothesis. Data are usually available at the industry level, rather than at firm level. This makes it necessary to identify industry characteristics which may be expected to relate to the presence of specific assets in firms classified in that industry.

(h) the level of concentration (MacDonald (1981); Gorecki (1975)): see the point (b) above.

The main characteristics of the target industry which are usually included are:

(a) growth: high growth industries should attract more entry. This hypothesis seems plausible, since higher growth implies less competition and hence more room for new entrants (but not only diversifying entrants) and the variable is usually found to be significant (Lamelin (1982); MacDonald (1981)).

(b) the share of imports/exports: a large share of imports may indicate low profitability and should discourage entry. The variable is found to be not significant (Lamelin (1982)). The reverse should hold for exports, which are found to be significantly related with diversification (Lamelin (1982)).

(c) concentration (Lamelin (1982); MacDonald (1981)): some authors have suggested that high concentration in the target industry might induce firms to diversify into that industry. The rationale for including this variable is not clear, however. If high concentration is associated with high profitability, it begs the question as to why entry has not occurred, or it does not occur, independently of the diversification activities of firms.

While the above sets of variables essentially try to capture motivations for entry or exit from specific industries, the third set looks at diversification patterns *per se*. Lamelin (1982) and Sembenelli et al. (1995) in particular studies the effect and importance of the degree of "relatedness" between the industries. The variables used are:

(a) industrial complementarity: this is measured by the correlation coefficient across industry input structures between the amounts of commodities directly required per dollar of industry output[20]. The coefficient will be high if one firm which buys one input is very likely to also buy the other. This variable should describe the relationship between the two industries in terms of markets served and distributions systems (which should generate a common pattern of product differentiation). The variable is found to be significant (Lamelin (1982)).

(b) similarity in production techniques: Lamelin introduces three dummies identifying three groups of industries: producer good industries, consumer convenience goods industry, consumer non convenience goods industry. The dummy is equal to 1 if the two industries are of the same type. This variable is found to be significant.

(c) reliance on science bases research or on advertising in both industries, which is used as another index of similarity[21]. It is significant (Lamelin (1982); Sembenelli et al. (1995)).

The main impression gained from an examination of this literature is that the usual method of investigation has been to postulate a number of candidate explanatory variables, often on the basis of informal arguments, and to test their significance. The pitfalls involved in this approach are evident, and even though it may be difficult to specify a fully adequate theoretical model in the present state of knowledge, it may nonetheless be helpful to try to proceed along such lines. This will be the main aim of Chapters 2 and 3.

6.2 Effects on Market Structure and Performance

Multiproduct firms are sometimes accused of anticompetitive behaviour (cross-subsidisation, exclusive dealing, tie-in selling, predatory pricing). The theoretical foundations for these hypotheses are very limited (see above), and the empirical evidence is still too limited to permit any strong conclusion.

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20 Measured through input/output tables: it allows to see which industries make products which are inputs for the same industries.

21 It is measured with a dummy variable which takes value 1, if both industries are science-based.

Utton (1979) offers one of the most detailed analyses of the diversification process (in U.K. manufacturing in 1972) and of its impact on competition. Other studies of this question include those of Caves (1981) and Scott (1982).

Utton tests, first, the hypothesis that "one possible consequence of a high degree of diversification by the largest firms in a concentrated manufacturing sector" is a "weakening of competitive forces" (Utton, 1979), due to multimarket contact. Moreover, when large firms enter an industry, they might be able to "restructure it to their own advantage", increasing the concentration in the industry.

Both hypotheses receive weak support: changes in market concentration do not appear directly related to the presence of large diversified firms[22].

More specifically, Utton finds a negative relationship between profit margins and entry by diversifying firms: "the greater the share of an industry accounted for by large firms primarily engaged elsewhere, the lower profitability tends to be on average, ceteris paribus". A detailed analysis of examples taken from the Monopolies Commission Reports on alleged anticompetitive behaviour of large firms does not show any clear evidence that diversifying firms adopt cross-subsidising policies with predatory intent [23].

Finally, Caves (1981)'s study (based on U.S. Enterprise Statistics) does not find a significant relationship between changes in diversification and changes in concentration levels form 1963 and 1972.

Hence, none of the common presumptions concerning the anticompetitive consequences of widespread diversification seems to be supported by the data. However, these results cannot be taken as conclusive. First, the data are not very detailed. Most of the accounting systems do not allow us to distinguish between lines of businesses within firms: this limits the amount of information available necessary to study the issue. Second, the analyses are mainly static rather than dynamic. The studies suggest, nonetheless, that the causal relationships are at least more complex than is usually assumed.

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[22] Berry (1975) finds that diversification into low concentration industries raises the level of concentration. However, he also finds that diversification in highly concentrated industries has pro-competitive effects.

[23] In fact the cases reported to the Monopolies and Merger Commission were taken from a sample restricted to concentrated industries, and referred to cases of firms in leading positions in their respective markets.

6.3 Diversification and Firms' Profitability

The hypothesis usually tested in the literature is that diversification generates synergies, and this increases the profitability of firms. These synergies are obtained essentially through two channels: (i) an increase in market power, or (ii) an increase in efficiency.

Two types of approach have been followed: the first involves regressing some measure of profitability on a diversification index, and this is usually done using industry level data. The second adopts a 'case study' method, and looks at the effect of different patterns of diversification on the firms profit stream over time.

6.3.1 Regression Approaches

The regression approach is usually justified by reference to the traditional structure-conduct-performance paradigm (Bain, 1956): diversification is considered an element of the industry's structure which has a systematic influence on industry profits[24]. The hypothesis is that diversification increases barriers to entry (Rhoades, 1973) and hence profits[25]. In practice, however, only the relationship between diversification and profitability is studied.

Much attention has been paid in the recent Industrial Organization literature to the inadequacy of the structure - conduct - performance paradigm. A full discussion of this point lies outside our present scope. See for example Dasgupta and Stiglitz (1980) and Tirole (1989).

The results of regression analyses based on this hypothesis are mixed: Rhoades (1973) uses data on 241 4-digit manufacturing industries from the 1963 Census of Manufactures and finds a positive correlation between profits (at the industry level) and a diversification index, when the classification is at the 4-digit level[26]. However, there is a negative correlation if another kind of

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[24] See Needham (1978): "The term "structure of industry"... refers to a selected number of characteristics of the output of a firm or group of firms. These include, for example, cost conditions, concentration, vertical integration, diversification and entry barriers." Or Scherer (1980): "Diversification can be viewed statistically as an element of market structure at some moment in time or as a dynamic process of movement by companies into new and different lines".

[25] Again no formal theoretical model supports this consideration and possibly this accounts for the ambiguity of results.

[26] The profit measure used is (value of shipments-direct costs)/(value of shipments). Two specialization indices are proposed: the first measures the extent to which firms primarily classified in

diversification index is used, which evaluates the extent to which the largest firms in a 4-digit industry diversify outside the corresponding 3-digit industry.

In a later study, Rhoades (1974) introduces different diversification indices, which take into account the number of industries where a firm is active, using an updated dataset with a modified industry classification. He finds a negative correlation between industry profitability and diversification. This suggests that the results are not robust to different specifications of the diversification measure[27].

A structure-conduct-performance model is used also by Carter (1977) to test for the presence of synergies arising from diversification. He suggests that profits in the i-th industry depend not only upon the characteristics of the industry, but also upon the extent to which a firm is diversified into other activities. With data on 374 firms from the 500 industrial firms listed in The Fortune Directory 1963, Carter regresses a measure of return on equity on concentration ratio, plant economies of scale, advertising, growth of demand, and several indices of diversification.

His results support the synergy hypothesis only in the case of one special diversification measure, the Herfindahl numbers equivalent. Carter also tries to distinguish between different types of diversification (vertical integration and closely related diversification versus conglomerate diversification)[28]. The synergistic effect is found to be greater for firms diversifying into closely related areas than for conglomerate.

Again results are very sensitive to the measure used, but they seem to indicate that diversification into closely related markets is more profitable than conglomerate diversification.

Lichtenberg (1992) considers how total factor productivity at the plant level is impacted by the degree of corporate diversification. Using plant-level Census Bureau data, he finds that the more diversified the firm (in this case, the

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a 4-digit industry are specialized in that industry (using employment figures); the second measures the extent to which the largest firms in a 4-digit industry are primarily classified in the corresponding enterprise industry category (approx. a 3-digit classification), i.e., the extent to which the industry is the secondary activity of leading firms. Both measure the extent of diversification but not the number of industries in which diversified firms are active. The other variables used in the regression are: concentration, demand growth, capital/output ratio, a producer-consumer good dummy, a geographic market index.

[27] However, one possibility would be to interpret these findings as support for the view that diversification into closely related fields (outside the 4-digit classification areas) leads to higher profitability, while diversification into distant areas (outside 3-digit classification areas) reduces it.

[28] On the basis of the hypothesis that conglomerate firms will adopt an M-form type of organization (decentralized multidivisional) while the other will have a U-form (multidepartmental form).

greater the number of industries in which a parent firm operates), the lower the productivity of its plants. However, the relationship between these variables is significant and negative only after controlling for the total number of parent-firm plants in all industries (itself an indication of diversification) which has a significant positive sign. These results suggest that a firm divesting an unrelated unit would benefit from the reduction in the number of business lines, but be hurt by the reduction in total number of plants, making the net effect ambiguous.

Scott (1982, 1989, 1993) adopts a different approach: he suggests that multimarket activity increases price-cost margins. He defines as multimarket grouping the phenomenon of "groups of diversified firms whose activities span to a significant extent the same markets". This could in principle induce a higher degree of co-ordination (see par. 5), and could explain why diversified firms following the same pattern of expansion will enjoy higher market power and higher profits[29].

The argument is relevant only for large companies, which are active in concentrated markets, where co-ordination is feasible, but not for small firms operating in highly competitive markets, where they have minor shares. This is precisely the hypothesis tested by Scott who analyses the effect of both concentration and multimarket contact on profitability. A problem with this approach is that a higher profitability for firms which meet on the same markets might be simply the consequence of efficiency gains linked to diversification across those markets. The observed patterns of diversification might just be the result of these efficiency enhancing possibilities. The two hypotheses (market power versus efficiency) are very difficult to disentangle.

Scott investigates, in the first instance, whether diversification occurs randomly or with the intention of generating multimarket contact, i.e., he tests whether contact among firms is in some markets significantly higher than should be expected under the hypothesis of pure chance contact. A significant multimarket contact is found in 51 cases (51 pairs of firms) over 246 cases considered[30] [31]. Scott tests whether the level of advertising and R&D expenditures is significantly different for markets where contact occurred than

29 For this reason not only horizontal mergers but also conglomerate mergers may enhance market power.

30 Where significant means that it would occur by chance less than once in every 100 cases, if the null hypothesis of random diversification were true.

31 The dataset is represented by 437 firms among the largest 1000 U.S. manufacturing firms.

for an archetypal conglomerate[32]. This should clarify the potential for 'economies' of multimarket operations. The results show that purposively diversified firms have lower expenditures, which Scott interprets as evidence of multimarket economies. The 'matching procedure' seems however quite dubious: rather than with the sum of randomly chosen firms[33], the purposively diversified firms should be matched with the "sum" of non-diversified ones or with diversified firms which do not experience multimarket contact.

Finally, Scott tests the hypothesis that profits (measured for "lines of businesses") are higher when there is multimarket contact and markets are concentrated. Average profits are highest when both these variables are high, which in turn is taken as a support for the theory advanced previously[34]. Again the results are obtained regressing the profitability of a line of business of a firm on the level of contact and the concentration level in that market[35]: diversification is again taken as a characteristic of the market structure.

The results suggest that it is implausible to attribute higher profitability to higher market power achieved by facilitating collusion through multimarket contact. In fact at the empirical level, the two factors (market power and increased efficiency) are not easily disentangled and the correlation between high contact and high profits may be a spurious one, with the direction of causality going from increased efficiency to higher contact and higher profits.

A different perspective on these issues is taken by Wernerfelt and Montgomery (1988a, 1988b). Their results, though novel in some respects, do not contradict the thesis that diversification is only profitable if it occurs in closely related areas.

In the Wernerfelt - Montgomery approach, diversification is taken as the profit maximising response to the presence of excess capacity[36]. Positive profits arise from the ownership of a 'specific factor' (Ricardian rents). There are costs

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32 The test consists of taking a pair of firms among the 51 (for which contact was more than random), check in how many markets the two firms meet, choose randomly an equal number of markets, and in each of these choose, again randomly, a firm: an archetypal conglomerate is defined as the sum of the firms in these markets; the comparison is between the advertising or R&D expenditures of the purposively diversified firms and those of the archetypal conglomerate.

33 Which in fact might include those experiencing multimarket contact as well.

34 Even if the fact that when concentration is low, a low value of multimarket contact generates higher profits than high contact has no obvious explanation.

35 Rather than matching profits of diversified and non diversified firms

36 In their framework nothing explains how excess capacity arises, and why does it lead to diversification rather than internal expansion. Demand considerations should be introduced referring to limits to expansion in the industry (industry shrinking, impossibility of eroding other firms' market share) and explaining why it is instead possible to expand into another industry (growing demand, incumbent firms with costs of creating new capacity higher than costs of readaptation by firms with excess capacity).

involved in adapting the excess capacity to alternative uses, which are a function of the specificity of the asset (s) and of how closely related the new market is (r):

$$C = C(s,r) \qquad\qquad C_1 > 0, C_2 < 0$$

The mostly diversified firms are those with lowest readaptation costs, that is those with less specific factors. Specialised firms are instead those endowed with factors so specific that the cost of using them in alternative industries is too high. It follows that diversification is performed by firms whose specific factors rents are lower. Moreover diversification itself will lower rents that can be earned on specific factors (as they are used in industries where they are less efficient). The total value of the firm should depend negatively on the optimal extent of diversification.

However in this model there is no cost of holding excess capacity (which would lower the average profitability of specialised firms) and, more important, there is no economies of scope effect, even when diversification occurs into related industries.

The authors test empirically for the relationship between the presence of positive rents (approximated by a high q value of the firm) and the diversification level of firms. Two equations are estimated: the first relates q directly to diversification[37], the second uses industry dummies as instruments to estimate the diversification variable[38], which amounts to using average industry diversification.

The results show a significant negative relationship between q and diversification only in the first equation, where no correction for measurement errors is introduced. When a correction is applied, the relationship becomes non significant. The best results are obtained with the second equation; the authors take this as evidence of the homogeneity of asset specificity within industries. This does not seem consistent with the assumption that rents for the firm are generated by the ownership of a specific factor, which would give it an advantage over the other firms in the industry, but rather with the presence of an industry specific factor, which might induce barriers to entry.

The main conclusions from these studies can be summarised as follows: (i) even given substantial methodological limitations, the analyses suggest that diversification does not occur randomly. The positive correlation between

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37 The other variables are firm's advertising expenditures, R&D expenditures, concentration in firm's market, growth in firm's market, market share, firm's foreign sales.

38 This procedure is used as rents and diversification are not linked directly, but only through the variables 'factor specificity' and 'relatedness', not observable.

diversification and firms' profitability found in some studies might be driven by a third variable, the firm's efficiency level. We shall develop this point at length in the following chapter;
(ii) the channels by which improved performance is achieved cannot be unambiguously identified.
The latter point seems a particularly relevant issue in terms of policy considerations.

6.3.2 A "Case Study" Approach

The second type of approach treats diversification as a strategy used to achieve growth or to increase profitability. The focus is on the type of strategy followed in the diversification process, and its effects on performance. The method used is a 'case study' approach (Biggadike (1979); Rumelt (1974)). This literature suggests that diversification may improve the performance of firms, but only if it is the result of a specific type of strategy. In particular, the importance of diversification into 'related' industries is stressed.

The results of Biggadike's (1979) analysis on PIMS[39] data, which allowed him to follow firms over a period of several years, suggest that it takes some years before diversification pays off. The financial performance of firms in the first eight years of the new activity is not very successful. In the first period (first 4 years) after diversification, firms usually show a negative return on investment and very low gross margins over sales. Cash flows only become positive after 8 years.

Concerning the effect of variables such as relatedness, market characteristics, and entry strategies, Biggadike finds that firms exploiting 'marketing relatedness', choosing moderate growth markets, moderately concentrated, performed better. Moreover an aggressive (i.e., low prices, better quality, higher marketing expenditures) and broad entry strategy was more rewarding. The worst results are obtained by firms pursuing a forward integration strategy and by those diversifying into technology related fields. However this only concerns the financial performance[40] - not the market

39 The Profit Impact of Market Strategy program collected data on firms through interviews and other sources for a series of years.

40 Measured by return on investment, cash flow to sales, gross margins to sales ratios.

performance[41]- and is mainly due to the higher cost disadvantage, while the market share performance of this group is rather good.

Rumelt (1974) studies the diversification strategies of large industrial corporations (500 Fortune firms in the period 1949-1969) and finds that the best performance is associated with a strategy of 'controlled diversity', while again the worst performers are firms following strategies of vertical integration. Firms "that have diversified to some extent but have restricted their range of activity to a central skill or competence have shown substantially higher rates of profitability and growth than other types of firms" and "the pattern of differences observed indicates that is it not diversity itself, but the central organising principle used to manage diversity that is the crucial factor in explaining performance differentials".

Lecraw (1984) defines his approach as half way between the 'economists' type of analysis (the regression approach) and the 'business researchers' one (the case approach). The first approach uses industry characteristics to explain diversification and to study the effects on performance, whereas the second emphasises firm characteristics. In his study the success of diversified firms is allowed to depend on industry characteristics, the strategy chosen by the firm, the appropriateness of this strategy, the extent to which it follows this strategy and the profitability of the industry.

Four distinct diversification strategies are defined, based on the relationship "in production and marketing between the industries in which the firm operated and the proportion of its activities that were located in each industry" (Lecraw (1984)).

Each firm (the 200 largest firms in terms of sales in the manufacturing sector in Canada) is assigned to one of four possible strategic groups (single business, vertically integrated business, related business, unrelated business), by means of discriminant analysis on the basis of the characteristics both of the industry and of the firm[42]. The result of this analysis suggests that the characteristics of the base industry and of the firm have a strong influence on the strategy followed by firms.

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[41] Measured by market shares.

[42] E.g., he assumes that the strategy 'single business' is associated to the fact that the industry is fast growing, with profitability above average, and to the absence of intangible assets from high levels of R&D or advertising expenditures; a 'related business' strategy on the other side, might be followed if firms have high levels of R&D or advertising expenditures, which generate intangible assets (expertise in other products, brand names, skills in marketing and distribution), and if the industry is not concentrated and has low barriers to entry.

The analysis of the profitability issue is performed in three steps:
(i) First the hypothesis is tested, that conforming to group behaviour is the best strategy. Firms which behave according to their predicted strategy have better performance than the others. However, firms that were predicted to follow an unrelated business strategy but followed another strategy did not have significantly lower profits than firms predicted to follow an unrelated business strategy who actually did so.
(ii) Second, the influence of industry profitability is taken into account. The performance of firms is found to be better relative to a weighted average of that of the industries where they operated if: (a) firms followed a strategy of 'related diversification', (b) firms followed an 'appropriate' strategy (they conformed to group behaviour), (c) firms had higher market shares.
(iii) Finally, the effect of the extent of the activities is tested, and again a strategy of related diversification induces a positive effect on profits whereas a strategy of unrelated diversification does not.

Thus a feature shared by all these studies is a positive effect of a strategy of related diversification on profits.

In general, the definitions of 'relatedness' given by the various authors can be grouped into two types: one refers to the presence of economies of scope in production (the presence of manufacturing processes and equipment sufficiently flexible to be used in alternative ways; the presence of a distribution network, that similar products can exploit); the other to the presence of management skills (or more generally firm specific skills) which can be transferred to another market. In Rumelt's terminology, a firm enters a 'related product' if "it adds new activities that are tangibly related to the collective skills and strengths possessed originally by the firm". Biggadike explains that "relatedness to the parent company refers to the likelihood that an entrant launched by an established company inherits skills form the parent which it tries to transfer to the entered market" and that "new product introductions are more likely to succeed if they demand skills that managers already have". He then classifies different types of relatedness: technology relatedness ("technology is the most likely basis for entry into other markets because corporate research often creates additional opportunities"), scale economy relatedness ("manufacturing processes and equipment sufficiently flexible to permit, with some modifications or extensions, entry into nearby markets" so that "the sharing of existing facilities permits economies through higher plant utilisation and lowers both the scale economy and the absolute cost barriers to entry"), marketing relatedness ("expertise in serving a certain type of customer, in differentiating products, in developing low cost distribution and customer service systems, in exploiting famous brand names").

7. Conclusions

The subject of this survey is a broad one. The absence of an adequate theoretical framework has led to the proliferation of ad hoc hypotheses and the econometric testing of these hypotheses. A few regularities do emerge, however, and it seems clear that a more systematic theory-based approach might be worth pursuing.

The breadth and complexity of the issues rule out a comprehensive attack, however, and in the remaining chapters, attention will be focused on attacking some limited parts of the problem.

The two aspects of the problem which are addressed in Chapters 2 and 3 are as follows. In Chapter 2, the issue of diversification and profitability is addressed in the setting of a model of diversification. The aim here is to examine whether any theoretical basis exists for the common hypothesis that the level of diversification should be correlated with profitability. The chapter answers this question in the negative: there is no good a priori basis for such a hypothesis. It is unsurprising, in the light of these results, that attempts to establish such statistical relationships have led to no clear consensus.

In Chapter 3, we turn to the problem of modelling patterns of diversification. Here, the aim is to look specifically to (technical or other) linkages between industries, in trying to account for a strong statistical regularity, viz. the fact that both across countries and over time, certain patterns of cross industry diversification appear and persist.

Thus both these chapters concern the link between theory and statistical regularities. The first seeks to account for the 'mixed' and 'disappointing' results in the diversification - profitability literature by pointing to the fact that theory does not suggests any basis for such a relationship. Chapter 3, on the other hand aims to use theory to explore carefully the mechanism underlying the appearance of a clear and substantial statistical pattern. Chapter 4 complements the approach of the previous chapter with a case study analysis of diversification processes of large firms in Italy.

Appendix: Measurement Issues

Most of the empirical literature assumes that a firm diversifies if it expands into another 4-digit/3-digit/2-digit industry. The classification refers to differences in production processes; the products may nevertheless be close substitutes in demand. However, there may be problems due to the fact that similar production processes are classified to different industries because of differences in buyers. In order to overcome this problem, some studies develop subjective classification systems (see Rumelt,1974).

Desirable properties of a diversification index (see MacDonald, 1981) include:

(a) that the index increases with the increase in the number of industries where the firm is active,

(b) that the index responds to the distribution of a firm's sales across industries,

(c) that it accounts for the "distance" between pairs of activities.

The most used indices are:

(1) N = the number of different 2/3/4-digit industries in which a firm is active. The problem with this index is that it ignores the distribution of sales across industries.

(2) P = the share of firm's sales accounts for by non-primary industry. This ignores the number of secondary activities and the distribution of sales.

(3) $G = P \cdot N$, which tries to account for both the distribution of sales and the number of activities.

(4) $E = \sum_{i=1}^{N} S_i \ln \frac{1}{S_i}$ = the entropy index (S_i is the share of firm in industry i). The index is sensitive to the number of activities, and the distribution of sales across markets, and can be decomposed into additive parts representing diversification across 2-digit industry groups and weighted average diversification across 3-digit industries within each 2-digit group.

(5) $H = \frac{1}{\sum s_i^2}$ = inverse of Herfindahl index. It responds to both distribution and number of activities. It is affected by primary industry's share of sales. It is insensitive to the addition of a large number of small shares.

(6) $C = \sum_{i=1}^{N} S_i \cdot \sum_{i=1}^{j} S_i d_{ij}$, where d_{ij} is a distance parameter and is equal to 0 if i=j, equal to 1 if i and j are in the same 3-digit industry, equal to 2 if i and j are in the same 2-digit industry, equal to 3 otherwise. It is strongly affected by

primary industry sales. It attempts to take account of the distance between industries.

(7) $D = 1 - \sum_{i=1}^{n} S_i^2$ = the Berry index (S_i is the ratio of the firm's sales in the i-th industry to the firm's total sales).

The seven indices are in general highly correlated. Each is better suited for particular analyses of diversification. When one is interested in describing diversification across a wide range of firms, simple industry counts may be a poor measure of diversification but the other measures are highly correlated. When one is interested in making finer distinctions among groups of diversified firms, there may be significant differences among indices.

In the following chapters, the only available measure is a count of products, due to data availability. However, since we are particularly interested in patterns of diversification the problem of choosing a suitable index is less serious than it might otherwise be.

Chapter 2

Diversification and Synergies: Effects on Profitability

1. Introduction

The usual type of theoretical approach to explaining diversification patterns assumes that diversification is an optimal response to the presence of synergies, which allow reductions in total cost, or the possibility of achieving higher market power through multimarket contact (see Scott (1982, 1989)). It is commonly argued in the business literature that diversified firms perform better if they expand into related markets, where they can exploit common skills. It is suggested that this should lead to an increase in the average profits of diversified firms, relative to undiversified competitors.

On the other hand econometric work does not in general confirm (or at least gives only very weak support to) the hypothesis that diversified firms are more profitable (see Rhoades (1973, 1974); Carter (1977))[1].

Should this lead to the rejection of the type of theory mentioned above?

In what follows, we develop a very simple idea which can account for the apparent inconsistency between theory and empirical observation.

We begin by noting that the results of empirical work (relating profitability to diversification) may be biased due to the omission of factors other than diversification which affect the efficiency of firms. It might then be the case that the performance of diversified (but relatively inefficient) firms is worse than the performance of specialised (but relatively efficient) firms: the advantages of the synergies might not be sufficient to offset the disadvantages of being inefficient. At first glance, it might seem that such effects were simply 'random', and that they would merely lead to 'noise' in the data. This, however, is not so. We shall identify conditions under which, in equilibrium, efficient specialised firms are not willing to diversify. In particular this is the case when it is "better" to be very good in one product only, rather than sufficiently good in all of them.

Specialised firms may be very efficient in one line of production, but relatively inefficient in the others. At the same time, some highly inefficient firms may only be able to survive in the market due to the presence of synergies.

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[1] Wernerfelt and Montgomery (1988a, 1988b) suggest that diversified firms might have lower average returns, as diversification is generated in their framework by the presence of excess capacity, and positive profits are the consequence of the ownership of a specific factor, whose efficiency is reduced when applied to other fields. However, in their context, the possibility of exploiting synergies is ignored.

Hence, the observation of higher average profits for the undiversified firms is not a sufficient argument against the theory that the diversification process was driven by synergies.

Indeed, the usual *ad hoc* assumption that diversification and profitability should be correlated across industry groups does not have any robust theoretical basis.

2. The Basic Framework

Consider an economy with an infinite number of potential firms, endowed with a random efficiency parameter which affects their cost function and which they can learn after paying a fixed entry cost (see Lippman, Rumelt (1982)[2]). Once on the market they act as price-taking profit maximisers and face increasing marginal costs[3].

The model we consider is static, and diversification in this framework will be generated only by attempts to exploit synergies across markets.

From the empirical and business literature, it emerges that, among the factors driving diversification and having a considerable impact on its success, the degree to which markets are 'related' is particularly relevant.

The concept of 'relatedness' is variously defined in this literature. Definitions vary in terms of two sets of factors. The first includes technological elements, which amount to the possibility of sharing fixed costs between different products (economies of scope). These can be either fixed plant costs (whenever one product technology is sufficiently close to another), or other types of fixed costs, such as marketing costs (whenever marketing networks can be at least partially shared across series of products), distribution costs (products used by the same type of consumer will be probably distributed through the same channels, e.g. durable consumer goods, food products etc.), or the exploitation of a brand image.

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[2] They explain in this framework the presence of positive and heterogeneous rents across firms with price taking behaviour and free entry: firms enter the market if their expected profits are positive; entry occurs until the price is driven down to the point where expected profits are negative. The surviving firms will have positive profits on average, even if free entry is allowed.

[3] Given that the Bertrand models of competition lead either to zero profits for the firms or to severe existence problems, any alternative specification should rely either on an entry-exit version of Cournot competition or on a product differentiation model with entry costs. However these specifications would create unnecessary technical difficulties for our problem. We are in fact confident that our argument would carry through to these alternative models, since it only relies on some general statistical properties of the profit function.

The second factor playing an essential role in the diversification process, and having a considerable influence on its effects, is what we might label 'managerial ability'. In the words of Biggadike (1979), "relatedness to the parent company refers to the likelihood that an entrant launched by an established company inherits skills from the parent, which it tries to transfer to the entered market" and "new product introductions are more likely to succeed if they demand skills that managers already have". The relatedness across markets arises then from the familiarity with manufacturing methods used in the market to be entered, and from expertise in serving a certain type of customer, in differentiating products and in developing low cost distribution and customer serving systems. Hence, the best strategy, when diversifying, is to enter businesses where the managerial skills can best be used (Peters and Waterman (1982)).

We shall represent these two elements in terms of the cost functions of firms as follows.

(i) The 'managerial skills' hypothesis will be represented through the presence of a positive correlation between costs in two industries, so that if a firm has relatively high costs in one product, it is likely that costs will also be high in the second product. This could be taken to describe two markets which are 'related' because they have the same type of production structure: if a firm, active in both markets, has a 'good' manager, his ability will show equally in both and generate the same level of efficiency. Specifically, we shall consider a firm-specific efficiency effect, which can be modelled in terms of a random 'cost draw' (see below).

(ii) The economies of scope possibility will be represented by a reduction in total cost that any firm enjoys if it actively produces in both industries. Here, we are concerned with a feature of the production or distribution technology, *per se*, which all firms face equally.

This introduces in a very simplified way both industry characteristics (summarised by economies of scope or cost correlation across them) and firm specific factors (a 'cost draw') in the diversification decision.

We want to concentrate on the issue of how diversification arises and the relation between diversification and profitability. In what follows, we examine in turn each of the two types of model. The 'managerial skills' model is explained in Sections 3-5, while the 'economies of scope' model is examined in Section 6. For simplicity we shall consider only two industries: firms will decide whether to enter neither industry, only one industry (specialised firms), or both industries (diversified firms).

3. The 'Managerial Skills' Model

We assume that:

- The products produced by the various firms are homogeneous within each of the two markets considered.

- The demand for each product i is fixed and known:
$$Q_i = A - p_i \qquad i = 1,2.$$

- Firms differ in their efficiency: for each of the two products the cost function for firm j is a simple quadratic function (so the marginal cost schedules of the firms are linear), and differs across firms by a vertical shift parameter, viz.
$$C_i^j = (q_i^j)^2 + c_i^j$$
where c_i^j is the realisation of a random variable $\tilde{c}_i^j$. $\tilde{c}_1^j$ and $\tilde{c}_2^j$ are i.i.d. with respect to j and have commonly known distribution functions. The realisation of c_i is observed by firm j only on paying a non-recoverable entry cost M>0[4];

- The profit function, once in market i, is therefore:
$$\pi_i^j = p_i q_i^j - ((q_i^j)^2 + c_i^j)$$

- Firms behave as price-takers. Their profit maximising choice of output given the market price p_i is:
$$q_i^j = \begin{cases} \dfrac{p_i}{2} & \text{if } \dfrac{p_i^2}{4} > c_i^j \\ 0 & \text{otherwise.} \end{cases}$$

- If n_i is the total number of firms active in market i, in equilibrium it must be the case that
$$S(p_i) = n_i \frac{p_i}{2} = A - p_i = D(p_i)$$

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4 The entry cost M is the cost of setting up the firm, and it is the same whether one wants to be able to produce on market 1, market 2 or both markets.

where $S(p_i)$ denotes total industry supply. Hence the equilibrium price is:

$$p_i = \frac{2A}{n_i + 2}$$

- We assume that firms are risk neutral: they enter the industry as long as the expected profits are larger than M.

An equilibrium is defined as a vector:

$$(n_T^*, p_1^*, n_1^*, p_2^*, n_2^*)$$

where: p_i^* is the market price;
n_T^* is the number of firms entering the market (i.e., paying M and observing cost draws);
n_i^* is the number of active firms on each market i (i.e., those with non negative profits).

We assume the following conditions:

1. Free Entry $\quad E(\pi | p_1, p_2) = M$

2. Price Taking Behaviour $\quad q_i^j(c_i^j, p_i) = \begin{cases} \frac{p_i}{2} & \text{if } \frac{p_i^2}{4} > c_i^j \\ 0 & \text{otherwise.} \end{cases}$

Condition 1 is the optimal entry decision rule, given market price. Condition 2 is the profit maximising output decision for price taking firms. We are thus assuming perfect competition in product markets, and condition 2 ensures that supply equals demand. Here we confine ourselves to symmetric equilibria $(p_1^* = p_2^*, n_1^* = n_2^*)$.

Within this basic model we want to consider two possible functional forms of the random variable c_i^j in order to study the effects of diversification on the performance of firms[5]. These will be used to represent the presence of cost correlation and economies of scope respectively.

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[5] Differences in c_i^j are taken to summarize different levels of efficiency in an extemely simple way, without evaluating potential strategic interactions internal to the firm. For example, if we also assume perfect competition in the input markets, the rents from greater efficiency of one input would be appropriated by that input (the managers, if we are considering their efficiency) and we would not observe different efficiency levels for the firms themselves.

4. Correlated Costs: is it Possible that Specialised Firms Perform Better?

We shall first consider the case where cost draws are correlated. This may be interpreted as the effect of 'relatedness' or similarity of markets: if a firm is efficient (its costs are relatively low) in one market, it is likely that it will be similarly efficient in another with analogous characteristics.

Imagine for example that the efficiency of the firm is essentially determined by the manager's ability. If a firm is active in two markets, with a relatively similar structure (e.g. in terms of type of consumers, or in terms of the competitive structure, so that a strategy successful in one would probably also be successful in the other), then if the manager of the firm is 'good' in one, he will probably be 'good' in the other. Another source of 'relatedness' may relate to input costs: if two industries use similar inputs, then a firm with access to low cost supplies will benefit in both markets.

We represent these possibilities by assuming a simple functional form for the firm specific element of cost c_i^j:

$$\tilde{c}_1 = (1-\rho)\tilde{v}_1 + \rho v_{12}$$
$$\tilde{c}_2 = (1-\rho)\tilde{v}_2 + \rho v_{12}$$

where $\tilde{v}_1, \tilde{v}_2, \tilde{v}_{12}$ are i.i.d. random variables. This allows us to describe the 'degree of relatedness' across markets in terms of the parameter ρ. If $\rho = 0$ the markets are completely unrelated, and $\tilde{c}_1 = \tilde{v}_1, \tilde{c}_2 = \tilde{v}_2$, i.e., the cost draws are independent. If $\rho = 1$ the cost draws are perfectly correlated, i.e., $\tilde{c}_1 = \tilde{v}_{12} = \tilde{c}_2$.

We might consider, for example, the cost of undertaking an advertising campaign. If the two markets are similar, a marketing manager who has organised a successful advertising campaign in one market will presumably be able to reproduce that success in the other. If the industries are not related, the success in one may be poorly correlated with success in another.

Now, as we noted in the introduction, it is often argued that diversified firms should have higher profits than undiversified firms, since the synergies they exploit should create higher profits. This intuition however does not account for the ambiguity and non-robustness of the empirical results on diversification and profitability.

In this section, we present a simple example which is consistent with the absence of a relationship between diversification and profitability.

We assume:

$$\tilde{v}_1, \tilde{v}_2, \tilde{v}_{12} = \begin{cases} 0 & \text{with probability } 1/2 \\ 1 & \text{with probability } 1/2 \end{cases}$$

$\tilde{v}_1, \tilde{v}_2$ are associated with the share of fixed costs which is independent in the two markets (which we shall define the "market specific cost draw"), while $\tilde{v}_{12}$ is associated with the share of costs which affects both markets together (the "common cost draw"). The random variable $\tilde{c} = (\tilde{c}_1, \tilde{c}_2)$ will thus be distributed as:

$\tilde{c}_1$	$\tilde{c}_2$	probability
0	0	1/8
ρ	ρ	1/8
0	$1-\rho$	1/8
ρ	1	1/8
$1-\rho$	0	1/8
1	ρ	1/8
$1-\rho$	$1-\rho$	1/8
1	1	1/8

It is easy in this case to solve explicitly for the equilibrium outcome $(n_T^*, p_1^*, n_1^*, p_2^*, n_2^*)$. We simplify by confining attention to symmetric equilibria, that is $p_1^* = p_2^* = p^*$, and $n_1^* = n_2^* = n^*$. Hence our equilibrium is a triple (n_T^*, n^*, p^*) where $n_T^* = \alpha n^*$ $(\alpha \geq 1)$. In order to solve the equilibrium conditions $E(\pi|p)$=M and $D = S$, we first compute $E(\pi|p)$. Given the distribution of the cost pairs, we have:

$$E(\pi|p) = \begin{cases} \frac{1}{8}p^2 & \text{if } \frac{p^2}{4} \leq \min(\rho, 1-\rho) \\ \frac{p^2}{4} - \frac{1}{2}\min(\rho, 1-\rho) & \text{if } \min(\rho, 1-\rho) < \frac{p^2}{4} \leq \max(\rho, 1-\rho) \\ \frac{3}{8}p^2 - \frac{1}{2} & \text{if } \max(\rho, 1-\rho) < \frac{p^2}{4} < 1 \end{cases}$$

To obtain the expression we proceed as follows. In the first interval $(\frac{p^2}{4} \leq \min(\rho, 1-\rho))$, observe that only firms with cost draws $(c_1, c_2) = (0,0), (0,\rho)$ or (ρ, o) are active in at least one market and would earn

$p^2/4$ in each. Firms with all the other possible cost draws earn, in this price interval, zero profits. Taking the expectation over the eight possible combinations leads to the above expression.

In the second interval (assuming we are in the case $\rho < 1-\rho$, i.e., $\rho < 1/2$[6]) firms active in both industries are those with cost draws $(c_1, c_2) = (0,0)$ or (ρ,ρ). In each market the former have profits $p^2/4$, the latter $p^2/4-\rho$. Firms active in one market only are those with cost draws $(c_1, c_2) = (0,1),(1,0),(\rho,0)$ or $(0,\rho)$. In the first two cases they have profits equal to $p^2/4$, in the second two, $p^2/4-\rho$. In all the other cases firms would earn zero profits. A straightforward computation of expected profits leads to the above expression.

Expected profits in the third zone are computed in a similar way[7]. Now, $E(\pi|p)$ is monotonically increasing in p. As long as $E(\pi|p) > M$, firms enter the market. Entry reduces market price, thus decreasing expected profits of entering firms, until $E(\pi|p) = M$ (as stated in condition 1 above). We can now solve for the equilibrium (n_T^*, n^*, p^*) in terms of the exogenous parameters M and ρ by substituting for $E(\pi|p)$ in the equilibrium conditions. There are four different cases depending on the values of M and ρ (here the two cases $\rho < 1/2$ and $\rho > 1/2$ have been split).

Case (i): $M \le \min(\frac{\rho}{2}, \frac{1-\rho}{2})$

$$n^* = \frac{A-2\sqrt{2M}}{\sqrt{2M}} \qquad p^* = 2\sqrt{2M} \qquad n_T^* = 8n^*$$

Case (ii): $\frac{\rho}{2} < M \le 1-\frac{3}{2}\rho \qquad \rho < 1-\rho$

$$n^* = \frac{2A}{\sqrt{4M+2\rho}} - 2 \qquad p^* = \sqrt{4M+2\rho} \qquad n_T^* = 2n^*$$

Case (iii): $\frac{1-\rho}{2} < M \le \frac{3}{2}\rho - \frac{1}{2} \qquad 1-\rho < \rho$

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6 The case $\rho > 1/2$ is treated in the same way.

7 Details of the computations will be found in Appendix 1.

$$n^* = \frac{2A}{\sqrt{4M+2(1-\rho)}} - 2 \qquad p^* = \sqrt{4M+2(1-\rho)} \qquad n_T^* = 2n^*$$

Case (iv): $\max(\frac{3}{2}\rho - \frac{1}{2}, 1 - \frac{3}{2}\rho) \leq M < 1$

$$n^* = \frac{A}{\sqrt{\frac{2}{3}M + \frac{1}{3}}} - 2 \qquad p^* = 2\sqrt{\frac{2}{3}(M + \frac{1}{2})} \qquad n_T^* = \frac{4}{3}n^*$$

To illustrate the derivation of these results, we outline the calculations for case (i). The two equilibrium conditions, $E(\pi|p) = M$ and $S = D$, can be now solved explicitly:

$$\begin{cases} E(\pi|p) = \frac{1}{8}p^2 = M \\ p = \frac{2A}{n^* + 2} \end{cases}$$

Solving for p^* and n^* leads to the above expressions. n_T^* is determined by computing the fraction of firms which will not produce. We can also substitute the value of p in terms of the exogenous parameter M into the condition $(p^2/4) \leq \min(\rho, 1-\rho)$.

We now turn to the performance of firms, by considering the profits of active firms, conditional on being diversified or non diversified.

Specifically, we compare expected profits conditional on being active in both markets, $E(\pi|c_1 \leq p_1^2/4, c_2 \leq p_2^2/4)$, with expected profits conditional on being active in one market only, $E(\pi|c_i \leq p_i^2/4, c_j > p_j^2/4)$[8]. In what follows we shall simply denote the former by $E(\pi|1\&2)$, and the latter by $E(\pi|i)$.

In order to make an appropriate comparison, we should either compare the total profits of a diversified firm with the sum of the profits of two specialised firms (active in different industries), each of size equal to the corresponding product line of the diversified firm, or compare the ratio (total profits/total sales revenue) of a diversified and a specialised firm. However, in

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8 p_i are the respective equilibrium prices.

our model the size of each product line, both for specialised and diversified firms, is always $p/2$. It is therefore irrelevant whether we compare profits per industry, profits/sales ratios or the sum of the profits of each product line. In what follows we compare the first variable.

To ease exposition, all derivations have been placed in the Appendix. Here we merely state the results. We again distinguish several cases, depending on the parameters of the model.

Case (i) $\min(\rho, 1-\rho) > \frac{p_i^2}{4}$

This case corresponds to a situation in which the observed equilibrium price is so low that only very efficient firms are active. Here, both specialised and diversified firms have the same expected profits, $E(\pi_1|1\&2) = \frac{p_i^2}{4} = E(\pi_1|1)$. This case arises when the entry cost M is very low $(M < \rho/2, (1-\rho)/2)$. This drives the equilibrium price down and allows only the most efficient firms to survive.

Case (ii) $1-\rho > \frac{p_i^2}{4} > \rho$

This case corresponds to a higher level of equilibrium price than case (i), with a very low correlation factor. Only firms with a low market specific cost draw ($v_i = 0$) are able to survive (as their total costs will be at most ρ), and this creates a 'symmetry' between diversified and non diversified firms, such that $E(\pi_1|1\&2) = E(\pi_1|1)$.

Case (iii) $\rho > \frac{p_i^2}{4} > 1-\rho$

This case differs from the previous one only in the presence of a high correlation factor. In this case all firms will be active in both markets. Only firms with a 'good' common cost draw ($v_{12} = 0$) will be able to survive, as $v_{12} = 1$ would imply $c_1, c_2 \geq \rho > p$, but having a 'low' common cost draw and high correlation implies being able to survive in both markets (as costs on each market will be smaller than $1-\rho < p$).

Case (iv) $1 > \frac{p_i^2}{4} > \max(\rho, 1-\rho)$

We turn now to the most interesting case: the observed equilibrium price is high enough that many firms, with different cost draws, will enter. In this case the price is sufficiently high to allow all the firms, except those with cost draw = 1, to survive on the market. We have:

$$E(\pi|1\&2)=\frac{p_i^2}{4}+\frac{1}{5}\rho-\frac{2}{5}$$
$$E(\pi_1|1)=\frac{p_i^2}{4}-\rho$$

so that:

$$E(\pi|1\&2)>E(\pi_1|1) \qquad \text{if} \quad \rho>1/3$$
$$E(\pi|1\&2)<E(\pi_1|1) \qquad \text{if} \quad \rho<1/3$$

This is the most interesting case for our purposes: if the price is sufficiently high, (which will be the case, whenever M is large enough, i.e., $M>1-3/2\rho$) diversified firms are more profitable only if the cost correlation is high enough. When it falls below 1/3, i.e. when markets are not very 'close', diversified firms are less efficient on average than specialised firms.

An intuitive interpretation of the results is as follows. When we observe that a firm is specialised, this raises the probability that its common cost draw[9] is 'bad' (if it were good the firm would have entered both markets). However, the fact that the firm is active in one market implies that the market specific share of the cost must have been relatively good. Accordingly, diversified firms must have a good common cost draw: this allows them to enter the market even if the market specific cost component is high.

If the correlation between the two industries is high, this synergy generates better average performance for diversified firms. However, if the industries do not have too much in common, the "good management" effect does not have a substantial effect on costs and profitability and diversified firms are less profitable than specialised ones.

Notice that it is not diversification *per se* which negatively affects firms' performance. Rather, being diversified is simply correlated with relative inefficiency.

The discreteness in our example makes it somewhat difficult to characterise the necessary conditions for the result. We therefore turn now to a

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9 We shall imagine, in the following, that the common cost draws depend on managerial skills, so that if $\tilde{v}_{12}=0$ we say the firm 'has a good management', and if $\tilde{v}_{12}=1$ then 'it has a bad management'.

continuous distribution function, by reference to which we can give a complete characterisation of the properties of the cost functions and the correlation factors which generate the outcome.

5. A General Characterisation

The result in the above example, that diversified firms may be less profitable, relies on a particular relation between the parameters M and ρ. First, the correlation ρ must be relatively low, so that efficiency is mainly affected by the firm specific element in the cost draw. Second, the distribution function of that cost element must be 'very steep' at some point (in fact, at the point corresponding to the equilibrium market price). This last characteristic will favour the entry of a large number of relatively inefficient diversified firms (i.e. those with a high firm specific cost element) since they can exploit a lower value of the common cost element, which 'just' compensates for the high realisation of the firm specific cost element.

In this section we show that, if the distribution of the firm specific cost factor has sufficient mass at some point, equilibrium configurations exist where a large number of diversified firms with high market specific cost draws enter the market.

This effect dominates the positive influence of the synergies when these are not too strong, i.e., when the correlation factor is sufficiently small.

In the remainder of this section we shall show that these two features are in fact necessary and sufficient to make diversified firms less profitable than single product firms.

To fix ideas, consider the random variables $\tilde{v}_1,\tilde{v}_2,\tilde{v}_{12}$, with continuous density functions f_1,f_2,f_{12} (resp. distribution functions F_1,F_2,F_{12}) and support $[0,1]$[10], and define as before:

$$\tilde{c}_1 = (1-\rho)\tilde{v}_1 + \rho v_{12}$$
$$\tilde{c}_2 = (1-\rho)\tilde{v}_2 + \rho v_{12}$$

Proposition: There exists a $\bar{\rho}$ and an equilibrium price $\bar{p}$, such that for all

$$\rho<\bar{\rho}:\ E(\tilde{c}_1|\tilde{c}_1 < \hat{p},\tilde{c}_2 < \hat{p}) > E(\tilde{c}_1|\tilde{c}_1 < \hat{p},\tilde{c}_2 > \hat{p})$$[11]

---

[10] The result would go through with any support.

[11] Here we are comparing the expected cost in industry 1 for diversified firms with the expected cost for firms specialized in industry 1. The same applies for the expected cost in industry 2.

(where $\hat{p} = \frac{\bar{p}^2}{2}$), if and only if there exists $x \in [0,1]$ such that the following condition is satisfied:

$$\left[\int_0^x f_1(v_1)dv_1\right]^2 < f_1(x)\left[\int_0^x (x-v_1)f_1(v_1)dv_1\right]$$

Intuitively, this condition requires that the density of the market specific cost component is sharply peaked at some point. This is satisfied, for example, in the case of a continuous distribution on $[0,1]$ with $f(v) \to \infty$ as $v \to 1$. It is not satisfied, for example, by uniform distributions.

The proof of the proposition is set out in Appendix 2.

It may be helpful to note here that this proposition is couched in terms of the equilibrium market price $\bar{p}$, and not in terms of M. It is easy to show, however that $\bar{p}$ is a 'possible' equilibrium price, depending on the value of the entry cost M. To see this, notice that $E(\pi|p)$ is a continuous increasing function of the equilibrium price:

$$E(\pi|p) = \int_0^{\frac{p^2}{4}} (\frac{p^2}{4} - c_1) f(c_1) dc_1 + \int_0^{\frac{p^2}{4}} (\frac{p^2}{4} - c_2) f(c_2) dc_2$$

$$\frac{\partial E(\pi|p)}{\partial p} = \int_0^{\frac{p^2}{4}} \frac{1}{2} p f(c_1) dc_1 + \int_0^{\frac{p^2}{4}} \frac{1}{2} p f(c_2) dc_2$$

and p is a continuous decreasing function of n (the number of active firms):

$$\frac{\partial p}{\partial n} = -\frac{2A}{(n+2)^2} < 0$$

The entry of firms on the market will therefore generate a reduction in expected profits. At equilibrium,

$$E[\pi(p(n))] = M$$

so that it is possible to solve for equilibrium values of n and p:

$$n^* = n^*(M) \qquad n^{*\prime} < 0$$

$$p^* = p^*(M) \qquad p^{*\prime} > 0$$

It is therefore always possible to find a value of the entry sunk costs that generates an equilibrium price $\bar{p}$.

6. The "Economies of Scope" Model

We turn now to the possibility that diversification is driven by economies of scope. This implies that if a firm produces two 'related' goods, the total cost of producing them jointly is lower than the sum of the costs of producing them separately. This possibility is usually attributed to the presence of shared inputs, which are imperfectly divisible (so that manufacturing a subset of the output leaves excess capacity), or of human or physical capital which is a public input[12].

If economies of scope exist, we would intuitively expect (and in fact this is the common presumption in the literature) that diversified firms, being those which benefit from this possibility, perform better on average. We shall see below that this might not be so. We shall illustrate this possibility by means of a simple example in the spirit of section 4.

The assumptions are identical to those of the first model, except for the determination of the fixed element in the cost function. Assume that the total fixed cost for firm j is given by:

$$\tilde{c}^j = \tilde{v}_i \qquad \text{if it is only active in industry i}$$
$$\tilde{c}^j = \tilde{v}_1 + \tilde{v}_2 - s \qquad \text{if it is active in both industries}$$

where s represents the proportion of the fixed costs which can be 'shared' between the two products and where v_1, v_2 are discrete i.i.d. random variables, viz.

$$\tilde{v}_i = \begin{cases} 1 & \text{with probab. } 1/3 \\ 2 & \text{with probab. } 1/3 \\ 3 & \text{with probab. } 1/3 \end{cases}$$

12 See Panzar and Willig (1981).

(with $s \leq 1$) so that the random variable c will be distributed as:

v_1	v_2	$c = v_1 + v_2 - s$	probability
1	1	$2-s$	1/9
1	2	$3-s$	1/9
1	3	$4-s$	1/9
2	1	$3-s$	1/9
2	2	$4-s$	1/9
2	3	$5-s$	1/9
3	1	$4-s$	1/9
3	2	$5-s$	1/9
3	3	$6-s$	1/9

When there are economies of scope, the entry decisions for the two markets are not independent (as was instead the case with correlated costs). The 'entry criterion' for a firm will involve a comparison of the profits that can be achieved by entering only one market with those that can be achieved by entering both markets.

A firm will enter only one market if the expected profits in that market are positive but smaller than those that could be earned entering two industries and thereby benefiting from the economies of scope.

We shall again have several cases depending on the value of the equilibrium price[13] (see the Appendix for the derivation of results).

(a) $\frac{p^2}{4} > 3 - s$

This corresponds to the case of a high market equilibrium price. This allows all firms entering the market to diversify. I.e. prices are so high that even the less efficient firms can survive in both markets.

[13] We shall simply assume here that the number of firms is given exogenously and this determines equilibrium prices.

(b) $3 - s > \frac{p^2}{4} > 2$

In this case the equilibrium price is slightly lower than in case (a). Diversified firms have an average cost per industry equal to (3-s)/2, while undiversified firms have on average cost equal to 3/2.
This means that diversified firms are more profitable. This case holds if the equilibrium price is high, and relatively inefficient firms can enter the market. Diversified firms will then enjoy the advantage of the economies of scope.

(c) $2 > \frac{p^2}{4} > 2 - s$

If the price is lower than in the previous cases, specialised firms need to be very efficient in order to survive (specialised firms will be those with a very good cost draw in one market and a very bad cost draw in the other, so that the cost reduction generated by the economies of scope are not sufficient to compensate for the losses in the market where they are less efficient), while those entering both markets can exploit the economies of scope. However these economies only allow the firms to survive in the markets and do not compensate for the relative inefficiency with respect to undiversified firms. Diversified firms have an average cost in each industry equal to (3-s)/2, while specialised have costs equal to 1. In this interval, <u>specialised firms are more profitable</u>.

(d) $2 - \frac{s}{2} > \frac{p^2}{4} > 2 - s$

In this case an equilibrium price lower than in the previous cases eliminates some of the inefficient diversified firms. Diversified firms have average costs per industry equal to (8-3s)/6 while specialised firms have, on average, costs equal to 1. Diversified firms are more profitable if s > 2/3, i.e., if economies of scope are 'important'. If the economies of scope are sufficiently high, this will induce a higher average profitability for the diversified firms.

(e) $2 - s > \frac{p^2}{4} > 1$

This is the extreme case of (d): if the price is extremely low, only highly efficient firms manage to survive, whether they diversify or not. Diversified firms however enjoy a cost reduction.

Diversified firms have an average cost in each industry equal to 1-s/2. Hence they are more profitable than specialised firms, whose average costs equals 1.

(f) $1 > \frac{p^2}{4} > 1 - \frac{s}{2}$

In this case the equilibrium price is even lower than in case (e). Only diversified firms (the most efficient ones) enter.

Here, the result that diversified firms are not more profitable than specialised firms is driven by the possibility, for those entering both markets, of achieving a cost reduction through economies of scope which allows even relatively inefficient firms to survive. Undiversified firms on the other hand are those with a very high efficiency level in one industry, and a very poor one in the other, so that the cost reduction does not compensate for the difference in costs.

7. Conclusions

Empirical studies that find a negative relationship between diversification and profitability do not necessarily imply that diversification has a negative impact on profitability.

We have shown that such econometric results may be explained either in terms of a bias in the estimation of the relationship, due to the omission of variables affecting efficiency, or in terms of selection bias: diversified firms may be very inefficient and able to survive only due to the exploitation of synergies.

More generally, it is not surprising that no very clear or consistent result emerges from the econometric literature. In spite of the commonly adduced arguments as to why a positive relationship should be expected here, an examination of some simple models suggests that there is no robust theoretical basis for any such relationship.

Appendix 1

(i) Cost correlation

Entry patterns for each price range:

	Cost combinations					Price ranges			
	v_1	v_2	v_{12}	c_1	c_2	$\rho, 1-\rho > \hat{p}$	$1-\rho > \hat{p} > \rho$	$\rho > \hat{p} > 1-\rho$	$\hat{p} > \rho, 1-\rho$
1)	0	0	0	0	0	1&2	1&2	1&2	1&2
2)	0	0	1	ρ	ρ	-	1&2	-	1&2
3)	0	1	0	0	$1-\rho$	1	1	1&2	1&2
4)	0	1	1	ρ	1	-	1	-	1
5)	1	0	0	$1-\rho$	0	2	2	1&2	1&2
6)	1	0	1	1	ρ	-	2	-	2
7)	1	1	0	$1-\rho$	$1-\rho$	-	-	1&2	1&2
8)	1	1	1	1	1	-	-	-	-

The symbol (-) means that firms with the indicated cost combinations do not enter any market; 1&2 that they enter both markets etc.

<u>An example of comparison between profits: the parameter range</u> $\frac{p^2}{4} > \rho, 1-\rho$

(a) We first look at specialised firms: these will be firms with the cost combinations 4) and 6), i.e.:

- firms with $v_1 = 0, v_2 = 1, v_{12} = 1$ (they enter only industry 1)
- firms with $v_1 = 1, v_2 = 0, v_{12} = 1$ (they enter only industry 2)

These firms have a "bad" common cost draw $v_{12} = 1$, and a "good" cost draw in one industry only. Average costs per industry, $E(c_1|1) = E(c_2|2)$, are ρ.

(b) We now look at diversified firms. These are firms with cost draws as in 1), 2), 3), 5), 7), i.e.:

- firms with $v_1 = 0, v_2 = 0, v_{12} = 0$
- firms with $v_1 = 0, v_2 = 0, v_{12} = 1$
- firms with $v_1 = 0, v_2 = 1, v_{12} = 0$
- firms with $v_1 = 1, v_2 = 0, v_{12} = 0$
- firms with $v_1 = 1, v_2 = 1, v_{12} = 0$

These firms have on average a "good" common cost draw (except in one case, 2), where firms have very good values of both independent cost draws), which allows entry even with high market specific draws. Average costs per industry are $E(c_1|1+2) = E(c_2|1+2) = (2-\rho)/5$.

(c) The comparison is then between $E(\pi|1 \; or \; 2) = \frac{p^2}{4} - \rho$ and $\frac{E(\pi|1+2)}{2} = \frac{p^2}{4} - \frac{2-\rho}{5}$

(ii) Economies of scope

When there are economies of scope, the entry decisions for the two markets are not independent: the "entry criterion" involves a comparison of profits that can be achieved by entering only one market with those that can be achieved by entering both.

(1) Firms enter only industry 1 if:

$$\frac{p^2}{4} - v_1 > 0$$

and

$$p_1 - v_1 > \frac{p_1^2}{4} + \frac{p_2^2}{4} - (v_1 + v_2 - s)$$

i.e., if profits in industry 1 are positive and higher than those that can be achieved by entering both markets.

(2) Firms enter only industry 2 if the equivalent condition holds, with the subscript interchanged.

(3) Firms enter both industries if:

$$\frac{p_1^2}{4} + \frac{p_2^2}{4} - (v_1 + v_2 - s) > 0 \qquad \frac{p_1^2}{4} + \frac{p_2^2}{4} - (v_1 + v_2 - s) > \max\left(\frac{p_1^2}{4} - v_1, \frac{p_2^2}{4} - v_2\right)$$

i.e., if profits are positive and higher than those that can be achieved by entering one market only.

<u>A profit comparison: the case</u> $3 - s > \frac{p^2}{4} > 2$:

	v_1	v_2	c
1	1	1	2-s
2	1	2	3-s
3	1	3	4-s
4	2	1	3-s
5	2	2	4-s
6	2	3	5-s
7	3	1	4-s
8	3	2	5-s
9	3	3	6-s

We first identify firms which pass the "enter both" criterion: these are firms in groups 1), 2), 4), 5). Their costs are (2-s), (3-s), (3-s) and (4-s). Average costs per industry are (3-s)/2.
Firms in groups 3) and 6) pass the "enter only industry 1" criterion. Their costs are 1, 2 (on average 3/2).
Firms in groups 7) and 8) pass the "enter only industry 2" criterion. Their average costs are 3/2. The comparison is therefore between $E(\pi|1 \text{ or } 2) = \frac{p^2}{4} - \frac{3}{2}$

and $E(\pi|1 + 2) = \frac{p^2}{4} - \frac{3-s}{2}$.

Appendix 2

Proof of proposition 1.

The proof proceeds in three steps:

(i) We first show that for $c_1 = (1-\rho)\tilde{v}_1 + \rho\tilde{v}_1$, $E(\tilde{c}_1|\tilde{c}_1 < \hat{p}, \tilde{v}_{12} = w)$ is a decreasing function of w under the assumption of the proposition. I.e., the lower is the realisation of the common part of the costs, the higher is the expected value of the cost $\tilde{c}_1$.

Observe that:

$$E(\tilde{c}_1|\tilde{c}_1 < \hat{p}, \tilde{v}_{12} = w) =$$

$$= (1-\rho)E(\tilde{v}_1|\tilde{v}_1 < \frac{\hat{p}-\rho w}{1-\rho}) + \rho w =$$

$$= (1-\rho)\frac{\int_0^{\frac{\hat{p}-\rho w}{1-\rho}} v_1 f_1(v_1)dv_1}{\int_0^{\frac{\hat{p}-\rho w}{1-\rho}} f_1(v_1)dv_1} + \rho w$$

Differentiating with respect to w gives:

$$\frac{1}{\rho}\frac{\partial E}{\partial w} = \frac{1}{\left[\int_0^{\frac{\hat{p}-\rho w}{1-\rho}} f_1(v_1)dv_1\right]^2} \cdot$$

$$\cdot \left[-\frac{\frac{\hat{p}-\rho w}{1-\rho}}{1-\rho} f_1(\frac{\hat{p}-\rho w}{1-\rho}) \int_0^{\frac{\hat{p}-\rho w}{1-\rho}} f_1(v_1)dv_1 + f_1(\frac{\hat{p}-\rho w}{1-\rho}) \int_0^{\frac{\hat{p}-\rho w}{1-\rho}} v_1 f_1(v_1)dv_1 \right] + 1$$

For $\hat{p} = x$ the assumption, by continuity, implies that, for every $w \in [0,1]$, if ρ is chosen small enough

$$\frac{\partial E}{\partial w} < 0$$

On the other hand if the assumption is not satisfied, it is always the case that

$$\frac{\partial E}{\partial w} > 0$$

(ii) we now integrate over the common cost factor. Here we use the fact that:

$$Pr(\tilde{v}_{12} < w | (1-\rho)\tilde{v}_2 + \rho\tilde{v}_{12} < \hat{p}) \geq Pr(\tilde{v}_{12} < w | (1-\rho)\tilde{v}_2 + \rho\tilde{v}_{12} > \hat{p}) \qquad \forall w \in [0,1]$$

This can be established by showing that, for independent x and y,

$$Pr((\tilde{x} < x) | \tilde{x} + \tilde{y} < z) \geq Pr((\tilde{x} < x) | \tilde{x} + \tilde{y} > z)$$

which, by standard properties of conditional probabilities, is equivalent to

$$\frac{Pr(\tilde{x} < x, \tilde{x} + \tilde{y} < z)}{Pr(\tilde{x} + \tilde{y} < z)} \geq \frac{Pr(\tilde{x} < x, \tilde{x} + \tilde{y} > z)}{Pr(\tilde{x} + \tilde{y} > z)}$$

This inequality holds if

$$Pr(\tilde{x} < x, \tilde{x} + \tilde{y} < z) \geq Pr(\tilde{x} < x) Pr(\tilde{x} + \tilde{y} < z)$$

which holds trivially for $z < x$. If $x < z$ we rewrite the last inequality as

$$\int_0^x F_y(z-t) f_x(t) dt \geq \int_0^x f_x(t) dt \cdot \int_0^z F_y(z-t) f_x(t) dt$$

that is

$$E(F_y(z - \tilde{x}) | \tilde{x} < x) \geq E(F_y(z - \tilde{x}) | \tilde{x} < z) Pr(\tilde{x} < z)$$

which is obviously true.

(iii) We can now proceed to the comparison of the two expectations:

$$E(\tilde{c}_1 | div.) - E(\tilde{c}_1 | undiv.) =$$

$$= E(\tilde{c}_1 | \tilde{c}_1 < \hat{p}, \tilde{c}_2 < \hat{p}) - E(\tilde{c}_1 | \tilde{c}_1 < \hat{p}, \tilde{c}_2 > \hat{p}) =$$

$$= \int_0^1 E(\tilde{c}_1 | \tilde{c}_1 < \hat{p}, \tilde{v}_{12} = w) [f(w | \tilde{c}_2 < \hat{p}) - f(w | \tilde{c}_2 > \hat{p})] dw =$$

$$= 0 - \int_0^1 \frac{\partial}{\partial w}(\tilde{c}_1 | \tilde{c}_1 < \hat{p}, \tilde{v}_{12} = w)\left[F(w|\tilde{c}_2 < \hat{p}) - F(w|\tilde{c}_2 > \hat{p})\right]dw > 0$$

as:

(i) implies $\frac{\partial E}{\partial w} < 0$ and

(ii) implies $\left[F(w|\tilde{c}_2 < \hat{p}) - F(w|\tilde{c}_2 > \hat{p})\right] > 0 \quad \forall w$

Since a violation of the assumption implies $\partial E / \partial w > 0$, we also obtain the necessary part of the proposition.

q.e.d.

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Abstract

The paper addresses the question of the effects of diversification strategies on firms' profitability. Empirical analyses do not seem to confirm the hypothesis that diversification is the optimal response to the presence of synergies and hence generates higher profits. It is shown that this might be either the effect of distortions due to the omission of some other factors which affect the efficiency of firms, or the result of selection bias. Diversified firms, in fact, may be the less efficient firms, just able to survive due to the synergies they achieve diversifying.

Chapter 3

Diversification Patterns in the Food Industry: U.K. and Italy

1. Introduction

In this chapter we introduce an empirical approach to the analysis of diversification, and in particular to changes in the pattern of diversification over time and across countries.

Most empirical studies on diversification consist of econometric analyses of the levels of diversification (and these studies face limitations due to measurement problems, and to the unavailability of disaggregated data). They assume a priori that patterns of diversification are driven by factors such as similarities in R&D intensity, common channels of distribution leading to economies of scope, and so on.

The present study takes a different approach, in that we begin by inferring directly from the observed levels and patterns of diversification, the extent to which one industry is, or is not, linked to another.

Our present aim is to analyse whether observed diversification patterns are consistent with the hypothesis that diversification within the food sector is driven largely by 'technological factors' (which we shall represent as 'correlation of costs' and 'economies of scope'). The analysis is based on a comparison of diversification patterns and levels across two countries (U.K. and Italy) in two different time periods (1962 and 1986).

The question we want to address is whether these patterns have changed over time, and are different across countries, or whether they are fairly stable (so that any differences we observe can be explained in terms of differences in the overall level of diversification, in the food sector, and differences in the relative size of the various markets - and so in the relative numbers of firms active in each).

This is done by estimating a model using one dataset and assessing how well this model predicts the other datasets.

The analysis is confined to the <u>food and drink sector</u>. The advantages of choosing a specific sector are basically that firms are relatively homogeneous with regard to the technology of production and distribution and to institutional factors which might affect the extent and direction of diversification[1].

The differences we observe at first glance between diversification patterns in the Italian food and drink sector and those in the British industry might easily be attributed to the fact that diversification <u>levels</u> are much lower in the Italian industry - the 1986 Italian levels correspond more closely to the

[1] Though we do not specifically address the effects of institutional factors on diversification, some institutional issues will be touched on when differences across countries are analysed.

1962 levels found in the UK, as opposed to the current UK levels, for example. Secondly, the relative size of different industries within the Italian food and drink sector is very different to the distribution found in the UK - and again, this might account for much of the difference. The key issue we address here is whether the observed patterns of diversification found in the Italian food and drink sector are consistent with the same underlying model (parameters) as is driving the UK diversification matrix, or not.

The first novel aspect of the present approach is that it uses a dataset which is highly disaggregated. This has been built up using the Kompass trade directories. The price we pay for this, is that the present dataset is only 'qualitative', i.e., we know the industries in which firm x operates in great detail, but we cannot distinguish the primary and secondary activities of the firms, nor do we know their relative weight, i.e., the total sales in industry j of a firm also operating in industry i.

The second novelty concerns the approach taken to the concept of 'industry relatedness', which, instead of being assumed as an explanatory factor underlying diversification, is deduced directly from the observed levels of diversification.

Finally we use a simulation, based on the model developed in chapter 2, as an indirect way of testing the hypothesis that diversification is driven by attempts to exploit economies of scope or cost correlations.

2. The Data Sets

2.1 The Food and Drink Industry: Preliminary Remarks

The food and drink sector is here approximately identified with sectors 41 and 42 of the NACE classification.

It is a mature sector, not highly affected by cyclical factors, and has relatively stable profit margins. The production technology is characterised by a low level of R&D investments, together with a high level of advertising intensity[2] (which varies widely across products).

Market structures are different across countries[3]: the English food and drink industry is the most concentrated in Europe. In 1977 there were 5600 firms, and the top 30 accounted for 3/5 of employment and value added[4].

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[2] See Sutton (1991).

[3] See Sutton for a detailed description.

[4] See Burns et al. (1983).

Employment in 1980 was 506,000 (7.6% of total manufacturing), and 44.4% was concentrated in firms with more than 10,000 employees. Concentration varies across segments but is generally very high.

On the other side the food and drink industry in Italy is extremely fragmented. In 1971 only 13.7% of total employment was in firms with more than 2000 employees (as compared to 65.5% in U.K. in 1977) and in 1981 15.2% was in firms with more than 1000 employees (as compared to 72.2% in the U.K.)[5]. Concentration differs widely across sectors: both in Italy and in the U.K., the salt, sugar, canned vegetables, margarine, ready to eat cereals, and baby food industries are highly concentrated, while among other industries there are some substantial differences in concentration levels.

On average, however, the Italian industries tend to be less highly concentrated than the corresponding U.K. industries.

The two countries also differ in regard to the relationship with the distribution sector: in the U.K., the distribution sector is highly concentrated; while in Italy it remains fragmented (though it is becoming less so over time).

Finally it is worth noting that, given the complete absence of antitrust intervention in Italy until the end of 1990, we would expect, *a priori*, to find a greater degree of intra-industry acquisitions in the Italian case, and so a lesser tendency for diversification to be used as a vehicle for growth.

2.2 Datasets

The basic dataset for the study was built up using the Kompass Trade Directories for the United Kingdom (1962 and 1986 editions) and for Italy (1986 edition)[6].

Kompass directories are not official Census publications and are not fully comprehensive (so that results derived from this analysis will have to be evaluated with care), but they offer an almost complete list of the companies operating in various sectors, and, for each firm, they provide a very detailed list of its product range. For the 'food and drink' sector Kompass has a basic classification which includes 65 product categories in the 1986 directory, for example. Within each category, a list of about 20-30 products is specified.

In Appendix 1, two Kompass tables are included to illustrate the level of detail they offer. The allocation of individual products to categories in the

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5 21% of employment in 1977 and 22.8% in 1981 was in firms with less than 6 employees (Censimento dell'Industria 1971, 1981).

6 The directory for the year 1986 was the most recent available at the beginning of the data collection, while 1962 corresponds to the first edition of the Kompass Trade Directories.

Kompass directory reflects, at some point, presentational convenience. However, the level of detail is approximately at the level of the U.S. 7-digit SIC classification. A lengthy process of data analysis was performed with a view to collapsing Kompass entries into sets of industries in some way comparable to a 4-digit SIC classification, identical for the U.K. and Italy. However, the availability of the detailed Kompass classification made it possible to create product categories which could be defined in a manner more suitable to the present analysis, and more reflective of demand patterns[7]. This procedure led to a set of 60 product categories, listed in Appendix 1. Having defined a product list which suited the analysis, we reconstructed the Kompass matrices associating with each firm a list of (newly classified) products. The number of firms in each dataset is as follows: 636 in the U.K. 1962 dataset, 889 in the U.K. 1986 dataset, and 1378 in the Italian 1986 dataset.

Hence we obtained three matrices of size (636, 60), (889, 60), (1378, 60), which associated each firm to its product range.

The main limitation of these datasets is that we do not have information on the relative weight of each production line for each firm. Diversification indices will be based on counts of products. Moreover, since for the Italian case it is not possible to identify inter-firm linkages (ownership patterns), our analysis deals only with diversification through internal expansion rather than by acquisition[8].

From the matrix of the production ranges of the companies, a 'diversification matrix' was generated: this is a square matrix D=(60 X 60) whose generic element d_{ij} represents the number of firms active both in sector i and j (the diagonal element d_{ii} is then the total number of firms active in sector i).

2.3. A Preliminary Analysis

In order to compare the matrices, the first preliminary analysis consisted of 'grouping' the 60 product categories into 'clusters' of products which are related in the following sense: if a high percentage of firms active in one industry is also active in the other, the two industries are considered linked, and are grouped together. The idea is to check whether the same sort of groups arise in all the datasets, and then to analyse in detail possible differences, i.e., we

7 As opposed to SIC classifications which are in most cases based on a commonality of production techniques.

8 Unfortunately this means that we cannot account for diversification strategies that are decided at the parent company level rather than at the individual firm level.

first check whether the same industries are related in the above sense, and secondly to what degree are they related in the different datasets.

From the diversification matrix D we first constructed a second matrix, labelled P, by dividing each row by the diagonal element; the result is again a (60 X 60) matrix whose generic element p_{ij} represents (loosely speaking) the 'probability' that a firm producing in sector i is also active in sector j (the diagonal elements p_{ii} equal 1). Note that the matrices P are not symmetric (while the D matrices are).

Product categories are then grouped so that all the product categories within a cluster are related through some chain of pairwise linkages, i.e., for any pair (ij), either p_{ij} is large, or there are some other products within the group, such that $p_{ik}, p_{kl}, \ldots, p_{rs}, p_{sj}$ are <u>all large</u>.

	1	2	3
1	0	0.8	0
2	0	0	0.9
3	0.7	0	0

Fig. 3.1- A possible group configuration

Note that not all pairwise links within a group need be large. A simple algorithm was used for this purpose, which 'block diagonalizes' the diversification matrix P. The procedure is best explained using a numerical example.

Suppose the matrix P is:

	1	2	3	4	5
1	1	0.3	**0.8**	0.1	0.2
2	0.2	1	0.3	0.5	0.4
3	0.3	0.6	1	0.2	0.1
4	0.6	0.2	0.3	1	0.2
5	0.4	0.7	0.5	0.5	1

Firstly the maximum off-diagonal element is identified (i.e., the highest probability of diversification from one product category i into another j): in the example this is $p_{13} = 0.8$. Sectors i and j are then grouped into one cluster (ij), which represents a new element in the matrix. This is carried out by re-ordering the industries so as to begin with the 'first cluster' i.e. (1, 3) and then the remaining industries are listed in the original order, i.e., 2,4,5 etc.:

	1	3	2	4	5
1	1	0.8	0.3	0.1	0.2
3	0.3	1	0.6	0.2	0.1
2	0.2	0.3	1	0.5	0.4
4	0.6	0.3	0.2	1	0.2
5	0.4	0.5	**0.7**	0.5	1

Again the maximum off-diagonal element is identified (i.e., the maximum element not lying in the diagonal block, in the example $p_{52} = 0.7$); this will determine a new group:

	1	3	2	5	4
1	1	0.8	0.3	0.2	0.1
3	0.3	1	0.6	0.1	0.2
2	0.2	0.3	1	0.4	0.5
5	0.4	0.5	0.7	1	0.5
4	0.6	0.3	0.2	0.2	1

Note that there are no 'natural' or statistical criteria which can be applied to indicate where to stop the procedure, i.e., for which value α of the diversification 'probability' the grouping procedure should end. This cut-off value is arbitrary[9]. We have therefore adopted the following approach: we first compared the results of the grouping procedure for the datasets UK62 and UK86, for different 'cut-off values'. Using as a minimum diversification probability the value $\alpha = 0.9$, 6 groups are formed in UK62 and only 3 in UK86. Only two of the groups are common to both. Lowering the value of α increases both the total number of groups formed and the number of groups common to both datasets. For a level of $\alpha = 0.7$ there are 11 groups in UK62 and 9 in UK86. Moreover the algorithm generates a grouping which is approximately similar for both matrices (7 of the groups are in common).

As we aim to identify the closely related product groups which will usually emerge from any dataset for the food industry (i.e. over countries and time periods), we also compare the groupings with those for the Italian dataset. Again there is a close similarity between the groups which appear in the UK

[9] This is a problem which is shared with most of the standard cluster procedures. The approach used here resembles the cluster method using the minimum distance between groups as a criterion to join elements.

and Italian datasets: 4 of the 11 groups in UK62 also arise in the Italian data, while 6 of the 9 groups in UK86 also appear in Italy.

We conclude very tentatively, that the groups observed at this level probably correspond to underlying 'technological' similarities[10], which hold good both across countries and across time (we shall try to confirm this preliminary conclusion in the section which follows).

If, on the other hand, we set the 'cut-off value' at a level below 0.7, we find less sharp differences, and the groupings become less obvious (see Appendix 1 for the results of the grouping procedure for different values of α) and it becomes more difficult to define them in such a way as to make them comparable across countries and time.

The groups identified through the procedure are therefore:

1) the **DAIRY** group, including:
   milk and yoghurt industry
   condensed and dried milk industry
   cheese industry

2) the **SOFT DRINKS** group, including:
   vegetable and fruit juices industry
   soft drinks industry
   mineral water industry

3) the **JAM** group, including:
   jam industry
   preserves industry

4) the **BISCUIT** group, including:
   biscuit industry
   crackers industry

5) the **CHOCOLATE** group, including:
   chocolate confectionery industry
   cocoa industry

6) the **BAKERY** group, including:
   bread industry

[10] I.e., related to production processes.

cakes and pastries industry

7) the **PROCESSED FRUIT AND VEGETABLES** group, including:
processed fruit industry
canned fruit industry
processed vegetables industry
canned vegetables industry

8) the **FLOUR AND CEREALS** group, including:
ready to eat cereals industry
other cereals industry
flour industry
special flours industry
processed rice industry

9) the **FATS** group, including:
margarine industry
edible oils industry

10) the **SUGAR** group, including:
sugar industry
sugar allied products industry

11) the **FROZEN FOOD** group, including:
frozen food industry
processed fish industry

12) the **CONDIMENTS** group, including:
vinegar, condiments, sauces industry
processed spices and herbs industry

13) the **ANIMAL FEED** group, including:
pet food industry
animal feed industry

14) the **PROCESSED MEAT** group, including
meat processing industry
poultry industry

15) the **TEA COFFEE** group, including:
   tea industry
   coffee industry

All the other industries do not appear strongly related to any other[11].

The groups obtained through this procedure seem acceptable, and even rather 'obvious' (but in fact, they are not exactly the same across the three datasets): this is reassuring, given the arbitrary elements in the approach. They are however useful for our objective, viz., to analyse differences across the datasets. From this preliminary analysis two lines have been followed.

2.4 A Log-Linear Analysis?

One way of both testing the 'group' structure and examining 'intra-group structure' is to use a log linear model. This is a convenient 'standard' technique to analyse relationships among categorical variables where data are organised in contingency tables.

For any multiway table there are a number of possible hypothesis about these relationships (that all the variables are independent, that each pair of variable is associated but the association is independent of other variables etc.). In the log-linear analysis these hypotheses are specified by models fitted to the cell frequencies which are decomposed into a number of multiplicative components. By taking the logarithm of the cell frequency the components of the model are made linear (Payne, 1977).

A very simple example of the kind of problems to which log-linear models can be applied, would be the following. Suppose we want to assess whether voting choices are independent of sex (race, culture etc.). The variables are "voting choice" (suppose there are only two parties, Conservatives and

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[11] Some comments on the results of the procedure (all the tables are presented in Appendix 1): In UK62 industries appear more 'strongly related' than in the other two cases: some groups in fact emerge for relatively low values of the 'stopping point'. When $\alpha = 0.9$, 6 groups are formed in UK62 (including 16 industries) while in UK86 and IT86 only 3 arise (with 7 industries each). When $\alpha = 0.8$, 10 groups are formed in UK62 (24 industries) while the corresponding number for UK86 and IT86 are 5 and 7. Groupings become closer only for $\alpha = 0.7$.
Concerning the groups that are formed: the dairy group emerges for all datasets, the soft drink industry is a group in the UK but is not so evident in Italy (fruit juices and mineral water are not strongly linked). The bread & cakes and the biscuit & crackers groups are more clearly identified in the UK, while in Italy only the first two are strongly linked. The fruit & vegetable group is one group in the UK but is a two group sector in Italy, while flour & cereal is a single group in the UK but not in Italy.

Progressives) and sex (male, female). A contingency table of size (2X2) can be constructed:

		Voting		
		C	P	
Sex	M	n_{11}	n_{12}	$f_{1.}$
	F	n_{21}	n_{22}	$f_{2.}$
		$f_{.1}$	$f_{.2}$	

where $f_{1.}, f_{2.}$ are the sex variable "marginals", $f_{.1}, f_{.2}$ are the voting variable "marginals".

Suppose the two variables are independent. Define $P(V=i)$ and $P(S=j)$ to be the probabilities that the Voting variable is at level i (C or P) and the Sex variable at level j (M or F). Assuming independence and given that marginals are fixed, the probability that an observation will fall in cell (ij) is:

$$P_{ij} = P(V=i) \cdot P(S=j) = \frac{F_i}{n} \cdot \frac{F_j}{n}$$

Under the assumption that the model is correct, the expected frequencies are given by:

$$F_{ij} = \frac{f_{i.}}{n} \cdot \frac{f_{.j}}{n} \cdot n$$

Taking the logarithm we obtain:

$$\log F_{ij} = \log f_{i.} + \log f_{.j} - \log n$$

It is possible to show that the equation can be reformulated as a log-linear model:

$$\log F_{ij} = \lambda + \lambda_1(i) + \lambda_2(j)$$

where λ is the overall mean of the logarithm of the expected frequencies, λ_1 is the main effect of the log frequency of being at level i of variable V, and similarly for λ_2. This can be extended to consider a term for the two-way effect between the two variables, $\lambda_{12}(ij)$. The aim is to find the model which best fits the data, having taken account of sampling variability in the cell frequencies. A range of models have to be fitted, where some or none of the λ terms are set to zero, in order to choose among them using a test for the goodness of fit, based on the comparison of the observed log frequencies with those fitted under the particular model[12].

[12] With three or more variables all possible links (two and three way) have to be considered. Tests are either χ^2 statistics or the likelihood ratio chi-square test.

In analysing diversification patterns with log-linear models the variables are the industries. For each firm the variable can take the value 'active' or 'non active'. A contingency table may be for example:

		Cheese	
		Active	Non Active
Yoghurt	Active	n_{11}	n_{12}
	Non Active	n_{21}	n_{22}

where: n_{11} is the number of firms active in both industries
n_{12} is the number active in yoghurt but not in cheese
n_{21} is the number active in cheese but not in yoghurt
n_{22} is the number not active in either industries[13].

The case of three, four, etc. variables is treated in a similar way.

Since computational limitations do not allow to apply the procedure to the whole (60X60) matrices, we limited the analysis to the previously identified groupings.

Results of the analysis are presented in Appendix 2. They approximately confirm the patterns found in the previous section but allow us to evaluate them in a statistically significant way and to uncover more complex links. Hence log-linear analysis has proven to be a rather powerful instrument to uncover complex links in categorical data. It may be a sufficient method of analysis if we only aim at distinguishing between cases where significant links exist and cases where no link emerges. When a more precise comparison is needed, log-linear analysis may be a reasonable starting point that allows to exclude non relevant links.

However there are at least two reasons why we decided in favour of an alternative approach. The first is a 'statistical' issue, which strongly affects results. The second relates to an interpretation question.

In our log-linear analysis, the product choice[14] is unconditional rather than conditional on being already in a certain group of industries[15]. In the above example matrix, the question is the definition of n_{22}, the number of firms not active in either cheese or yoghurt. It seemed reasonable to define n_{22} as (total number of firms in the food industry - number of firms active at least in one of

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13 See Appendix 2 for the problems in defining n_{22}.

14 In which industry to operate.

15 See the Appendix for details.

the two industries). However this is to some extent arbitrary[16]. The problem is that this choice strongly affect the results in terms of significance of interaction parameters. Given the absence of a reference model for this choice, the interpretation becomes rather shaky.

The second point refers to an interpretation issue. A log-linear model uncovers relationships across variables (revealing whether they are independent or not), but does not allow to "describe" the type of relationship between them. This is particularly relevant as we would like to compare these relationships across datasets.

It is this dissatisfaction which justifies the approach developed in the next section.

3. A Simulation Approach

In what follows, we proceed directly to implement the theoretical models developed in Chapter 2. The hypothesis is advanced that, within the food sector, diversification can be mainly explained through 'economies of scope' or 'correlation across costs'. We try to describe the data through simulations based on each of these hypotheses, and then compare them to test whether differences across datasets can be attributed only to differences in the distribution of firms across industries and in the levels of diversification, the patterns being substantially the same.

In this section we shall advance the hypothesis that diversification within the food sector is essentially driven by technological factors, namely correlation across costs in different markets[17], and economies of scope[18] (as introduced in the previous section) and that this hypothesis holds across different countries and different time periods.

We shall first develop some models which allow us to "describe" diversification in a way relevant for comparisons.

We shall fit the data with these models and then compare the models which best approximate each dataset, with the aim of testing whether we can assume diversification is generated by the same underlying process, or whether there are significant differences to be explained. Simulations are used since it is

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16 For example, why not choosing the total number of firms in the economy?

17 By which we refer to the case of managerial skills (or in some cases common inputs, with prices moving in the same direction) driving diversification.

18 Which describe cases where some costs can be shared across more than one production line.

extremely difficult to test the theories directly: data on firms' costs are available only in a limited number of cases, and are often not separated for different production lines.

We first show that the actual diversification patterns are not consistent with an underlying random diversification process. Hence, we implement the two models developed in chapter 2 (where diversification is driven by the aim of exploiting synergies). We perform a simulation which (on the basis of these models) generates diversification matrices with a structure similar to that of the observed ones. The generated matrices are then compared with the actual ones in order to select the model which best approximates them. Finally the models which best fit each dataset are compared using the parameters of the model which best approximates one dataset (UK62) to predict the others, testing whether predictions differ from observed parameters in a significant manner[19].

The Underlying Model

The models used for the simulations are based on those developed in Chapter 2. Consider one sector of the economy (the food industry). Within this sector, we assume that products in each of the industries are homogeneous, and demand is given by:

$$D(p) = A_i - p_i$$

Firms are price-takers, and have a cost function for each product i:

$$C_i = (q_i)^2 + c_i$$

where c_i is a random draw. The profit maximising choice of output i for a firm is:

$$q_i = \begin{cases} \dfrac{p_i}{2} & \text{if } \dfrac{p_i^2}{4} > c_i \\ 0 & \text{otherwise} \end{cases}$$

Given the equilibrium price in each industry, a firm will be active in industry i, if its fixed cost c_i is lower than $\frac{p_i^2}{4}$. Each firm has a range of activities determined by the value of its random cost draws: this describes diversification patterns in the sector. The models we shall consider differ essentially in the representation of the fixed cost draws. We shall first assume that the c_i's are independent random draws from a uniform distribution on $[0,1]$, and then reject

[19] It has of course to be noticed that the description of diversification is based solely on qualitative data. Results therefore cannot be taken as conclusive, but rather as an indication of general patterns which we want to confirm with further work.

this hypothesis in favour of the two alternatives of correlation between costs and economies of scope.

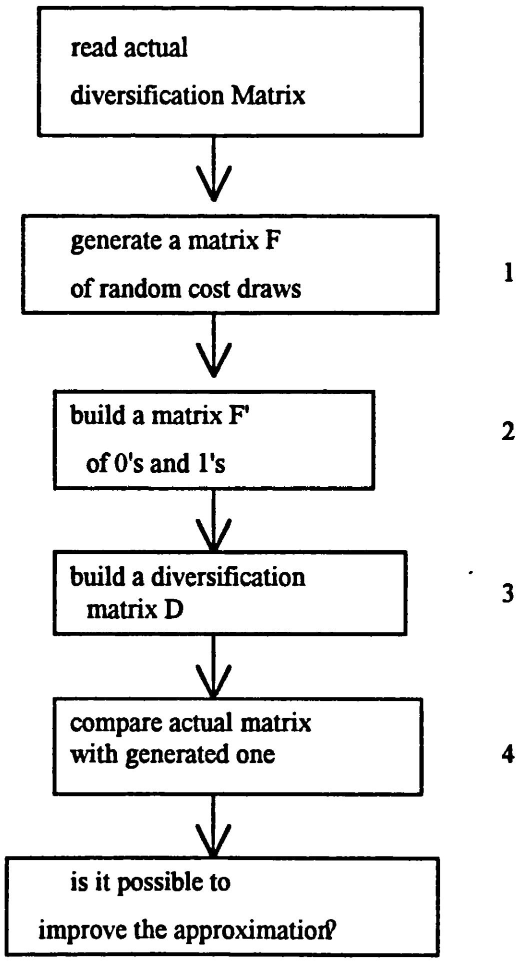
The Simulation Program

In order to describe how the simulation program works, we shall use an example. Suppose that the actual diversification matrix we want to 'describe' is the following:

Industries	1	2	3	4
1	3	2	0	3
2	2	4	1	4
3	0	1	1	1
4	3	4	1	5

Fig. 3.2- The actual **D** matrix

The basic program can be described by means of a flow-chart:



1 - After having "read" the actual diversification matrix, the simulation program generates a matrix where each row represents a firm: each row is a vector of random cost draws from a uniform distribution on [0,1], one for each possible industry. The number of 'potential firms', N, is exogenously set[20]. In the example N= 10. If we consider K possible industries we have a matrix F of dimension (N x K). In the example K = 4. The matrix F could be, for example:

	1	2	3	4
1	0.9	0.3	0.5	**0.4**
2	0.6	**0.2**	0.7	**0.2**
3	**0.2**	0.8	0.8	0.9
4	**0.1**	0.5	0.8	0.4
5	0.3	0.6	**0.2**	0.6
6	0.4	0.9	0.9	0.7
7	0.5	0.4	0.4	0.6
8	0.8	**0.2**	0.3	**0.5**
9	0.7	**0.1**	0.7	**0.3**
10	**0.2**	**0.1**	0.6	0.7

Fig. 3.3- The (NxK) matrix **F** of random cost draws

2 - To match the observed matrix D, we exogenously fix the number of firms operating in each industry[21] and set it equal to the actual number (the diagonal element on the D matrix). Then we select the firms active in each industry. For example, industry 1 has 3 active firms (number of firms in industry 1 = d_{ii} =3), whence firms 3, 4 and 10 (the lowest cost firms) are deemed 'active'. We now construct a new matrix **G**, being an (N x K) matrix of 0's and 1's (0 for industries where the firm is not active, 1 for industries where it operates). In the example **G** is:

[20] It could be taken to be the actual total number of firms in the manufacturing sector.

[21] We assume that the actual number of firms operating in each industry is the equilibrium number.

	1	2	3	4
1	0	0	0	1
2	0	1	0	1
3	1	0	0	0
4	1	0	0	1
5	0	0	1	0
6	0	0	0	0
7	0	0	0	0
8	0	1	0	1
9	0	1	0	1
10	1	1	0	0

Fig.3.4 - The **G** matrix shows firms active in each industry

3 - From **G**, it is finally possible to build a 'diversification matrix' **D'**, analogous to the observed one, which can be compared directly with the observed matrix D shown above. An element d'_{ij} of matrix D' represents the number of firms active both in industry i and j. In the example, the generated **D'** matrix is:

	1	2	3	4
1	3	1	0	1
2	1	4	0	3
3	0	0	1	0
4	1	3	0	5

4 - We carry out a large number of runs, following this procedure, and thereby generate an 'average' or 'expected' matrix $\overline{D}$.

5 - The last step in the basic program consists of generating a 'test statistic', T, for the comparison between the actual and the generated diversification matrix:

$$T = (\sum_{ij} \frac{|\overline{d}'_{ij} - d_{ij}|}{d_{ij}}) / n$$

where $\overline{d}'_{ij}$ is the generated value

d_{ij} is the actual value

The preliminary results obtained in the previous sections (the significance of the groupings has also been confirmed through the log-linear analysis) were used to select the groups to be analysed by means of the present approach[22]. Here the purpose is firstly to analyse how well the hypotheses of 'cost correlation' and 'economies of scope', as described, fit the data, and to describe patterns of correlation and economies of scope within groups; secondly to study how they differ across time and countries.

As noted earlier, we first tested for random as opposed to purposive[23] diversification. In each group (as described above) we generated a matrix with a vector of random independent cost draws for each firm (as described), and obtained diversification matrices. In each case the 'random cost draws' (and therefore the 'random diversification') hypothesis was rejected through a comparison between the value of the test T in the basic simulation and its value when the two more complex hypotheses are introduced. In both cases the value of the test decreases, suggesting that either of the two models considered is a more appropriate description than 'random draws'.

4. Cost Correlation

The Underlying Model

Here we use the basic model described previously but modify the process generating fixed costs.

The fixed cost of producing product i will be described as follows:

(i) if industry i is not 'related' to any other industry, a random draw from a uniform distribution:

$$c_i \sim [0,1]$$

(ii) if two industries, i and j, are related, the fixed cost of producing products i and j will be respectively:

$$c_i = (1-\rho_{ij})\tilde{v}_i + \rho_{ij}\tilde{v}_{ij}$$
$$c_j = (1-\rho_{ij})\tilde{v}_j + \rho_{ij}\tilde{v}_{ij}$$

where v_i, v_j, v_{ij} are random draws from uniform distributions[24]:

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[22] Computational unfeasibility made it necessary to introduce some sort of preliminary selection.

[23] The term is borrowed from Scott (1982) who uses it to describe diversification performed with a specific aim (exploiting synergies, obtaining market power) as opposed to random diversification.

[24] Whenever more than two industries are related, we consider a 'group relationship'; i.e., if i and j are related, and j and k are related, we assume:

$$c_i = (1-\rho_{ijk})v_i + \rho_{ijk}v_{ijk}$$
$$c_j = (1-\rho_{ijk})v_j + \rho_{ijk}v_{ijk}$$

$\tilde{v}_i, \tilde{v}_j, \tilde{v}_{ij} \sim \; [0,1]$

As before, given the equilibrium price in each industry, a firm will be active in industry i if its fixed costs c_i are lower than $p_i^4 / 4$. The range of activities of each firm will therefore be determined by the value of its random fixed costs relative to the equilibrium prices in the markets.

The Simulation Program

The basic program described previously represents the first step of the procedure. Fixed costs will now be however generated as:

$$c_i = (1 - \rho_{ij})\tilde{v}_i + \rho_{ij}\tilde{v}_{ij}$$
$$c_j = (1 - \rho_{ij})\tilde{v}_j + \rho_{ij}\tilde{v}_{ij}$$

The aim is to endogenously determine the values of ρ which best approximate the actual data.

The way the program works is described by means of a flow chart in the Appendix. The structure of this program is similar to that of the basic program and it iteratively determines the values of the "correlation factors". The output of the program is a generated diversification matrix, a value for the test T, which allows for comparisons, and the values of the significant correlation factors.

Test for the Results

In order to test for the results, i.e., to see whether the model proposed predicts the actual data reasonably well, we shall use a test of hypotheses on the parameters of normal distributions.

The simulation program performs 100 runs for each value to be determined, and generates a distribution of parameters d_{ii}. It is possible to show (see Appendix 3 for some examples) that these parameters are approximately

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$c_k = (1 - \rho_{ijk})v_k + \rho_{ijk}v_{ijk}$

This is rather restrictive. However any other relatedness structure would be equally arbitrary and restrictive.

normally distributed. We shall therefore use a test of hypotheses for normal distributions[25].

For each group of industries described through diversification matrices we therefore test the hypothesis that each generated value d_{ij}, i.e., each off-diagonal element is not significantly different from the actual one.

Results

Results are summarised in Table 3.1, which we shall presently discuss. Some tentative explanations are introduced which will be developed in what follows. Details are left for the Appendix.

For the interpretation of results we are basically interested in the values of the ρ-coefficients, which describe the degree of relatedness and therefore are used for the comparisons of the differences in diversification[26].

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[25] Assume we have a random sample of n observations $x_1, \ldots, x_n$ from a normal population with mean μ and variance σ^2 and we are interested in testing hypotheses about μ. Our null hypothesis will be:

$$H_o: \mu = \mu_o$$
$$H_1: \mu \neq \mu_o$$

If σ^2 is known, we have that:

$$\left(\bar{x} - z_{\frac{1+\gamma}{2}} \frac{\sigma}{\sqrt{n}}, \bar{x} + z_{\frac{1+\gamma}{2}} \frac{\sigma}{\sqrt{n}} \right)$$

is a 100γ percent confidence interval for μ. A possible test is given by the following: reject H_0 if the confidence interval does not contain μ_0. Such a test has size $1-\gamma$ since:

$$\Pr_{\mu=\mu_0}\left[\bar{x} - z_{\frac{1+\gamma}{2}} \frac{\sigma}{\sqrt{n}} < \mu_0 < \bar{x} + z_{\frac{1+\gamma}{2}} \frac{\sigma}{\sqrt{n}} \right] = \gamma$$

If σ^2 is unknown, we can obtain a test similar to the one above, using the γ percent confidence interval:

$$\left(\bar{x} - t_{\frac{1+\gamma}{2}} \frac{s}{\sqrt{n}}, \bar{x} + t_{\frac{1+\gamma}{2}} \frac{s}{\sqrt{n}} \right)$$

In our case n=100, $\bar{x}$ is the sample mean that we take as an estimate of each cell, and s is the computed standard deviation. We shall perform a test for $\gamma = 95$ $(t_{1+95} = 1.99)$. In each test μ_0 is the actual value of each cell, of which we want to see whether the sample mean generated by the program is a reasonable approximation.

[26] T is only a useful indicator for the program (saying where to stop, when no other improvements are possible). However, it can be useful for impressionistic considerations. χ^2 tests whether the model is accepted or rejected by the data.

Results with cost correlation

Sector	Dataset	Links across industries	Values of coeffic.	T	χ^2
Dairy	UK62	1-2 2-3 1-3	0.6	0.118	4.82
	UK86	1-2 2-3 1-3	0.5	0.246	2.33
	IT86	1-2 2-3 1-3	0.6	0.133	4.62
Soft drinks	UK62	1-2 2-3 1-3	0.7	0.142	2.67
	UK86	1-2 2-3 1-3	0.7	0.310	6.47
	IT86	2-3	0.6	0.640	7.30
Biscuit Bakery	UK62	1-2 3-4	0.8	0.624	9.57
	UK86	1-4 3-4	0.6	0.303	27.99(R)
	IT86	1-2 1-3 1-4 2-3 2-4 3-4	0.5	0.325	11.50
Fruit-Veget.	UK62	1-2 1-3 1-4 2-3 2-4 3-4	0.7	0.122	12.39
	UK86	1-2 1-3 1-4 2-3 2-4 3-4	0.7	0.158	11.22
	IT86	1-2	0.5	0.320	28.72(R)
		3-4	0.7		
Flour-Cereals	UK62	1-2 1-3 1-4 1-5 2-3 2-4	0.5	0.243	13.13
		2-5 3-4 3-5 4-5	0.5		
	UK86	2-3 2-4 2-5 3-4 3-5 4-5	0.5	0.324	12.32
	IT86				7.14

R=rejected.

Table 3.1

The Dairy Sector

The same model explains the three datasets equally well. The three industries seem to be strongly related in all cases. The degree of relatedness is slightly lower in the UK86 case ($\rho = 0.5$ instead of 0.6), but patterns are very similar. In the three cases a 3-way link is accepted as a reasonable model describing the data.

The Soft Drink Sector

Diversification in UK is explained equally well in 1962 and 1986 by a model where relatedness is very strong ($\rho = 0.7$). Both patterns and levels are the same.

Italian diversification however is not described by the same parameters. The model which best describes this dataset includes no relatedness parameter between the first industry (fruit juices) and the other two, but has a relatedness coefficient equal to the UK one between these two (soft drinks and mineral waters)[27].

The Biscuit-Bakery Sector

Different models seem to describe the three datasets: in the UK62 dataset two subgroups clearly emerge: industries 1 and 2 (biscuits and crackers) are strongly linked ($\rho = 0.8$) as are industries 3 and 4 (bread and cakes & pastries, with $\rho = 0.8$). The two groups represent separate industries. In UK86 industries 1, 3 and 4 are linked, but less strongly than in 1962 ($\rho = 0.6$). The cracker industry has 'developed separately'[28].

A still different model (but one not too far from the first) describes diversification in Italy: the four industries are related (less strongly than in UK, $\rho = 0.5$). Contrary to UK62 there is no clear separation between the 'bread and cake' industry and the 'biscuits and crackers' sector. This might be mainly due to the fact that a 'bread industry' cannot properly be defined in Italy (production is highly fragmented, the industry consists of a huge number of small independent bakeries), and firms classified as bread producers are mainly offering other baked products, among which are biscuits and crackers. In the UK, on the other hand, the bread industry is strongly concentrated.

The Fruit and Vegetable Sector

The same model holds for UK62 and UK86: in both cases strong links exist across all industries ($\rho = 0.7$). In Italy, the best fit is obtained by including two relatedness parameters, ρ_{12} and ρ_{34}, the first slightly lower (0.5), the second as high as in the U.K. case (0.7)[29]. The vegetable industry and the fruit industry are therefore separate sectors.

The Flour and Cereal Sector

In the U.K. the model which best describes diversification patterns has not changed substantially over time: in 1962 a link existed across all the 5 industries included in the group ($\rho = 0.5$). In 1986 the first industry (RTE

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27 In fact In Italy the fruit juice industry appears more strongly related to the canned vegetables and fruit industry. This finding might depend on the different types of correlation across markets that are relevant in the two countries. The correlation might come, for the U.K., from the highly concentrated distribution system, while for Italy it could be generated by common inputs (for example, the type of package).

28 This is the model which best approximates the data. However it is not a sufficiently good description, as the χ^2 test rejects it as a correct representation of the data.

29 However, for the Italian dataset the model is not accepted by the data.

cereals) seems to have developed as a more specialised industry. The other four industries are linked as strongly as in 1962 ($\rho = 0.5$).

In Italy there does not seem to be any relationship across these industries. This may be partly explained by the absence of a cereal (ready to eat) industry, and by high fragmentation of the flour industry, in contrast to the U.K. case.

5. Economies of Scope

The Underlying Model

The alternative hypothesis we want to test is the presence of economies of scope as the main factor driving diversification. Starting from the same basic model, we shall now assume that for firm k, the fixed cost of producing product i is a random draw from a uniform distribution:

$$c_i \sim \quad [0,1]$$

if industry i does not share economies of scope with any other industry; if economies of scope arise in the joint production of products i and j, then the total cost of producing them will be:

$$c_{ij} = c_i + c_j - s_{ij}$$

with:

$$c_i, c_j \sim \quad [0,1]$$

where s is an index of the reduction in costs due to the joint production.
Again in each industry only the firms with lowest costs will be active.
However the 'entry criterion' is different from that in the 'cost correlation' case; there the level of costs was independent of entry in other markets, so that, for each industry i, it was sufficient to compare the cost draw of each firm for each industry with the equilibrium price in the industry[30]; here the cost reduction is only achieved if the firm enters both markets.
In general, if the equilibrium prices in markets i and j are p_i and p_j the entry criterion will be:
(a) a firm only enters industry i if:

$$\frac{p_i^4}{4} > c_i$$

[30] That is, in the program we could simply examine column i and set the cell corresponding to the n_i lowest cost draws equal to 1.

$$\frac{p_i^2}{4}+\frac{p_j^2}{4}-(c_i+c_j-s_{ij})<\frac{p_i^2}{4}-c_i$$

The first condition guarantees non negative profits; the second implies that the profits that can be attained by entering both industries are lower than those earned entering only market 1: this will be the case when c_1 is very low and c_2 is very high.

(b) a firm only enters industry j if the above conditions hold, with j substituting for i;

(c) a firm enters both industries i and j if:

$$\frac{p_i^2}{4}+\frac{p_j^2}{4}-(c_i+c_j-s_{ij})>\max\left(0,\frac{p_i^2}{4}-c_i,\frac{p_j^2}{4}-c_j\right)$$

(d) a firm does not enter if none of the above conditions is satisfied.

These conditions determine the markets where each firm is active; again this uniquely identifies a diversification matrix.

The Simulation Program

As before, the program is illustrated by means of a flow chart in the Appendix. The basic program explained in section 3 still represents the first step in the procedure. The main differences with the cost correlation program lie in the way costs are generated, and in the criterion used to allow entry of firms into the markets.

The output of the program will be:

(a) a generated diversification matrix

(b) a value for the test statistic

(c) the values of the significant economies of scope factors.

Results

Results are summarised in Table 3.2, which we shall presently discuss.

Results with economies of scope

Sector	Dataset	Links across industries	Values of coeffic.	T	χ^2
Dairy	UK62	1-2 2-3	0.2	0.098	0.330
		1-3	0.3		
	UK86	1-2 13	0.2	0.131	0.612
	IT86	1-2	0.4	0.128	0.630
		1-3	0.3		
		2-3	0.2		
Soft drinks	UK62	1-2	0.4	0.290	3.290
		1-3	0.2		
	UK86	1-2	0.4	0.082	1.180
		2-3 1-3	0.2		
	IT86	2-3	0.2	0.740	7.090
Biscuit Bakery	UK62	1-2 3-4	0.4	0.343	4.05
	UK86	3-4	0.2	0.373	8.82
		1-4	0.1		
	IT86	1-2	0.2	0.311	2.81
		1-4 2-4 3-4	0.1		
Fruit-Veget.	UK62	1-2	0.5	0.197	9.53
		2-4	0.4		
		3-4	0.3		
		1-3 1-4 2-3	0.2		
	UK86	1-2 1-3 2-4 3-4	0.2	0.222	9.23
	IT86	3-4	0.3	0.506	4.29
		1-2 2-3	0.2		
		2-4	0.1		
Flour-Cereals	UK62	2-3 4-5	0.5	0.372	44.34(R)
		3-5	0.3		
		2-5 1-5 2-4	0.2		
		1-3	0.1		
	UK86	2-4 3-5	0.2	0.260	6.57
		2-3 4-5 3-4	0.1		
	IT86			0.600	7.14

R = rejected

Table 3.2

The Dairy Sector

Similar models describe diversification in UK62 and UK86. For the first, the results are basically the same as with the cost correlation procedure. For the Italian case all links are significant but with slightly different values. The model is a better description of the data than the cost correlation one, in terms of the T obtained.

The Soft Drink Sector

The only difference between UK62 and UK86 lies, as above, in the fact that, in the first dataset, strong links are only found between industries 1 and 2 and industries 1 and 3 (and not directly between 2 and 3), while in the second, links exist across all three. In Italy, again, a relatedness pattern is only shown between industries 2 and 3. Only for UK86 does this model give a better approximation than the cost correlation case.

The Biscuit-Bakery Sector

Results for all three cases do not substantially differ from those derived assuming cost correlation, but in this case the approximation is better.

The Fruit and Vegetable Sector

In UK62 and UK86 all links appear significant even if in UK62 some of them (between the first two) are stronger. In IT86 links emerge across all industries, but industry 1 only appears to be related to industry 2 and not to the others. The model gives a worse approximation than in the cost correlation case.

The Flour and Cereal Sector

All the industries are linked in UK62 and all except RTE cereals are linked in UK86. In Italy there is no significant link.

To summarise the preceding analysis, we must notice first that it is difficult to compare the two sets of results in order to identify the correct model: we cannot conclude that one type of synergy (managerial ability in the cost correlation case) or the other (economies of scope) is the main explanatory variable in the diversification process. In most cases, in fact, both are acceptable models for describing the datasets[31]. The main conclusion is that we can reject the random diversification hypothesis.

However we can use the above methodology in order to describe and compare data. In the next section we propose a simple application to compare patterns and levels of diversification at the same time.

6. Comparisons across Time and Countries

In this section we present an application of the simulation procedure used above.

The question we want to answer here concerns the possibility of predicting diversification, given the distribution of firms across industries. That is, is it true that diversification patterns are relatively stable over time and countries and that the changes in observed diversification can be entirely attributed to a different distribution of firms across industries?

We test this hypothesis for the UK 1962 - UK 1986 and the UK 1962 - IT 1986 cases: the way we proceed is to impose on the 1986 distributions of firms, the 1962 diversification patterns; i.e., we take as given the number of firms in each industry in 1986 and see how well we can predict diversification on the basis of the 1962 patterns and levels. We consider the cost correlation model.

Results of the simulation exercise are summarised in Figs. 3.6 and 3.7[32]. There, the actual p_{ij} values[33] are on the horizontal axis for UK86 and It86 matrices. The values predicted from the UK62 diversification patterns and levels (with their prediction error terms)[34] are on the vertical axis.

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31 In some sense, given the way the models are built, a better performance of the cost correlation model might be interpreted as a uniform pattern within the group, while a better performance of the economies of scope model shows a more differentiated pattern.

32 For sector details see Appendix 3.3.

33 We transformed the D matrices, with the actual number of firms, into P matrices, with relative frequencies, in order to be able to describe graphically the differences.

34 Notice that we can mainly draw general considerations from the analysis. Firstly from a statistical point of view, the approach is rather ad hoc. We cannot precisely compare the difference between parameters that describe diversification in two datasets. Secondly diversification is only described through the count of products, i.e., in a qualitative sense.

Actual values vs. predicted values
U.K.

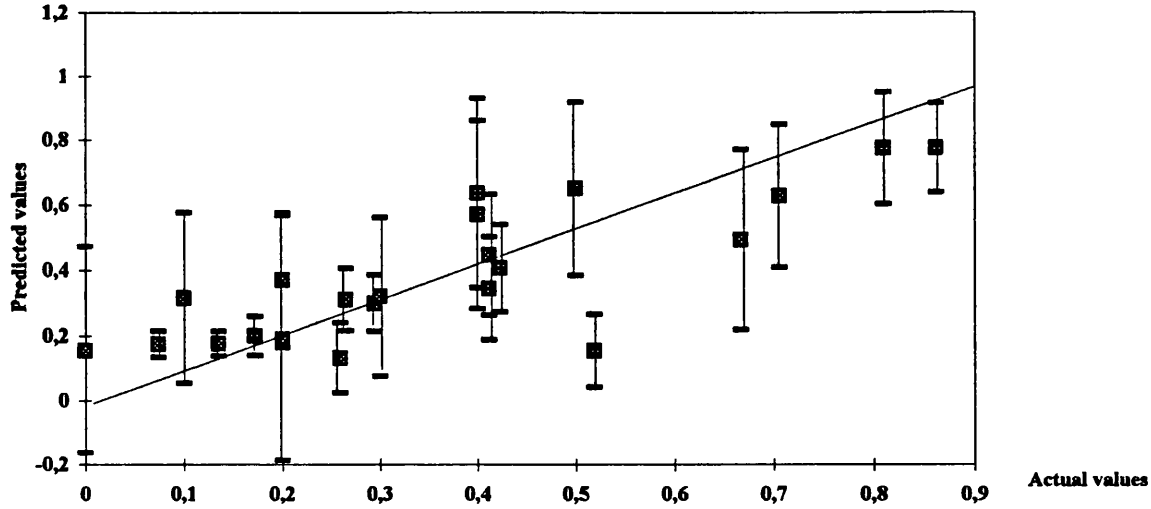

Fig. 3.6

Actual values vs. predicted values
Italy

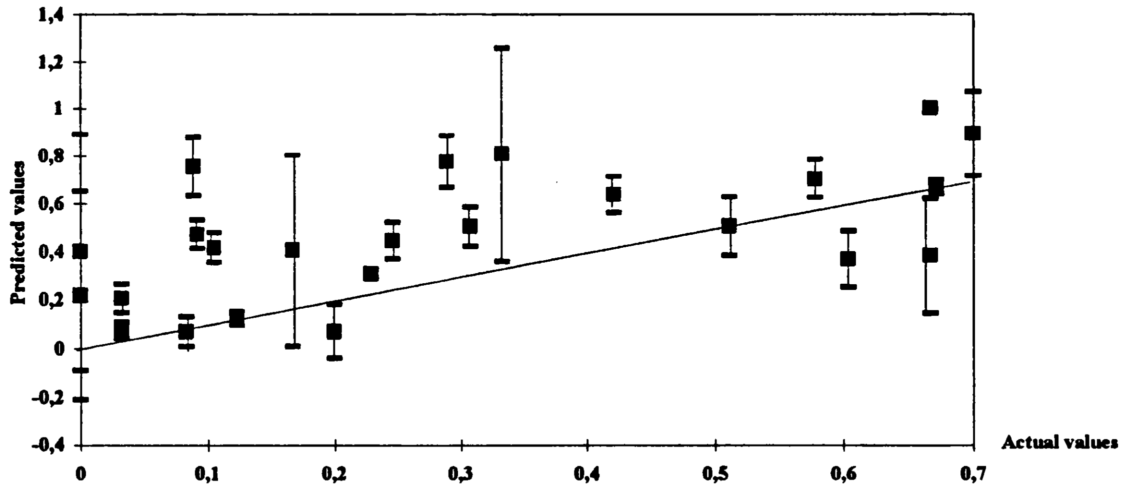

Fig. 3.7

Fig. 3.6 clearly shows that UK86 values are well predicted from UK62 diversification. Only 4 out of 28 values are significantly different. Italian diversification patterns and levels instead cannot be correctly predicted from UK values (Fig. 3.7). Only 7 out of 24 values are not significantly different.

The global quantitative description of diversification suggests that:

1) diversification patterns are essentially unchanged in the UK from 1962 to 1986: diversification processes are induced by the same underlying technological motivations. Also levels are not substantially different in the UK:

they have slightly decreased between 1962 and 1986. Given that diversification is measured by the count of products, this only means that this number decreased on average, but it might be consistent with a larger share of production in non primary products (and therefore with an increase in diversification).
2) diversification levels are certainly different from the Italian ones, so that specific factors must be considered for Italy.

6.1 Qualitative Similarities

We now go back to the original P matrices (Table 3.3) in order to analyse in greater detail the differences, and assess whether there are qualitative similarities between the UK 1962 and the Italian case.

UK62

Dairy

1.000	0.530	0.473
0.625	1.000	0.375
1.000	0.666	1.000

Soft drinks

1.000	0.784	0.078
0.769	1.000	0.058
1.000	0.750	1.000

Biscuit-Bakery

1.000	0.464	0.071	0.250
1.000	1.000	0.154	0.538
0.125	0.125	1.000	0.937
0.200	0.200	0.428	1.000

Fruit-Vegetables

1.000	0.595	0.476	0.428
0.893	1.000	0.607	0.678
0.645	0.548	1.000	0.581
0.666	0.703	0.666	1.000

UK86

Dairy

1.000	0.265	0.294
0.600	1.000	0.200
0.714	0.210	1.000

Soft drinks

1.000	0.862	0.172
0.676	1.000	0.135
0.714	0.714	1.000

Biscuit-Bakery

1.000	0.074	0.259	0.518
0.400	1.000	0.000	0.200
0.333	0.000	1.000	0.809
0.250	0.018	0.303	1.000

Fruit-Vegetables

1.000	0.411	0.706	0.411
0.411	1.000	0.500	0.666
0.461	0.231	1.000	0.423
0.411	0.470	0.647	1.000

IT86

Dairy

1.000	0.123	0.671
0.900	1.000	0.700
0.690	0.098	1.000

Soft drinks

1.000	0.288	0.088
0.203	1.000	0.578
0.064	0.597	1.000

Biscuit-Bakery

1.000	0.229	0.083	0.604
0.733	1.000	0.200	0.666
0.333	0.250	1.000	0.666
0.439	0.151	0.121	1.000

Fruit-Vegetables

1.000	0.421	0.092	0.105
0.492	1.000	0.308	0.246
0.155	0.444	1.000	0.511
0.205	0.410	0.589	1.000

Table 3.3

The main differences occur in the soft drink cluster (where p_{12}, p_{31} are overestimated and p_{23} is underestimated), in the biscuit segment (where p_{14}, p_{23}, p_{24} are underestimated and p_{12}, p_{34} are overestimated), in the fruit & vegetable segment (where nearly all coefficient except p_{34} are overestimated)[35].

Specifically, in the soft drink cluster, these differences arise because British producers of fruit juice also produce soft drinks (and vice versa) and mineral water firms also produce soft drinks (but not vice versa). In Italy soft drinks and fruit juices are produced by different firms; conversely, in Italy soft drink producers also produce mineral water, which is not the case in the UK.

[35] We exclude the flour & cereal matrices since they are completely different in the two countries.

In the biscuit cluster, patterns are similar with two main differences: in the UK fewer biscuit producers also produce pastries, and most of pastries' producers also produce bread, while this is not the case in Italy.

Finally in the fruit and vegetable cluster, differences are concentrated along the "secondary" diagonal: in the U.K. fruit and vegetables are all produced by the same firms, while in Italy vegetable producers are not fruit producers.

Hence, we have here some similarities in patterns, but differences are sufficient to generate the above global disparities in predictions. We conclude that the models developed above are useful to explore general patterns, but we need to consider further specific factors relative to the Italian case.

7. Conclusions

In this chapter we have compared patterns and levels of diversification in the food industry across three datasets. We showed how a log-linear analysis approach could be used to tackle this problem, and then applied a simulation analysis to explore two hypotheses concerning the reasons for diversification.

The results of the log-linear analysis suggested that general diversification patterns are rather similar across countries and time, i.e., that the same 'group' patterns seem to explain the three datasets equally well. These results must however be qualified. If we try to explain diversification on the basis of correlation of costs or economies of scope, we find that in general these hypotheses cannot be rejected for any of the three datasets taken individually, but that different models (i.e. different patterns and levels of correlation or scope economies) explain the U.K. case and the Italian one. The Italian situation is characterised by a much lower degree of diversification within the groups previously identified, while U.K. patterns and levels of diversification reveal rather stable behaviour over time.

In concluding we remark on some (descriptive) analyses of Italian industry which suggest some ways of interpreting these results.

D. Odifreddi (1988) describes the diversification strategies of 44 large food companies over the period 1981/85 using both the Utton diversification index (w)[36], and the Rumelt indicators[37]. The first index mainly accounts for the <u>levels</u> of diversification, the second for the <u>type</u> of diversification strategies.

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36 The Utton diversification index is:

Only 12 of the firms considered are reasonably diversified (w > 1.5). Of these 4 are highly diversified (w>2.5), often in non related activities; 3 are diversified (w>2) in activities both related and unrelated; 5 have an average level of diversification (w>1.5) in related activities. The others have a very low degree of diversification and operate in closely related activities. In general, even for highly diversified firms Odifreddi finds that the search for technological synergies forms the basis of these strategies.

The same sort of considerations emerge from A. Nova (1990), who analyses the diversification behaviour of 55 large Italian manufacturing firms. In particular he compares the Herfindahl diversification index for the Fortune 500 firms in 1965 with that for the 55 largest Italian firms in 1986, at the 2, 3, and 4-digit levels. While the index for the Fortune firms is, respectively, 0.396, 0.585 and 0.661, for the Italian case it reduces to 0.10, 0.25, and 0.34.

Finally it is particularly interesting to compare these results with those of R. Pozzana (1991) on acquisitions in the food sector over the period 1983/88. Pozzana finds that most of the acquisitions occurred within the food industry, and that actually the majority were within the same sector, as the following table shows:

Industries	Acquired firm's main activity %	Buyer firm's main activity %	% acquisitions within sector
Drinks	35.2	22.8	78.3
Pasta	15.2	13.3	93.0
Sugar	6.7	8.6	77.0
Bakery	4.8		
Processed meat	4.8		
Dairy	4.8	7.6	100.0
Milk	4.8		
Chocolate	4.8		75.0

Table 3.4: Acquisitions in the Italian food sector

$$w = 2\sum_{i=1}^{n} p_i \cdot i - 1$$

where $p_i = T_i / T_{tot}$ is the share of the firm's turnover in industry i (and i=1 is the primary activity of the firm). It takes into account both the number of industries where the firm is active and the share of activity in that sector. If the firm is completely specialised, w=1; if it is equally diversified into n activities, w=n.

[37] These describe the type of diversification strategy pursued by the firm: specialised; with a dominant activity and minor correlated activities; with a dominant activity and minor uncorrelated activities; diversified in correlated activities; diversified in non-correlated activities.

It is rather obvious that acquisitions are not used to diversify, but mainly to expand within the same industry. The effects of these acquisitions have been to increase concentration, especially in the 'mineral water' and in the 'pasta' industry. The search for market power seems an obvious motivation for those acquisitions. This strategy was only available to firms due to the absence of any antitrust law in Italy up to the end of 1990.

All these analyses concentrate only on large firms' behaviour (on which better data are available). However they may provide some suggestions for the interpretation of the results presented here.

As anticipated, two factors appear relevant in explaining differences in diversification in the two countries considered: differences in competition policy, and differences in concentration in the distribution sector. The absence of anti-trust legislation might lead to a greater reliance on acquisitions as a means of growth in Italy, first of all within the same sector (in order to increase market power directly) and secondly into related sectors. This might have the effect of reducing the incentives to diversify through internal expansion.

The impact of the second factor is more subtle and ambiguous: in Italy the distribution sector has been highly fragmented until recently, and the concentration process had not gone very far. This meant that large (national) companies needed their own distribution networks. In some cases an extremely well developed distribution organisation formed the incentive to diversify into a wide range of products (see the example of STAR spa). In this way the large costs of distribution could be shared over a wider set of products. This solution has been used in a limited number of cases[38].

In the U.K. the high level of concentration in food distribution has greatly increased the bargaining power of distributors versus manufacturers. The optimum response of manufacturers to this situation may be to be present in relatively few sectors, with a strong position in each of them. This might allow them to counterbalance the power of supermarket chains. An alternative strategy would be to become a subcontractor to the chain-stores themselves, and produce own brand products. In Italy both distribution and manufacturing are much more fragmented, and except in a few cases there does not seem to be any evident conflict of interest between the two groups[39].

In order to explore these issues further, we turn in the next chapter to a case-study approach.

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[38] Recent changes in the structure of the distribution channels led to a higher concentration of activities.

[39] An interesting test of the relevance of this line of argument would be to analyse the future behaviour of Italian manufacturers in response to increasing concentration in distribution, and to the presence of anti-trust legislation.

Appendix 1: Datasets
Table A1.1 An example of a Kompass table: Sugar

Table A1.2 An example of a Kompass table: Coffee

Table A1.3 List of Products

1 - Salt
2 - Meat Processing
3 - Poultry
4 - Milk and Cream Products
5 -Yoghurt
6 - Ice cream
7 - Condensed and Dried Milk
8 - Cheese
9 - Egg Products
10 - Processed Fruit
11 - Canned Fruit
12 - Processed Vegetables
13 - Canned Vegetables
14 - Canned Tomatoes
15 - Canned Olives
16 - Canned Baked Beans
17 - Jams
18 - Preserves
19 - Soups
20 - Processed Fish
21 - Frozen Foods
22 - RTE Cereals
23 - Other Cereals
24 - Flour
25 - Special Flours
26 - Processed Rice
27 - Pasta
28 - Biscuits
29 - Bread
30 - Cakes and Pastries
31 - Crisps
32 - Crackers
33 - Baby Food
34 - Health Food
35 - Sugar
36 - Sugar Allied Products
37 - Sugar Confectionery
38 - Tea
39 - Coffee
40 - Chocolate Confectionery
41 - Cocoa
42 - Processed Spices and Herbs
43 - Vinegar, Condiments, Sauces
44 - Processed Nuts
45 - Margarine
46 - Edible Oils
47 - Pet Foods
48 - Animal Feed
49 - Additives for Food Industry, Yeast
50 - Tobacco Products
51 - Spirits
52 - Wines
53 - Beers
54 - Malt
55 - Cider

56 - Fruit Juices
57 - Vegetable Juices
58 - Soft Drinks
59 - Spa Waters
60 - Miscellaneous

Table A1.4 Results of Grouping Procedure $\alpha = 0.9$

UK62	UK86	IT86
4,5,7,8 (Dairy Products)	4,5 (Dairy Products)	4,5 (Dairy Products)
56,57,58,59 (Soft Drinks)	56,57 (Fruit Juices)	
17,18 (Jams)		
28,32 (Biscuits)		
29,30 (Bakery)		
40,41 (Chocolate)		
	15,42,43 (Condiments)	13,15,43 (Condiments)
		47,48 (Animal Feed)

Table A1.5 Results of Grouping Procedure $\alpha = 0.8$

UK62	UK86	IT86
4,5,7,8 (Dairy Products)	4,5 (Dairy Products)	4,5 (Dairy Products)
56,57,58,59 (Soft Drinks)	56,57 (Fruit Juices)	
29,30 (Bakery)	29,30 (Bakery)	
40,41 (Chocolate)		40,41 (Chocolate)
17,18 (Jams)		
28,32 (Biscuits)		
10,11 (Canned Fruit and Veg.)		
13,16 (Canned Veg. and Baked Beans)		
23,24 (Flour, Cereals)		
25,26 (Special Flour, Rice)		
	2,3 (Meat Processing)	2,3 (Meat Processing)
	15,42,43 (Condiments)	13,15,43 (Condiments)
		47,48 (Animal Feed)
		38,39 (Tea, Coffee)
		14,57 (Vegetables, Veg. Juices)

Table A1.6 Results of Grouping Procedure $\alpha = 0.7$

UK62	UK86	IT86
4,5,7,8 (Dairy Products)	4,5,8 (Dairy Products)	4,5,7,8 (Dairy Products)
56,57,58,59 (Soft Drinks)	51,52,53,54,55,56,57,58,59 (Soft Drinks and Alcoholics)	
29,30 (Bakery)	29,30 (Bakery)	
40,41 (Chocolate)	40,41 (Chocolate)	40,41 (Chocolate)
17,18 (Jams)	17,18 (Jams)	
45,46 (Fats)	45,46 (Fats)	45,46 (Fats)
28,32 (Biscuits)		28,32 (Biscuits)
10,11,12,13,16 (Processed Fruit and Vegetable)	10,12,13 (Processed Fruit and Vegetable)	
22,23,24,25,26 (Flour, Cereals)		
20,21 (Frozen Food)		
35,36 (Sugar)		
	2,3,27 (Meat Processing)	2,3 (Meat Processing)
	15,42,43 (Condiments)	13,14,15,19,42,43,57 (Condiments, Process. Vegetable)
	47,48 (Animal Feed)	47,48 (Animal Feed)
		38,39 (Tea, Coffee)

Table A1.7 Results of Grouping Procedure $\alpha = 0.6$

UK62	UK86	IT86
4,5,7,8 (Dairy Products)	4,5,8 (Dairy Products)	4,5,7,8 (Dairy Products)
56,57,58,59 (Soft Drinks)	51,52,53,54,55,56,57,58,59 (Soft Drinks and Alcoholics)	
29,30 (Bakery)	29,30 (Bakery)	
37,40,41 (Chocolate, Sugar Confectionery)	40,41 (Chocolate)	40,41 (Chocolate)
10,11,12,13,16,17,18 (Processed Fruit and Veget., Jams)	17,18 (Jams)	
45,46 (Fats)	45,46 (Fats)	45,46 (Fats)
28,32 (Biscuits)		22,28,29,30,31,32 (Biscuits, RTE Cereals, Bread)
22,23,24,25,26 (Flour, Cereals)	25,26 (Flour, Rice)	
20,21 (Frozen Food)		
35,36 (Sugar)		
	2,3,10,11,12,13,15,24,27, 38,39,42,43,49,60 (Various)	2,3 (Meat Processing)
		11,12,13,14,15,16,17,19, 21,42,43,57,60 (Various)
	47,48 (Animal Feed)	47,48 (Animal Feed)
		38,39 (Tea, Coffee)
1,39,49 (Salt, Coffee, Additives)		

Table A1.8 Diversification Matrices by Groups

The dairy group

Within this group we include the products milk (1), condensed milk (2), cheese (3). The 'diversification matrices' for the group are:

	1	2	3
1	19	10	9
2	10	16	6
3	9	6	9

UK1962

	1	2	3
1	34	9	10
2	9	15	3
3	10	3	14

UK1986

	1	2	3
1	73	9	49
2	9	10	7
3	49	7	71

IT1986

The soft drinks group

Within this group we include the products: fruit and vegetable juices (1), soft drinks (2), mineral water (3). The 'diversification matrices' for the group are:

	1	2	3
1	51	40	4
2	40	52	3
3	4	3	4

UK1962

	1	2	3
1	29	25	5
2	25	37	5
3	5	5	7

UK1986

	1	2	3
1	45	13	4
2	13	64	37
3	4	37	62

IT1986

The biscuit-bakery group

The three dataset include the products: biscuits (1), crackers (2), bread (3), cakes and pastries (4); the 'diversification matrices' are:

	1	2	3	4
1	28	13	2	7
2	13	13	2	7
3	2	2	16	15
4	7	7	15	35

UK1962

	1	2	3	4
1	27	2	7	14
2	2	5	0	1
3	7	0	21	17
4	14	1	17	56

UK1986

	1	2	3	4
1	48	11	4	29
2	11	15	3	10
3	4	3	12	8
4	29	10	8	66

IT1986

The fruit-vegetables group

The group includes the products: processed fruit (1), canned fruit (2), processed vegetables (3), canned vegetables (4), canned baked beans (5). The 'diversification matrices' are:

	1	2	3	4
1	42	25	20	18
2	25	28	17	19
3	20	17	31	18
4	18	19	18	27

UK1962

	1	2	3	4
1	17	7	12	7
2	7	12	6	8
3	12	6	26	11
4	7	8	11	17

UK1986

	1	2	3	4
1	76	32	7	8
2	32	65	20	16
3	7	20	45	23
4	8	16	23	39

IT1986

The flour-cereals group

The group includes the products: ready to eat cereals (1), other cereals (2), flour (3), special flours (4), processed rice (5). The 'diversification matrices' are:

UK1962

	1	2	3	4	5
1	16	5	10	6	5
2	5	9	8	6	5
3	10	8	41	12	5
4	6	6	12	29	6
5	5	5	5	6	7

UK1986

	1	2	3	4	5
1	10	4	4	1	3
2	4	32	14	7	4
3	4	14	38	7	9
4	1	7	7	14	6
5	3	4	9	6	14

IT1986

	1	2	3	4	5
1	3	0	1	0	0
2	0	0	0	0	0
3	1	0	63	2	2
4	0	0	2	6	1
5	0	0	2	1	18

Appendix 2

Log-linear Analysis

1. Evaluation of a Model through Log-linear Analysis

The class of statistical techniques called log-linear models has been formulated for the analysis of categorical data (Haberman, 1978). These models are useful for uncovering the potentially complex relationships among variables in contingency tables.

In order to explain how they are used, we consider the case of a (2X2) table, that is, the case of two dichotomous variables A and B, which can take values 1 and 2:

		B: 1	B: 2
A	1	n_{11}	n_{12}
	2	n_{21}	n_{22}

The behaviour of contingency tables can be characterised by reference to conditional and marginal probabilities and conditional and marginal log odds ratios.

Assuming that the N (A_h, B_h) observations are independently and identically distributed, let p_{ij} be the probability that A_h is equal to i and B_h is equal to j; then $m_{ij} = N \cdot p_{ij}$ is the expected value of n_{ij}. The odds ratios:

$$q_{12}^{A} = \frac{p_{1.}}{p_{2.}}$$

(where $p_{1.}$, $p_{2.}$ are the marginal probabilities of A = 1 and A = 2), and the log odds ratios:

$$\tau_{12}^{A} = \log q_{12}^{A}$$

can be used to characterise the contingency table. Conditional odds ratios:

$$q_{12}^{A}(B=j) = \frac{\Pr(A=1|B=j)}{\Pr(A=2|B=j)} = \frac{p_{1j}/p_{.j}}{p_{2j}/p_{.j}} = \frac{Np_{1j}}{Np_{2j}} = \frac{m_{1j}}{m_{2j}}$$

and conditional log odds ratios:

$$\tau_{12}^{A}(B=j) = \log q_{12}^{A}(B=j)$$

are considered to study the effect of one variable on the other. Dependence of the two variables can be assessed by differences in conditional probabilities or in conditional log odds ratios.

The differences in conditional log odds ratios can be analysed through the log cross-product ratio:

$$\tau_{(12)(12)}^{AB} = \tau_{12}^{A}(B=1) - \tau_{12}^{A}(B=2) = \log m_{11} - \log m_{21} - \log m_{12} + \log m_{22}$$

Since the hypothesis of independence of the two dichotomous variables is equivalent to a log cross-product ratio of zero, and this can be expressed as a linear function of the logarithms of the cells means, the hypothesis of independence can be shown to be equivalent to an additive log-linear model.

We can represent the underlying probabilities as:

$$p_{ij} = \frac{e^{\lambda+\lambda_i^A+\lambda_j^B+\lambda_{ij}^{AB}}}{N}$$

Hence:

$$\log m_{ij} = \lambda + \lambda_i^A + \lambda_j^B + \lambda_{ij}^{AB}$$

with:

$$\sum \lambda_i^A = \sum \lambda_j^B = \sum_j \lambda_{ij}^{AB} = \sum_i \lambda_{ij}^{AB} = 0$$

where:

$$\lambda = \frac{1}{4}(\log m_{11} + \log m_{12} + \log m_{21} + \log m_{22})$$

$$\lambda_1^A = -\lambda_2^A = \frac{1}{4}(\log m_{11} - \log m_{12} + \log m_{21} - \log m_{22})$$

$$\lambda_1^B = -\lambda_2^B = \frac{1}{4}(\log m_{11} + \log m_{12} - \log m_{21} - \log m_{22})$$

$$\lambda_{11}^{AB} = \lambda_{22}^{AB} = -\lambda_{12}^{AB} = --\lambda_{21}^{AB}\ \frac{1}{4}(\log m_{11} + \log m_{12} - \log m_{21} + \log m_{22})$$

Testing independence of the two variables (which implies a log cross-product ratio equal to zero) means testing whether λ_{ij}^{AB} is equal to zero.

In the model above λ_1^A is the parameter indicating the main effect of variable A. In fact:

$$\lambda_1^A - \lambda_2^A \;=\; 2\lambda_1^A \;=\; \frac{1}{2}\left(\log\frac{m_{11}}{m_{21}} + \log\frac{m_{12}}{m_{22}}\right) \;=\; \frac{1}{2}\left(\log\frac{p_{11}}{p_{21}} + \log\frac{p_{12}}{p_{22}}\right)$$

under the independence model,

$$\frac{p_{11}}{p_{21}} = \frac{p_{12}}{p_{22}}$$

and:

$$2\lambda_1^A = \log\frac{p_{11}}{p_{21}}$$

i.e. the parameter provides a measure of the relative prevalence of the two responses. Analogously for λ_1^B.

To test the independence model either the Pearson chi-square statistic:

$$\chi^2 = \sum_i \sum_j \frac{(n_{ij} - \hat{m}_{ij})^2}{\hat{m}_{ij}}$$

where $\hat{m}_{ij} = \dfrac{n_{i.} \cdot n_{.j}}{N}$ is the maximum likelihood estimate of m_{ij} under the independence model; or the likelihood ratio chi-square test:

$$L^2 = 2\sum_i \sum_j F_{ij}\, ln \frac{F_{ij}}{\hat{F}_{ij}}$$

with d.f. = number of cells - number of independent parameters in the model, can be used.

When three (or more) dichotomous (polytomous) variables A, B, and C are cross-classified, they are usually analysed through hierarchical log-linear models. These are extensions of the model described for the two dichotomous variables case, so that the logarithm of the mean of the cell value is represented as:

$$\log m_{ijk} = \lambda + \lambda_i^A + \lambda_j^B + \lambda_k^C + \lambda_{ij}^{AB} + \lambda_{ik}^{AC} + \lambda_{jk}^{BC} + \lambda_{ijk}^{ABC}$$

with:

$$\sum_i \lambda_i^A = \sum_j \lambda_j^B = \sum_k \lambda_k^C = \sum_i \lambda_{ij}^{AB} = \sum_j \lambda_{ij}^{AB} = \sum_i \lambda_{ik}^{AC} = \sum_k \lambda_{ik}^{AC} =$$

$$= \sum_j \lambda_{jk}^{BC} = \sum_k \lambda_{jk}^{BC} = \sum_i \lambda_{ijk}^{ABC} = \sum_j \lambda_{ijk}^{ABC} = \sum_k \lambda_{ijk}^{ABC} = 0$$

where, as before, the λ_{ij}^{AB} represent the A-B interaction parameters, the λ_{ijk}^{ABC} represent the A-B-C interaction parameters, etc.

The model above is called a saturated model, as no restrictions on the parameters are imposed. This is an example of a hierarchical model; other hierarchical models have some λ parameters set to zero, with the restriction that if any λ parameter is set to zero, any λ parameter of higher order must be zero as well.

This is the type of model we will be using for the analysis of diversification.

According to Haberman (1978, p. 2), the analysis of data through a log-linear model involves three stages: the proposal of a plausible model for the data under study; the estimation of unknown parameters from the data, generally by means of the maximum likelihood method; and the use of the parameters in statistical tests of the model's adequacy. If the last step reveals an inadequacy of the model, the results should be used to suggest new models more consistent with the data.

In practice, two methods are usually adopted to select a model:

(a) one possibility is to fit a saturated model and then, by backward induction, eliminate the effects which are not relevant; this could be done by examining the standardised values for the parameter estimates (parameter estimates/standard errors) which are approximately normally distributed with zero mean and standard deviation=1 if the model fits the data;

(b) another possibility is to systematically test the contribution made by terms of a particular order to the model (a decrease in the value of the likelihood ratio chi-square statistic when terms are added to the model signals their contribution).

In the following analysis we shall adopt the first procedure.

2. Log-linear Analysis applied to Diversification

In order to study the pattern of relatedness across products, we used a rather 'ad hoc' method, which consisted of clustering products in the same group if more than 70% of firms producing one of them was also producing the other.

Using log-linear analysis for this problem would allow a better consideration of the relationships across products, not only based on possible two way interactions, as in the previous case, but also taking into account many possible levels of interactions.

The obvious problem here is the dimension of the datasets. In order to use a log-linear model, the original (60 X 60) matrix must first be transformed into a contingency table, where the variables are represented by the 60 industries (which can take values 'Active' or 'Non Active'); each firm can be either active or not in each of the industries, and the number of cells would be 2^{60}, given all the possible values taken by each variable.

Most of these cells would have a zero frequency, making the computation of the results unfeasible. Moreover, even if computation difficulties could be overcome, problems of interpretation would arise, as the interaction patterns would be too complicated to be able to give them any economic meaning.

We therefore decided to use the log-linear analysis with the limited aim of studying the problems of the comparison within 'groups' or 'clusters', as they were obtained through the previous procedure, with the following objectives:

(i) firstly, as a way to confirm or reject the validity of the previous approach; if no interaction is in fact significant through a loglinear model, this would signal the inappropriateness of the clustering procedure;

(ii) secondly, as an alternative way to compare patterns of diversification within groups, and across countries (U.K. and Italy) and time (U.K. 1962, U.K. 1986).

We wanted in particular to use log-linear models to study the groups: dairy, soft drinks, biscuit+bakery, processed fruit and vegetables, and flour, as these are the groups which include more than two products and allow us to study more than just two-way interactions and the similarities in patterns.

For the other groups, the log-linear analysis will address only the first objective.

3. The Model

We want to test, by means of a log-linear model, whether there are significant links between the industries within the groups, in the sense that the probability of being active in one of them is not independent of the probability of being active in another within the same group.

Our variables will be, for each group, the industries belonging to it. For each firm in the dataset, each industry variable can take value 1 (if the firm is active in that industry) or 0 (if the firm is not). Hence in each cell of the contingency table there will be the number of firms corresponding to a specific pattern of activity. The contingency tables are analysed assuming a log-linear model for the underlying probabilities.

In a two industry case we would have a contingency table given by:

		ind2	
		active	non active
ind1	active	n_{11}	n_{12}
	non active	n_{21}	n_{22}

with n_{11} being the number of firms active in both industries, n_{12} the number of those active in 1 but not in 2, n_{21} vice versa, and n_{22} the number not active in either industry.

One problem that arises concerns the number of firms which are not active in any of the industries in the group considered. The choice of this value is relevant for the analysis as it influences the level of significance of the parameters. A large number of firms non active in any of the industries in the group considered implies a low probability p_i of producing in one industry in the group, and a probability of order p_i^2 of randomly entering two industries in the group; which in turn implies that the larger the number of non active firms, the more likely it is that even a small number of firms active in more than one sector will generate a result of a significant link between the two.

Therefore there is a degree of arbitrariness in this choice. The most reasonable approach seemed to be that of using (as the number of non active firms in each group) the total number of firms in the food industry which are not in the specific group[1].

[1] This issue however hides a more serious problem, which is that we would actually wish to model the product choice conditional on being in the group, rather than the unconditional product choice. That is, if we assume that the full probability function is log-linear:

$$p_{ij} = \frac{e^{\lambda + \lambda_i^{ind1} + \lambda_j^{ind2} + \lambda_{ij}^{ind1ind2}}}{n}$$

then, p_{22} is the probability of not being active in any of the two industries, and q_{ij} the probability of being in i and j, conditional on being active, is:

$$q_{ij} = \frac{p_{ij}}{1 - p_{11}} \frac{e^{\lambda + \lambda_i^{ind1} + \lambda_j^{ind2} + \lambda_{ij}^{ind1ind2}}}{1 - e^{\lambda + \lambda_i^{ind1} + \lambda_j^{ind2} + \lambda_{ij}^{ind1ind2}}}$$

The conditional distribution is then also log-linear. However there is no easy solution to this problem, as most of the statistical packages do not allow great flexibility, i.e. they do not allow us to estimate a conditional log-linear model. We therefore decided to use the unconditional specification, even with its limitations, and interpret the results with care.

The estimation procedure implied starting with a 'saturated model', progressively eliminating interactions parameters which did not contribute significantly in explaining the pattern[2].

4 The results
4.1 The dairy group

Within this group we include the products: milk, condensed milk, and cheese.

The results obtained through the procedure which starts with a saturated model and progressively eliminates interaction terms which are not significant in 'explaining' the inter-relationships (that is, whose addition to the model does not reduce chi-square significantly) are summarised in Table A2.1.

Here, the presence of significant positive two way interaction terms is interpreted as implying that the number of firms active in two industries cannot be explained simply by the product of the probabilities of being active in each industry.

	UK1962 n. firms=25		UK1986 n. firms=42		IT1986 n. firms=96	
Parameters	Value	z-value	Value	z-value	Value	z-value
Ind1	-0.262	-1.21	-0.273	-1.50	-0.068	-0.33
Ind2	-0.541*	-2.46	-1.035*	-5.69	-1.769*	-8.75
Ind3	-1.061*	-4.83	-1.090*	-6.03	-0.331	-1.63
Ind1 by Ind2	0.613*	2.79	0.548*	3.02	0.790*	3.91
Ind1 by Ind3	0.989*	4.50	0.688*	3.78	0.683*	3.38
Ind2 by Ind3	0.711*	3.25	0.476*	2.62	0.504*	2.49
Ind1 by Ind2 by Ind3	-0.444*	-2.00	0.413*	2.27	-0.510*	-2.52

Saturated model.
* Significant at the 5% level.

Table A2.1

The results of the log-linear analysis reveal approximately the same pattern of relationships across industries as the preliminary analysis; i.e., whenever a 'link' was found through the previous method, it is also found by the log-linear analysis.

One feature of the results which is worth noticing and requires an explanation is the presence of negative three-way interaction effects in two of the three datasets (in the UK-1986 case it is positive and significant).

This seems to imply that the "probability" of being active in all three industries is lower than that generated by considering 'main effects' (each variable, taken alone) and two-way interaction effects only; that is, it seems that there are some obstacles to being active in all three industries.

[2] One problem in the estimation was the presence, for some groups, of a large number of zero cells, which, given the way the likelihood chi-square test is defined, might generate convergence problems; to avoid this, a small value (0.01) has been introduced whenever a zero occurred.

As there are positive links between each of the industries, taken in pairs, it is difficult to imagine technological diseconomies of scope, when producing three instead of two products.

We should look then for other explanations: as this effect is particularly strong for the case of UK 1962 and Italy 1986, we could consider the possibility of the presence of financial constraints, relevant in these two cases, which limited the expansion from two to three sectors, and that are not relevant any more in the UK 1986 sample.

4.2 The soft drinks group

Within this group we include the products: fruit and vegetable juices, soft drinks, and mineral water.

	UK1962 n. firms=62		UK1986 n. firms=43		IT1986 n. firms=120	
Parameters	Value	z-value	Value	z-value	Value	z-value
Ind1	-0.230	-0.97	-0.491*	-2.23	-1.230*	-7.80
Ind2	-0.180	-0.76	-0.216*	-0.98	-0.494*	-3.13
Ind3	-1.680*	-7.12	-1.410*	-6.43	-0.983*	-6.22
Ind1 by Ind2	0.808*	3.42	1.020*	4.65	0.485*	3.07
Ind1 by Ind3	0.505*	2.14	0.720*	3.28	-0.175*	-1.11
Ind2 by Ind3	0.454	1.92	0.445*	2.02	0.863*	5.46
Ind1 by Ind2 by Ind3	-0.533*	-2.26	0.445*	2.02	-0.305	-1.93

Saturated model.
* Significant at the 5% level.

Table A2.2

We find a rather similar pattern across the three datasets (except for the link between the fruit juice sector and the mineral water one in Italy), which confirms the links found through the previous procedure:

	1	2	3
1	1	.78	.07
2	.76	1	.00
3	1	.75	1

UK1962

	1	2	3
1	1	.86	.13
2	.67	1	.10
3	.66	.66	1

UK1986

	1	2	3
1	1	.28	.08
2	.20	1	.57
3	.06	.59	1

IT1986

Again the results have the feature of a negative three way interaction effect in the UK1962 and Italy1986 cases.

4.3 The biscuit-bakery group

Here we have considered two of the groups formed through the previous procedure together. In fact the links between products just failed to be strong enough to satisfy the previous criterion.

The datasets include the products: biscuits (1), crackers (2), bread (3), and cakes and pastries (4).

The results of the log-linear analysis are in Table A2.3.

	UK1962 n. firms=56		UK1986 n. firms=74		IT1986 n. firms=88	
Parameters	Value	z-value	Value	z-value	Value	z-value
Ind1	-0.440	-0.83	-0.573*	-2.83	0.295	-0.92
Ind2	-0.780	-1.46	-1.166*	-6.15	-1.178*	-3.69
Ind3	-1.176*	-2.20	-0.643*	-3.39	-1.328*	-4.16
Ind4	-0.349	-0.65	-0.108	-0.57	0.143	0.44
Ind1 by Ind2	1.533*	2.86	0.399*	2.11	0.632*	1.98
Ind1 by Ind3	-0.075	-0.14	0.324	1.71	0.059	0.18
Ind1 by Ind4	0.074	0.13	0.275	1.45	0.347	1.08
Ind2 by Ind3	0.262	0.49	0.505*	2.66	0.391	1.22
Ind2 by Ind4	0.413	0.77	-0.029	-0.15	0.542	1.70
Ind3 by Ind4	1.044*	1.96	0.494*	2.60	0.566	1.77
Ind1 by Ind2 by Ind3	-0.262	-0.49	-0.186	-0.98	-0.247	-0.77
Ind1 by Ind2 by Ind4	0.564	1.05	-0.138	-0.72	-0.111	-0.34
Ind1 by Ind3 by Ind4	-0.020	-0.03	-0.213	-1.13	-0.308	-0.96
Ind2 by Ind3 by Ind4	-0.359	-0.07	-0.357	-1.88	0.095	0.30
Ind1 by Ind2 by Ind3 by Ind4	0.130	0.24	0.076	0.40	-0.221	-0.69

Saturated model.
* Significant at the 5% level.

Table A2.3

Again the patterns described by the previous procedure are confirmed:

	1	2	3	4
1	1	1	.07	.25
2	1	1	.15	.53
3	.12	.12	1	.93
4	.20	.20	.42	1

UK1962

	1	2	3	4
1	1	.21	.26	.47
2	.41	1	.08	.25
3	.23	.03	1	.84
4	.17	.04	.34	1

UK1986

	1	2	3	4
1	1	.22	.08	.60
2	.73	1	.20	.66
3	.33	.25	1	.66
4	.43	.15	.12	1

IT1986

and actually the 'grouping' procedure is justified by the log-linear analysis (with the previous approach, products 1 and 2 were not a group in the UK 1986 dataset, but the log-linear model shows a link; the same is true for the Italy 1986 dataset, where industries 3 and 4 were not linked by the previous procedure, but are now through the log-linear analysis).

4.4 The fruit-vegetables group

The group includes the products: processed fruit (1), canned fruit (2), processed vegetables (3), and canned vegetables (4). The results of the log-linear analysis are in Table A2.4.

	UK1962 n. firms=54		UK1986 n. firms=32		IT1986 n. firms=144	
Parameters	Value	z-value	Value	z-value	Value	z-value
Ind1	-0.373	-1.15	-0.739	-1.77	-1.098*	-3.60
Ind2	-0.291	-0.90	-0.991*	-2.38	- 0.025	-0.08
Ind3	-0.370	-1.14	-0.250	-0.60	-0.660*	-2.17
Ind4	-0.744*	-2.31	-0.479	-1.15	-0.717*	-2.35
Ind1 by Ind2	1.070*	3.33	0.566	1.35	0.815*	2.68
Ind1 by Ind3	0.200	0.62	0.803	1.92	-0.092	-0.30
Ind1 by Ind4	-0.072	-0.22	0.054	0.13	0.137	0.45
Ind2 by Ind3	0.347	1.07	-0.095	-0.23	0.377	1.24
Ind2 by Ind4	0.996*	3.09	0.882*	2.11	0.362	1.19
Ind3 by Ind4	0.571	1.77	0.991*	2.38	1.149*	3.77
Ind1 by Ind2 by Ind3	-0.223	-0.69	-0.227	-0.55	-0.190	-0.62
Ind1 by Ind2 by Ind4	0.324	1.00	-0.227	-0.55	-0.002	-0.01
Ind1 by Ind3 by Ind4	0.001	0.00	0.182	0.43	0.407	1.34
Ind2 by Ind3 by Ind4	-0.146	-0.45	0.159	0.38	-0.464	-1.52
Ind1 by Ind2 by Ind3 by Ind4	0.424	1.31	0.393	0.94	-0.069	-0.22

Saturated model.
* Significant at the 5% level.

Table A2.4

The same comments as those to the previous case apply to this case as well. For the first two datasets (UK 1962 and UK 1986) the same links are found as with the previous approach, and other links, previously not significant, are relevant now and justify the grouping of the four industries.

For the Italian case only links across the first two (fruit) and the second two (vegetables) appear significant.

4.5 The flour-cereals group

The group includes the products: ready to eat cereals (1), other cereals (2), flour (3), special flours (4), and processed rice (5). The results of the log-linear analysis are in Table A2.5.

	UK1962 n. firms=61		UK1986 n. firms=69		IT1986 n. firms=84	
Parameters	Value	z-value	Value	z-value	Value	z-value
Ind1	-0.415	-1.78	-0.900*	-4.61	-2.620*	-8.77
Ind2	-0.853*	-3.03	-0.426	-1.95		
Ind3	0.148	0.64	0.034	0.16	-0.344	-0.95
Ind4	0.390	0.15	-0.783*	-3.98	-1.670*	-5.91
Ind5	-0.957*	-3.41	-0.611*	-2.77	-1.480*	-5.42
Ind1 by Ind2	0.390	1.58	0.376*	2.15		
Ind1 by Ind3	0.252	1.76			0.596*	1.99
Ind1 by Ind5	0.806*	3.29	0.653*	3.57		
Ind2 by Ind3	0.877*	3.85	0.328	1.89		
Ind2 by Ind4	0.419	1.85	0.701*	3.87		
Ind2 by Ind5	0.791*	2.92	-0.282	-1.24		
Ind3 by Ind4			0.252	1.29	0.596*	2.76
Ind3 by Ind5			0.428*	2.20		
Ind4 by Ind5	0.839*	3.29	0.847*	3.99	0.703*	2.57
Ind1 by Ind2 by Ind3			-0.422*	-2.59		
Ind1 by Ind3 by Ind4	-0.645*	-5.81				
Ind1 by Ind3 by Ind5			-0.544*	-3.26		
	χ^2=8.35		χ^2=8.77		χ^2=2.46	
	d.f.=18		d.f.=16		d.f.=8	

Saturated model.
* Significant at the 5% level.

Table A2.5

In this case the pattern is not so clear. Through the previous procedure only the first dataset had sufficiently strong links to justify the groupings, while in the two other dataset such links are considerably weaker (especially in the Italian case).

The log-linear analysis results seem, however, to approximately confirm the pattern of the links and to justify the groupings. For the UK 1962 data, the significant links are 1-5, 2-3, 2-5 and 4-5, all significant also with the previous approach. Only the 3-5 link does not appear significant. For the UK 1986 data the significant ones are 1-2, 1-5, 2-4, 3-5, and 4-5, which show the highest values of the percentages with the previous approach. For the Italy 1986 data the significant ones are 1-3, 3-4, and 4-5, which again are the highest values of the percentages.

4.6 Groups with only two Products

The results of the log-linear analysis are in Table A2.6 and they do not require many comments: all the two-way links are significant in each of the datasets, confirming the validity of the grouping procedure for these products.

	UK1962		UK1986		IT1986	
Parameters	Value	z-value	Value	z-value	Value	z-value
FATS	n. firms=36		n. firms=34		n. firms=92	
Ind1	-1.720*	-8.31	-1.844*	-8.96	-2.050*	-12.12
Ind2	-0.503*	-2.44	-0.601*	-2.86	-0.418*	-2.47
Ind1 by Ind2	1.129*	5.44	1.150*	5.47	0.967*	5.71
SUGAR	n. firms=18		n. firms=12		n. firms=14	
Ind1	-0.756*	-3.45	-1.420*	-5.93	-1.456*	-7.22
Ind2	-0.156*	-7.12	-1.620*	-6.78	-1.344*	-6.66
Ind1 by Ind2	1.305*	5.95	1.070*	4.49	1.456*	7.22
FROZEN FOOD	n. firms=40		n. firms=53		n. firms=40	
Ind1	-0.688*	-5.31	-1.002*	-9.36	-1.206*	-5.77
Ind2	-1.034*	-7.98	-1.125*	-10.50	-2.040*	-9.77
Ind1 by Ind2	1.187*	9.16	0.800*	7.47	0.657*	3.14
CONDIMENTS	n. firms=33		n. firms=55		n. firms=158	
Ind1	-1.160*	-8.85	-1.600*	12.72	-2.050*	-12.89
Ind2	-0.858*	-6.14	-0.570*	-4.53	-0.137	-0.85
Ind1 by Ind2	1.080*	7.76	0.755*	6.32	0.941*	5.89
ANIMAL FEED	n. firms=77		n. firms=100		n. firms=135	
Ind1	-1.680*	-11.80	-1.885*	-11.50	-2.110*	-8.26
Ind2	-0.580*	-4.05	-0.213	-1.30	0.219	0.85
Ind1 by Ind2	0.503*	3.52	0.907*	5.53	1.440*	5.65
MEAT PROCESS.	n. firms=59		n. firms=113		n. firms=139	
Ind1	-0.518*	-4.17	-0.252*	-2.43	0.053	0.20
Ind2	-1.377*	-11.08	-1.360*	-13.16	-2.360*	-9.06
Ind1 by Ind2	0.828*	6.66	0.926*	8.96	1.189	4.55
TEA-COFFEE	n. firms=12		n. firms=25		n. firms=47	
Ind1	-1.390*	-6.27	-0.960*	-5.96	-1.823*	-9.37
Ind2	-1.270*	-5.77	-1.130*	-7.00	-0.452*	-2.32
Ind1 by Ind2	1.134*	5.12	1.440*	8.91	1.420*	7.33
CHOCOLATE	n. firms=34		n. firms=34		n. firms=52	
Ind1	-0.289	-1.06	-0.637*	-2.96	-0.569*	-3.90
Ind2	-1.930*	-7.12	-1.939*	-9.02	-1.577*	-10.82
Ind1 by Ind2	1.262*	4.64	1.096*	5.10	1.321*	9.07

Saturated models.
* Significant at the 5% level.

Table A2.6

5 Limits of the Approach

We have already underlined a number of limitations of the analysis of diversification patterns through the log-linear approach. Even though it is considered a standard method for the problem considered, ambiguities arise in the interpretation, due to the arbitrariness in the choice of some parameters (the number of firms non active in either industry of the group) and of the underlying model (unconditional rather than conditional).

There is however an even more serious limitation, in our view, represented by the absence of any underlying economic model, which makes the results hard to interpret.

It is essentially this dissatisfaction which justifies the approach developed in section 3 of chapter 3.

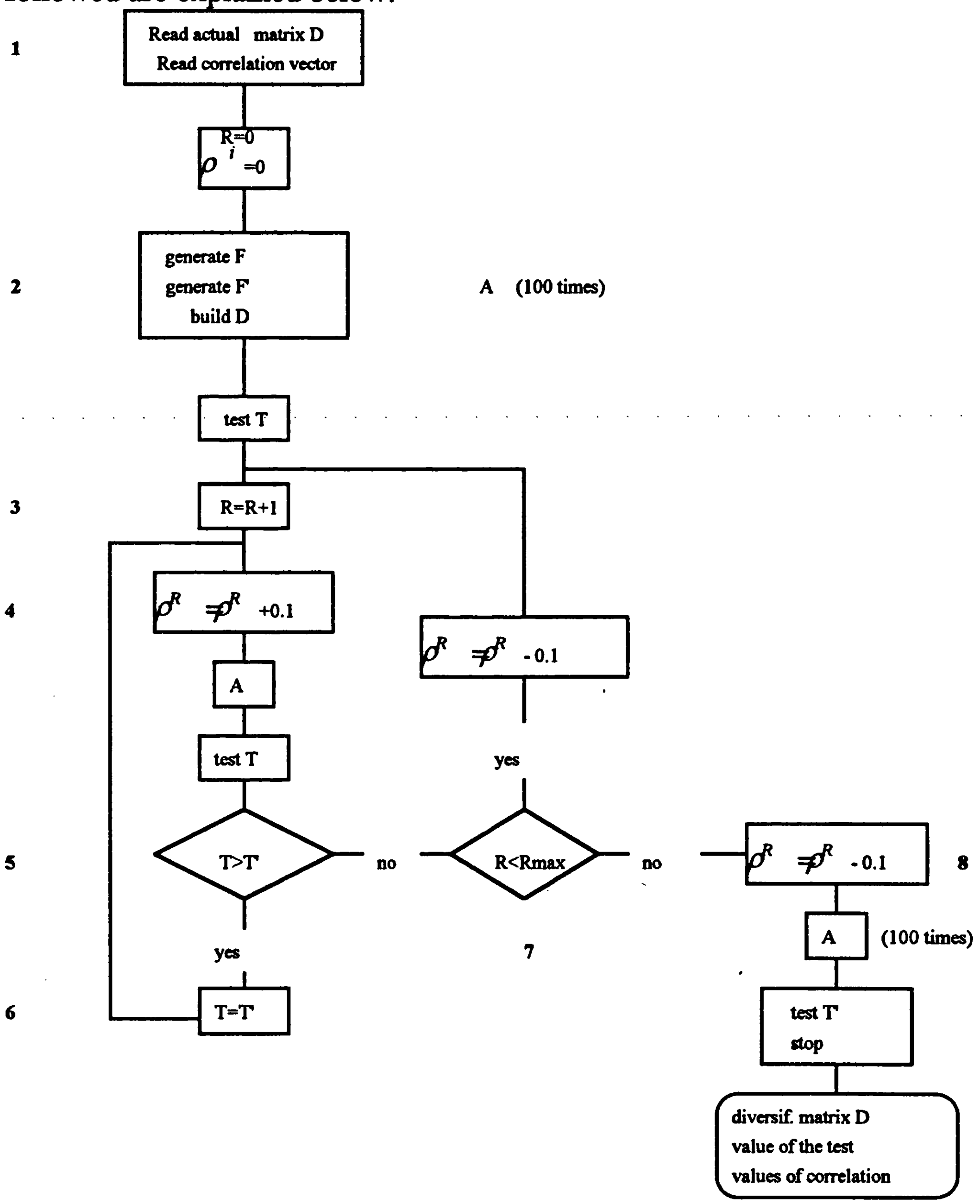
Appendix 3

A simulation analysis

1 Correlated costs

1.1 Program flow chart

The way the program works is best described through a flow chart. The steps followed are explained below:



1- The program reads: (i) the actual diversification matrix D: the diagonal values will be used as the equilibrium number of firms in each industry; this means that in the final diversification matrix generated by the program, the diagonal values will be the same as in the actual one, by construction; (ii) a vector of 'links', describing which industries seem more closely related, in terms of the ad hoc method of the first section. So, for example, if the actual matrix is:

	1	2	3
1	10	8	1
2	8	12	3
3	1	3	4

the correlation vector would be:

R	links
1	1-2
2	2-3
3	1-3

i.e., the vector indicates to the program which 'links' should be tried first, as they seem more relevant. In the above matrix, industry 1 and 2 appear to be the most strongly related, while 1 and 3 are the most distant.

2 - In the first 'round', no link is considered (R=0). We are just repeating the basic program, which assumes that fixed costs are random draws from uniform distributions, and serves as a reference point to compute the test which will be compared with the following ones.Each **A** is repeated for 100 runs and mean values are computed. A typical result could be:

$$D = \begin{matrix} 10 & 2 & 1 \\ 2 & 12 & 1 \\ 1 & 1 & 4 \end{matrix}$$

$T = 0.314$

3 - After the first round we try introducing the first link. As noted, possible links (correlation factors) are ordered according to the percentage of firms active in two industries.
In the example above, at this point we would have R=1 and the first link (1-2) is considered.

4 - The value of ρ_{12} for $c_1 = (1-\rho_{12})v_1 + \rho_{12}v_{12}$; $c_2 = (1-\rho_{12})v_2 + \rho_{12}v_{12}$ $(\rho_{12} = \rho^1$ in the program) is determined iteratively. As all ρ's are initialized at 0, in the first run and $\rho^1 = 0 + 0.1 = 0.1$.
With this value the matrix F is generated again, where c_1 and c_2 are now computed according to the formula and c_3 are random draws from uniform distributions. Again F' and D are built from F and a new test T' is computed. D could be in this case:

$$\begin{matrix} 10 & 4 & 1 \\ 4 & 12 & 1 \\ 1 & 1 & 4 \end{matrix}$$

with $T' = 0.259$.

5 - We now compare the value of the test when correlation is introduced with the case when no correlation is assumed.

6 - If the test decreases, (meaning that the approximation has improved) we repeat the previous procedure, i.e., we try whether increasing the value of the correlation factor ρ^{l} improves the fit.

7 - When the value of the test does not decrease any more, we introduce a further possible link; i.e., we first check whether further links can be examined (in the example only 3 links are possible, so that $R\max = 3$); if that is the case, we repeat the procedure with all the previous correlations which appeared significant (the last value of ρ has to be reduced of 0.1 as the last step - increase of 0.1 - did not improve the approximation) and a new one: R=R+1.

8 - Finally, when all possible links have been considered, we build a diversification matrix with all correlation factors that the data "accepted", i.e. which helped in describing the actual matrix.
The final output of the program is:
(a) a generated diversification matrix
(b) a value of the test
(c) the values of the significant correlation factors.

1.2 Results

(a) The Dairy Sector

UK1962 Results of the simulation:

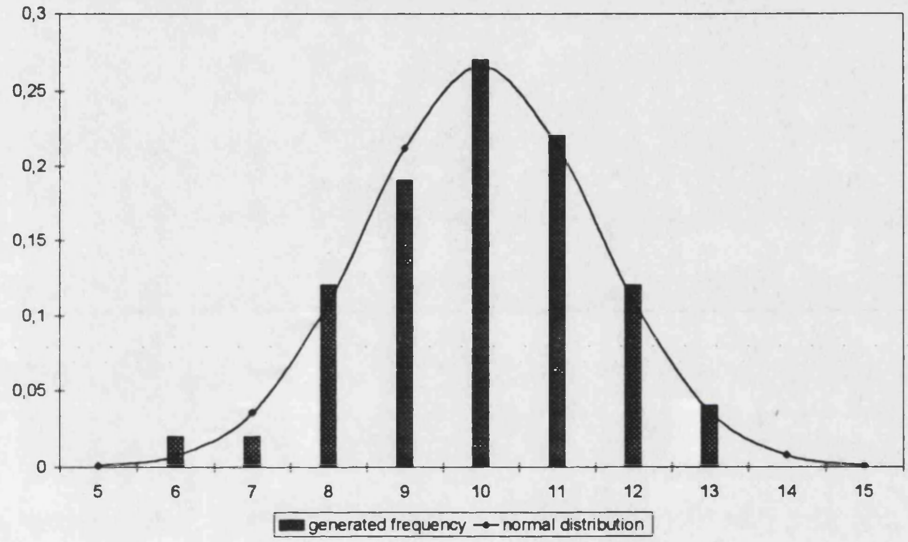
Generated matrix	19.00	10.01	6.36
	10.01	16.00	5.64
	6.35	5.64	9.00
Values of ρ coefficients		1-2: 0.6	
		1-3: 0.6	
		2-3: 0.6	
Value of test T		0.118	

Tests on the generated values of off-diagonal cells[1]:

	$\overline{x}$	$s/\sqrt{n}$		
d_{12}	10.01	1.500	$H_0:\mu=10$	accepted[2]
d_{13}	6.35	1.233	$H_0:\mu=9$	rejected[3]
d_{23}	5.64	1.403	$H_0:\mu=6$	accepted[4]

Here we present some examples of the generated d_{ij} parameters. They are approximately normally distributed. Hence we can use a test of hypotheses for normal distributions.

d_{12}: generated distribution vs. normal distribution:



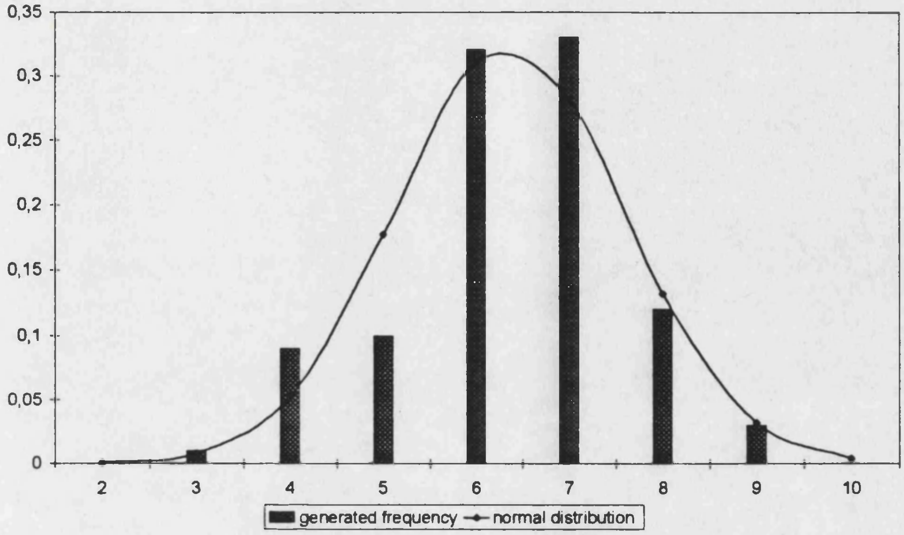
[1] Here they are shown in detail as an example. In the remaining of the text only the results are given.

[2] In fact the interval $\left(x-t\cdot\frac{s}{\sqrt{n}},\overline{x}+t\cdot\frac{s}{\sqrt{n}}\right)$=(10.01-1.99•1.5, 10.01+1.99•1.5) = (7.025, 12.995) includes the value 10.

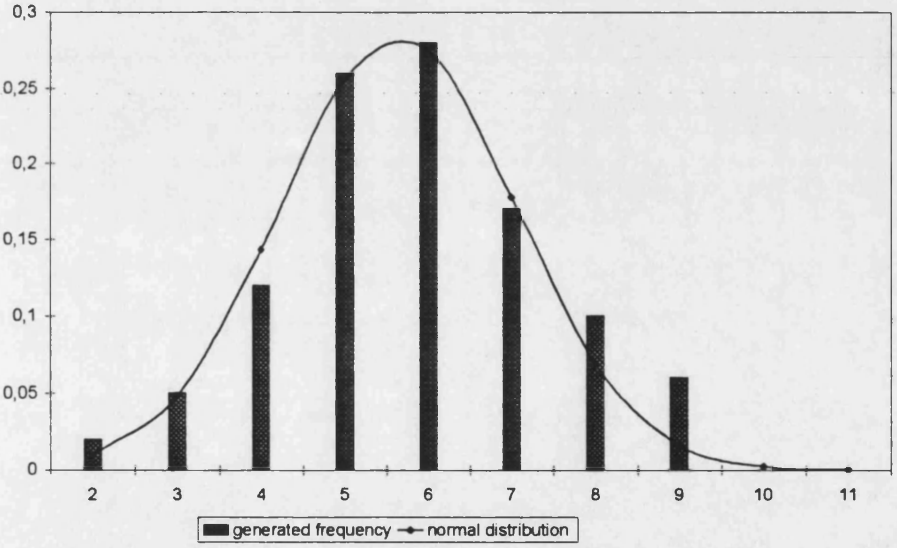
[3] In fact the interval (6.35-1.99•1.233, 6.36+1.99•1.233) does not include the value 9.

[4] In fact the interval (5.64-1.99•1.403, 5.64+1.99•1.403) includes the value 6.

d_{13}: **generated distribution vs. normal distribution:**



d_{23}: **generated distribution vs. normal distribution:**



UK1986 Results of the simulation:

Generated matrix	34.00	8.91	8.26
	8.91	15.00	4.83
	8.26	4.83	14.00
Values of ρ coefficients	1-2: 0.5 1-3: 0.5 2-3: 0.5		
Value of test T	0.246		

All the generated value pass the test.

IT1986 Results of the simulation:

Generated matrix	73.00	8.95	48.65
	8.95	10.00	8.93
	48.65	8.93	71.00
Values of ρ coefficients	1-2: 0.6		
	1-3: 0.6		
	2-3: 0.6		
Value of test T	0.133		

Only d_{23} does not pass the test.

(b) The Soft Drink Sector

UK1962 Results of the simulation:

Generated matrix	51.00	42.12	4.00
	42.12	52.00	4.00
	4.00	4.00	4.00
Values of ρ coefficients	1-2: 0.7		
	1-3: 0.7		
	2-3: 0.7		
Value of test T	0.142		

Only d_{23} does not pass the test.

UK1986 Results of the simulation:

Generated matrix	29.00	22.51	5.78
	22.51	137.00	6.47
	5.78	6.47	7.00
Values of ρ coefficients	1-2: 0.7		
	1-3: 0.7		
	2-3: 0.7		
Value of test T	0.310		

Only d_{23} does not pass the test.

IT1986 Results of the simulation:

Generated matrix	45.00	11.78	11.28
	11.78	64.00	36.64
	11.28	36.64	62.00
Values of ρ coefficients	2-3: 0.6		
Value of test T	0.640		

Only d_{13} does not pass the test.

(c) The Biscuit Sector

UK1962 Results of the simulation:

Generated matrix	28.00	12.45	4.16	8.88
	12.45	13.00	1.92	4.23
	4.16	1.92	16.00	15.79
	8.88	4.23	15.79	35.00
Values of ρ coefficients	1-2: 0.8 3-4: 0.8			
Value of test T	0.624			

All the generated value pass the test.

UK1986 Results of the simulation:

Generated matrix	27.00	0.88	9.92	12.02
	0.88	5.00	0.62	0.91
	9.92	0.62	21.00	9.96
	12.02	0.91	9.96	26.00
Values of ρ coefficients	1-4: 0.6 3-4: 0.6			
Value of test T	0.303			

Only d_{34} does not pass the test.

IT1986 Results of the simulation:

Generated matrix	48.00	3.93	7.28	29.40
	3.93	15.00	3.22	10.70
	7.28	3.22	12.00	10.70
	29.40	10.70	10.70	66.00
Values of ρ coefficients	1-2: 0.5 1-3:0.5 1-4:0.5 2-3:0.5 3-4: 0.5 2-4: 0.5			
Value of test T	0.325			

Only d_{13} does not pass the test.

(d) The Fruit and Vegetable Sector

UK1962 Results of the simulation:

Generated matrix	42.00	22.67	24.44	21.64
	22.67	28.00	17.92	16.36
	24.44	17.92	31.00	17.67
	21.64	16.36	17.67	27.00
Values of ρ coefficients	1-2: 0.7 1-3: 0.7 1-4: 0.7 2-3: 0.7 3-4: 0.7 2-4: 0.7			
Value of test T	0.122			

Only d_{13} does not pass the test.

UK1986 Results of the simulation:

Generated matrix	17.00	5.86	10.67	7.62
	5.86	12.00	37.81	5.93
	10.67	7.81	26.00	1059
	7.62	5.93	10.59	17.00
Values of ρ coefficients	1-2: 0.7 1-3: 0.7 1-4: 0.7 2-3: 0.7 3-4: 0.7 2-4: 0.7			
Value of test T	0.158			

All the values pass the test.

IT1986 Results of the simulation:

Generated matrix	76.00	31.66	11.88	10.03
	31.66	65.00	10.24	8.85
	11.88	10.24	45.00	22.37
	10.03	8.85	22.37	39.00
Values of ρ coefficients	1-2: 0.5 3-4: 0.7			
Value of test T	0.320			

Both d_{23} and d_{24} do not pass the test.

(e) The Flour and Cereal Sector

UK1962 Results of the simulation:

Generated matrix	16.00	3.50	10.42	8.01	2.57
	3.50	9.00	6.51	4.96	1.99
	10.42	6.51	41.00	12.30	5.05
	8.01	4.96	12.30	29.00	4.23
	2.57	1.99	5.05	4.23	7.00
Values of ρ coefficients	1-2: 0.5 1-3: 0.5 1-4: 0.5 1-5: 0.5 2-3: 0.5 2-4: 0.5 2-5: 0.5 3-4: 0.5 3-5: 0.5 4-5:0.5				
Value of test T	0.243				

d_{15}, d_{25}, d_{34} do not pass the test.

UK1986 Results of the simulation:

Generated matrix	10.00	2.3	3.00	1.30	1.25
	2.31	32.00	16.83	7.82	7.31
	3.00	16.83	38.00	8.50	8.49
	1.30	7.82	8.50	14.00	4.38
	21.25	7.31	8.49	4.38	14.00
Values of ρ coefficients	2-3: 0.5 2-4: 0.5 2-5: 0.5 3-4: 0.5 3-5: 0.5 4-5: 0.5				
Value of test T	0.324				

All the values pass the test.

IT1986 Results of the simulation:

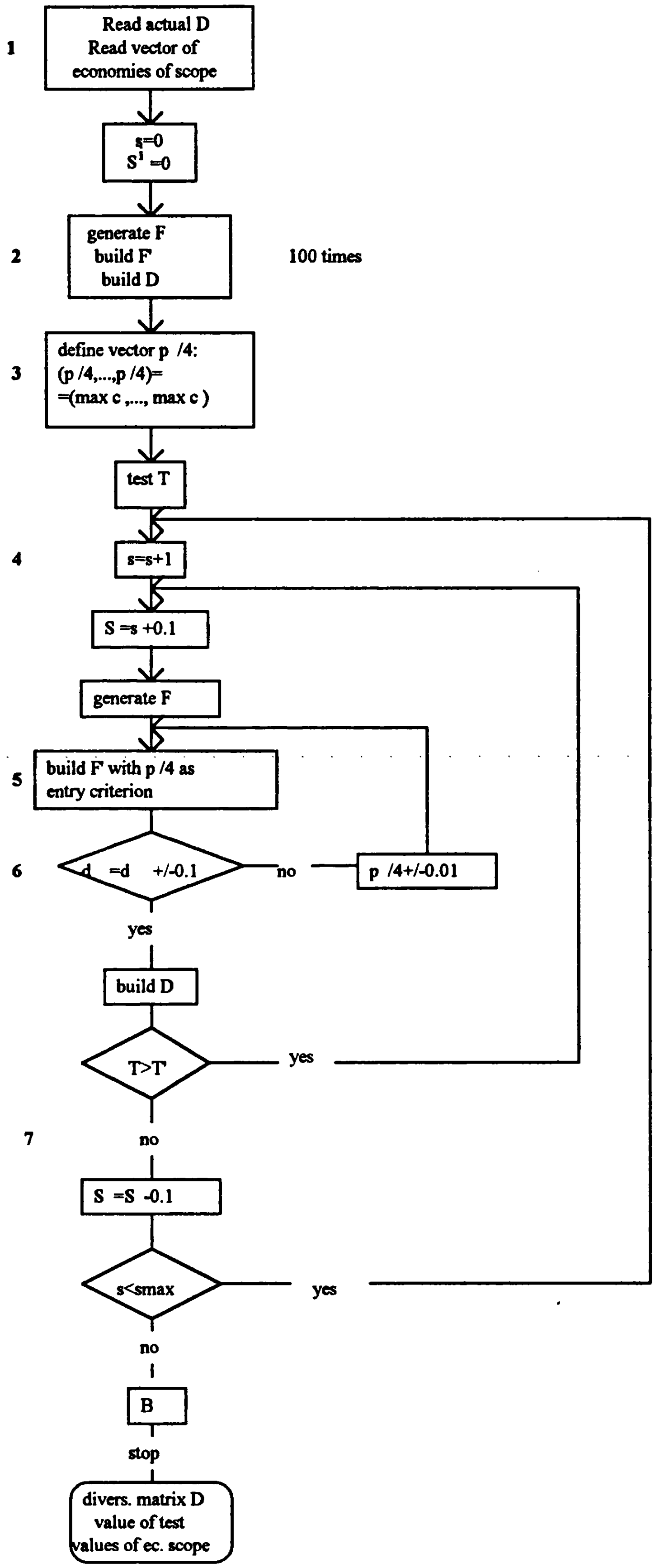
Generated matrix	3.00	0.00	1.15	0.14	0.39
	0.00	0.00	0.00	0.00	0.00
	1.15	0.00	63.00	2.78	6.93
	0.14	0.00	2.78	6.00	0.82
	0.39	0.00	6.93	0.82	18.00
Values of ρ coefficients	-				
Value of test T	0.640				

Only d_{35} does not pass the test.

2 Economies of Scope

2.1 Program flow chart

As before, the program is illustrated by means of a flow chart. The basic program explained in section 3 still represents the first step in the procedure:



1
Read actual D
Read vector of
economies of scope
s=0
S' =0
2
generate F
build F
build D
100 times
3
define vector p /4:
(p /4,...,p /4)=
=(max c ,..., max c)
test T
4
s=s+1
S =s +0.1
generate F
5
build F with p /4 as
entry criterion
6
d =d +/-0.1
no
p /4+/-0.01
yes
build D
T>T
yes
7
no
S =S -0.1
s<smax
yes
no
B
stop
divers. matrix D
value of test
values of ec. scope

1 - As for the first simulation exercise, the program: (i) reads the actual diversification matrix D, (ii) reads the vector with the pattern of economies of scope[5].

If we take the same example, i.e. the matrix:

	1	2	3
1	10	8	1
2	8	12	3
3	1	3	4

with the economies of scope vector:

s	links
1	1-2
2	2-3
3	1-3

the program will consider them in turn as for the correlation factors.

2 - Again, as a reference starting point, we generate a basic diversification matrix assuming no economies of scope are present.

3 - From F (matrix of random cost draws) we build F' (0's-1's matrix), using the hypothesis that, on each market, the equilibrium number of firms is equal to the actual number observed in the industry (d_{ii} in the observed diversification matrix), and active firms are the d_{ii} lowest cost firms in market i.

We now make a further step, and define as equilibrium price on each market, the price defined by the equality between the highest cost draw among the d_{ii} active firms in market i and $p_i^2/4$. We shall need equilibrium prices in order to define an entry criterion, where economies of scope are considered.

4 - As previously, we compute the value of the test T, as a reference, and then we introduce positive values of economies of scope, starting from the highest link. Again we generate a matrix F of random cost draws.

5 - In order to build F', we have here to use the 'entry criterion' described in the model. When economies of scope are present it is not possible to sort each column and define the lowest cost firms as the active ones on that market. The level of fixed costs depends in fact on whether the firm enters one market only (or more than one market but not linked through economies of scope) or more than one market which share economies of scope.

We therefore use the 'entry criterion' described: given equilibrium prices on each market, for each cost draw of each firm, (c_i^j, i= industry index, j=firm index):

---

[5] Contrary to the cost correlation case, where a relationship between i and j, and between j and k, was taken to create a 'group relationship' among i, j and k, here we only introduce two way economies of scope: i.e., if i,k,j are somehow linked, we consider as possible patterns:ij, jk; ij, ik; ij, ik, jk.

(i) if industry i is not linked through economies of scope to any other industry, we simply compare c_i^j with $p_i^2/4$: the firm is active (the corresponding cell is set to 1) if $c_i^j \le p_i^2/4$,

(ii) if industry i shares economies of scope with another industry l, we shall first compare c_i^j with $p_i^2/4$; if the first is smaller, firm j will be certainly active in industry i. If this is not true, we have to check whether the firm is able, and has an incentive to enter anyway, exploiting the economies of scope advantage:

$$\frac{p_i^2}{4}+\frac{p_l^2}{4}-(c_i^j+c_l^j-s_{il}) \ge max\left(0, \frac{p_l^2}{4}-c_l^j\right)$$

(i.e., entering both industries generate positive profits and the "bad performance" in industry i does not completely outweigh the cost reductions obtained through the economies of scope). If the inequality holds, both cells ji and jl are set to 1.

6 - This however will in general generate more entry than desired, i.e., in markets where firms enter exploiting economies of scope, for more firms than d_{ii} the new criterion will be satisfied.
In order to obtain again the right number of firms, we 'adjust' the equilibrium price. Starting from the industry where the actual number of firms diverges most from the generated one, we reduce slightly the equilibrium price and compute again F' and the number of firms in each market (as before, each time 100 runs are performed and means are computed). The adjustment continues until actual and generated number of firms do not differ by more than one.
The diversification matrix D is then finally built.

7 - From here on, the procedure repeats exactly the steps of the previous program, updating values of economies of scope, and introducing new ones until every possibility has been tried. The output of the program will be:
(a) a generated diversification matrix
(b) a value for the test
(c) the values of the significant economies of scope factors.

We shall present here only the values of the economies of scope which best approximate the actual matrix, with the value of the test T and the results of the test of the hypothesis that the off-diagonal elements, as predicted by the simulation, are not significantly different from the actual ones.

2.2. Results

(a) The Dairy Sector

UK1962 Results of the simulation:

Values of S coefficients	1-2: 0.2 1-3: 0.3 2-3: 0.2
Value of test T	0.098

All the values pass the test.

UK1986 Results of the simulation:

Values of S coefficients	1-2: 0.2 1-3: 0.2
Value of test T	0.131

All the values pass the test.

IT1986 Results of the simulation:

Values of S coefficients	1-2: 0.4 1-3: 0.3 2-3: 0.2
Value of test T	0.128

All the values pass the test.

(b) The Soft Drink Sector

UK1962 Results of the simulation:

Values of S coefficients	1-2: 0.4 1-3: 0.2
Value of test T	0.290

All the values pass the test.

UK1986 Results of the simulation:

Values of S coefficients	1-2: 0.4 1-3: 0.2 2-3: 0.2
Value of test T	0.082

All the values pass the test.

IT1986 Results of the simulation:

Values of S coefficients	2-3: 0.2
Value of test T	0.704

Only d_{13} does not pass the test.

(c) The Biscuit Sector

UK1962 Results of the simulation:

Values of S coefficients	1-2: 0.4 3-4: 0.4
Value of test T	0.343

All the values pass the test.

UK1986 Results of the simulation:

Values of S coefficients	1-4: 0.1 3-4: 0.2
Value of test T	0.373

.Only d_{34} does not pass the test.

IT1986 Results of the simulation:

Values of S coefficients	1-2: 0.2 3-4: 0.1 2-4: 0.1 1-4: 0.1
Value of test T	0.311

All the values pass the test.

(d) The Fruit-Vegetable Sector

UK1962 Results of the simulation:

Values of S coefficients	1-2: 0.5 2-4: 0.4 3-4: 0.3 1-4: 0.2 2-3: 0.2 1-3: 0.2
Value of test T	0.197

The values d_{23}, d_{24} do not pass the test.

UK1986 Results of the simulation:

Values of S coefficients	1-2: 0.2 3-4: 0.2 1-3: 0.2 2-4: 0.2
Value of test T	0.222

Only d_{14} does not pass the test.

IT1986 Results of the simulation:

Values of S coefficients	3-4: 0.3 1-2: 0.2 2-3: 0.2 2-4: 0.1
Value of test T	0.506

All the values pass the test.

(e) The Flour-Cereal Sector

UK1962 Results of the simulation:

Values of S coefficients	2-3: 0.5 4-5: 0.5 3-5: 0.3 2-5: 0.2 1-5: 0.2 2-4: 0.2 1-3: 0.1
Value of test T	0.372

The values $d_{12}, d_{15}, d_{24}, d_{25}$ do not pass the test.

UK1986 Results of the simulation:

Values of S coefficients	3-5: 0.2 2-4: 0.2 2-3: 0.1 4-5: 0.1 3-4: 0.1
Value of test T	0.260

All the values pass the test.

IT1986 Results of the simulation:

Values of S coefficients	-
Value of test T	0.600

Only d_{35} does not pass the test.

3 Comparisons across Time and Countries: Results

(a) Dairy Sector

We "give" to the simulation program only the distribution of firms across industries:

UK1986

35	.	.
.	15	.
.	.	14

IT1986

73	.	.
.	10	.
.	.	71

We impose the 'correlation pattern': 1-2: 0.6; 2-3: 0.6; 1-3: 0.6, which was the best approximation to the UK 1962 data. The predictions for the two matrices are:

UK1986

34.00	10.78	10.30
10.78	15.00	5.56
10.30	5.56	14.00

value of T: 0.36

IT1986

73.00	8.95	48.65
8.95	10.00	8.93
48.65	8.93	71.00

value of T: 0.24

In order to test the hypothesis that predicted values are <u>not</u> significantly different from the true ones, we compute for each value the standard deviation:

UK1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0{:}\mu=\mu_0$
d_{12}	10.78	1.63	accepted
d_{13}	10.30	1.46	accepted
d_{23}	5.56	1.56	accepted

IT1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0{:}\mu=\mu_0$
d_{12}	8.95	1.03	accepted
d_{13}	48.65	1.03	accepted
d_{23}	8.93	0.90	<u>rejected</u>

(b) Soft Drink Sector

The distribution of firms is:

UK1986

29	.	.
.	37	.
.	.	7

IT1986

45	.	.
.	64	.
.	.	62

We impose the UK1962 'correlation pattern': 1-2: 0.7; 2-3: 0.7; 1-3: 0.7. The predictions are:

UK1986

29.00	22.51	5.78
22.51	37.00	6.47
5.78	6.47	7.00

value of T: 0.31

IT1986

45.00	34.87	34.01
34.87	64.00	34.90
34.01	34.90	62.00

value of T: 10.02

The results of the test of hypothesis are:

UK1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0{:}\mu=\mu_0$
d_{12}	22.51	2.01	accepted
d_{13}	5.78	0.87	accepted
d_{23}	6.47	0.70	<u>rejected</u>

IT1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0{:}\mu=\mu_0$
d_{12}	34.87	2.47	<u>rejected</u>
d_{13}	34.01	2.77	<u>rejected</u>
d_{23}	34.90	2.53	<u>rejected</u>

(c) Biscuit Sector

The diagonal elements of the actual diversification matrices are:

UK1986

27	.	.	.
.	15	.	.
.	.	21	.
.	.	.	56

IT1986

48	.	.	.
.	15	.	.
.	.	12	.
.	.	.	66

From the UK 1962 model the correlation pattern is: 1-2: 0.8; 3-4: 0.8. The predictions are:

UK1986

27.00	4.69	3.56	4.13
4.69	5.00	0.77	0.95
3.56	0.77	21.00	16.68
4.13	0.95	16.68	56.00

value of T: 0.63

IT1986

48.00	14.78	3.34	17.60
14.78	15.00	1.04	5.72
3.34	1.04	12.00	12.00
17.60	5.72	12.00	66.00

value of T: 0.41

Testing the hypothesis $\mu = \mu_0$ we have:

UK1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0: \mu = \mu_0$
d_{12}	4.69	0.54	rejected
d_{13}	3.56	1.45	rejected
d_{14}	4.13	1.50	rejected
d_{23}	077	0.80	accepted
d_{24}	0.95	0.95	accepted
d_{34}	16.28	1.82	accepted

IT1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0: \mu = \mu_0$
d_{12}	14.78	0.44	rejected
d_{13}	3.34	1.50	accepted
d_{14}	17.60	2.83	rejected
d_{23}	1.04	0.83	rejected
d_{24}	5.72	1.78	rejected
d_{34}	12.00	0.00	rejected

(d) Fruit and Vegetable Sector

Given the distribution of firms across industries:

UK1986

17	.	.	.
.	12	.	.
.	.	26	.
.	.	.	17

IT1986

76	.	.	.
.	65	.	.
.	.	45	.
.	.	.	39

We impose the correlation patterns: 1-2 : 0.7; 2-3: 0.7; 3-4: 0.7. The predictions are:

UK1986

17.00	5.86	10.67	7.62
5.86	12.00	7.81	5.93
10.67	7.81	26.00	10.59
7.62	5.93	10.59	17.00

value of T: 0.16

IT1986

26.00	48.38	35.81	31.55
48.38	65.00	32.67	28.91
35.81	32.67	45.00	22.66
31.55	28.91	22.66	39.00

value of T: 1.50

The results of the tests of hypothesis are:

UK1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0:\mu=\mu_0$
d_{12}	5.86	1.34	accepted
d_{13}	10.67	1.88	accepted
d_{14}	7.62	1.59	accepted
d_{23}	7.81	1.61	accepted
d_{24}	5.93	1.97	accepted
d_{34}	10.59	1.75	accepted

IT1986

$\bar{x}$	$s/\sqrt{n}$	$H_0:\mu=\mu_0$
48.38	2.87	rejected
35.81	2.25	rejected
31.55	2.36	rejected
32.67	2.69	rejected
28.91	2.43	rejected
22.66	2.78	accepted

(e) Flour and Cereals Sector

Starting with the actual distribution of firms:

UK1986

10	.	.	.	.
.	32	.	.	.
.	.	38	.	.
.	.	.	14	.
.	.	.	.	14

IT1986

3	.	.	.	.
.	0	.	.	.
.	.	63	.	.
.	.	.	6	.
.	.	.	.	18

We impose the UK 1962 correlation patterns: 1-2: 0.5; 2-3: 0.5; 3-4: 0.5; 4-5: 0.5. The result is:

UK1986

10.00	5.72	6.38	3.15	3.20
5.72	32.00	17.02	7.50	7.85
6.38	17.02	38.00	8.35	8.74
3.15	7.50	8.35	14.00	4.43
3.20	7.85	8.74	4.43	14.00

value of T: 0.42

IT1986

3.00	0.00	2.42	0.66	1.20
0.00	0.00	0.00	0.00	0.00
0.00	0.00	63.00	4.67	12.92
2.42	0.00	4.67	6.00	2.43
1.20	0.00	12.92	2.43	18.00

value of T: 1.90

The test of hypothesis leads to:

UK1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0: \mu = \mu_0$
d_{12}	5.72	1.45	accepted
d_{13}	6.38	1.46	accepted
d_{14}	3.15	1.31	accepted
d_{15}	3.20	1.22	accepted
d_{23}	17.02	2.24	accepted
d_{24}	7.50	1.77	accepted
d_{25}	7.85	1.94	accepted
d_{34}	8.35	1.71	accepted
d_{35}	8.74	1.53	accepted
d_{45}	4.43	1.58	accepted

IT1986

	$\bar{x}$	$s/\sqrt{n}$	$H_0: \mu = \mu_0$
d_{12}	0.00	/	/
d_{13}	2.42	0.68	rejected
d_{14}	0.66	0.65	accepted
d_{15}	1.20	0.74	accepted
d_{23}	0.00	/	/
d_{24}	0.00	/	/
d_{25}	0.00	/	/
d_{34}	4.67	1.10	rejected
d_{35}	12.92	1.85	rejected
d_{45}	2.43	1.20	accepted

Chapter 4

Diversification of Italian Food Firms: A Case Study Analysis

1. Introduction

The main theme of this chapter is that the factors shaping the diversification strategies of the largest Italian firms are rather different from those determining diversification patterns among small and medium size firms, whose behaviour dominated the statistical pattern described in the cluster analysis of chapter 3.

While we argue that these largest firms are atypical, we cannot demonstrate this statistically since we are dealing with a mere handful of firms. To uncover what is special about these firms, we need to proceed to detailed case studies. That is the task of this chapter. What we argue is that, in the case of these firms, four mechanisms are important. Apart from technological economies of scope, which formed the focus of our discussion so far, we find that three further factors play a role. These are: constraints to the expansion of firms, brand economies of scope, and, most importantly, economies of scope in distribution. We explore the role of these three mechanisms, by reference to the experience of four of the Italian largest food processors: Galbani, Barilla, Parmalat and Star. They display a wide variety of diversification strategies. Galbani and Barilla are diversified but focused on core activities, Parmalat is more widely diversified, and Star, the most widely diversified of these companies, has a range of products which is extremely large.

The data used here are collected from publicly available sources (balance sheets of firms, trade publications, census information), information obtained from market research companies (Databank, AGB), interviews within the companies themselves and interviews with independent experts of the Italian food industry. Quantitative data are available only for parts of the histories of the firms. For the remaining years we rely, in describing the industry, on information collected through interviews.

The structure of the chapter is as follows. We first describe the framework used to analyse diversification of our four firms. Secondly we present a brief history of each firm. In section 4 we develop the diversification analysis. Section 5 discusses other factors that might be considered relevant to explain diversification. Section 6 analyses the relationship between the case studies in this chapter and the results of chapter 3.

The Appendix includes detailed Tables with the data used in the analysis.

2. Reasons for Diversification

In chapter 3 we looked at how economies of scope accounted for diversification patterns. Economies of scope were defined in an abstract way, so as to include everything which made it cheaper to produce two (or more) products jointly rather than separately. However the discussion on the clusters identified through the statistical analysis revealed that economies of scope were mainly related to the presence of common inputs.

In the present chapter, we need to consider a wider menu of motives for diversification.

2.1 Motives for Diversification A: a Push Factor

The first theme we explore here is the familiar idea of a unique individual asset that allows profitable expansion of the firm's scale of operation as was described in chapter 1. If this expansion is hindered by the size of the segment relative to the firm's current size (in other words if the firm's market share in the segment is already large) then diversification may be the only route to profitable expansion[1]. Usually, this factor will only operate for large firms. There is, however, a variant of this effect, which might in principle affect smaller firms. If some institutional constraint renders the average or marginal returns to this unique asset artificially low, then the optimal response for the firm may be to diversify out of the industry. An example of this arises in the case of Barilla, as we shall see below.

2.2 Motives for Diversification B: Pull Factors

The second set of factors relevant to the discussion that follows falls within the economies of scope model[2]. If we interpret the concept broadly, we have to include everything that makes it cheaper to produce or market products jointly. We need to distinguish between economies of scope arising at the level

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1 If, as was discussed in Chapter 1, transaction costs imply that renting or selling the excess capacity is not a feasible option.

2 As discussed in chapter 1 and as used both in the theoretical analysis of chapter 2 and in the statistical analysis of chapter 3.

of production costs (those normally emphasised in the literature) and those arising at the level of marketing costs.

Regarding production costs, technological economies of scope may arise because of the existence of by-products that can be used in other production lines, because of common inputs, or because of the availability of machines with excess capacity at some stages of production. These types of economies may arise at different stages in the production process.

As to marketing costs, we first note those brand name economies of scope which reflect the fact that advertising costs for one product can be "shared" with another, having the same brand name. I.e., if the first is a successful product, the second might need lower advertising expenditures since it benefits from the success of the first. The role of this type of economy is likely to be important only for the largest firms, in that only a quite small number of firms support nationally recognised brands.

A second kind of marketing economy arises when the distribution network of the firm can be profitably shared across more than one product. This is so if the distribution network, a fixed asset for the firm, exhibits excess capacity: this case we label distribution economies of scope. Again, unlike production economies, the role of distribution economies of scope is likely to be relevant only for the largest firms, for only a tiny fraction of Italian firms enjoy a widespread distribution network (most of them distribute their products via independent distributors).

In chapter 3 it emerged that the first set of factors (technological economies of scope) sufficed to describe diversification patterns in the broad run of Italian and British food firms. Here we claim that the further economies just described, and in particular distribution economies, are relevant in explaining diversification activities of the largest firms. It is also claimed that this accounts - at least partially - for the different diversification patterns of these large food firms as compared to the typical diversification pattern that emerged from the statistical analysis of chapter 3. To put the point another way, we shall see how the diversification histories of the firms considered in this chapter are rather atypical of the general run of Italian food firms. We conclude that the statistical analysis (as it was performed in chapter 3, without weighting for firms' size) is useful in uncovering diversification patterns among small and medium size firms, but a different approach needs to be taken in discussing large firms. Some economies of scope may be quantitatively unimportant except at very large scales.

We first describe the firms' histories and activities and then go on to consider in turn each of the listed reasons for diversification. We shall see whether and how each one is relevant in explaining the firm's diversification and, where appropriate, how it compares with other firms. We discuss some other possible reasons for diversification that might be considered relevant. Finally, we compare these findings to the results of the statistical analysis of chapter 3.

3. The Firms' Histories

The following case studies are based on four Italian food producers: Egidio Galbani S.p.A., Parmalat S.p.A., Barilla S.p.A. and Star S.p.A.. The reasons for choosing these firms lie in their peculiar diversification histories, which are outlined in the next section. They are all large firms in the food industry (respectively the 3rd, 6th, 5th, and 12th, in terms of total sales in 1991. Two of them (Galbani and Barilla) are diversified into related markets, the first producing cheese and salami, the second pasta and biscuits. One (Parmalat) is diversified into more distant activities (milk, fruit juice, processed tomatoes, biscuits). Finally, Star is a firm which has been extremely diversified since its earliest days.

We briefly summarise their histories before looking at the main factors driving their diversification (and non diversification) strategies.

3.1 Galbani[3]

Galbani was founded in 1920 by Egidio Galbani and his family, as the successors to a small cheese producer/seller in the area of Lecco. The firm built plants in Melzo (Milan), Certosa (Pavia), Corteolona (Pavia) and Casale (Cremona), with approximately 30/40 employees each. A large distribution network was rapidly built up with salesmen directly employed by the firm.

Along with other cheese producers, Galbani also raised pigs on a farm near the cheese plants, some by-products of cheese production being used to feed the pigs. Until the war the firm used to raise pigs to sell them. After the war Galbani entered the salami and pork meat market with separate plants.

3 What follows is bases on information obtained from Mediobanca, R&S, Company reports, Milano (issues from 1977 to 1991), hereafter R&S; interviews at the company and daily business/financial newspapers.

Galbani also produced other dairy products, albeit in smaller quantities: butter, yoghurt, cream (and a very limited amount of milk).

In the meantime the original owners had sold some share of the firm to others. Following some internal disputes these shareholders left the firm to found Locatelli (now a competitor to Galbani, which was later acquired by Nestlè). By the 1960s the other shareholders had sold the firm to five foreign financial companies[4].

In July 1989 Galbani was acquired by IFIL (Fiat Group), who later sold 35% to BSN. In December 1990 IFIL sold a further 15% to BSN. In 1990 BSN, through Galbani, acquired Agnesi, a pasta producer. In June 1992 BSN acquired 10% of IFIL's remaining holding of Galbani shares, and in 1993 another 10%; the remaining 30% will be transferred in the near future[5].

Both of the markets in which Galbani operates are extremely fragmented. The cheese market is the more concentrated of the two (the four firm sales concentration ratio is approximately 30% but there are approximately 2000 of firms in the market[6]) and has higher brand consciousness. Galbani sells a large number of differentiated products in the average quality-low price range. It has always been the market leader and currently has a market share of approximately 17%[7]. In the late 1960s Galbani advertised heavily in the cheese market, creating a very well known image (the brand Bel Paese was advertised with the sentence "Galbani vuol dire fiducia" (Galbani means trust) which is still familiar today). Later its advertising expenditures fell to approximately 0.5-1.5% of total sales, as compared to 11-15% for Kraft, the second largest producer[8]. This reflects the fact that Galbani's main customers are cheese shops, which are not very sensitive to advertising, and sell unbranded products[9] [10].

In the salami market brand consciousness is basically absent. The market is very fragmented (CR4 is less than 15%) with Galbani being the second largest producer with approximately 3.5% of the market[11]. The new management plans to launch the salami products under a new brand name distinct from Galbani.

The main strength of the company has always been the distribution network, which in the cheese[12] market is essential. With its system of "tentata

4 Source: company interview.
5 Source: Sole 24-Ore, various issues, R&S.
6 Source: Databank.
7 Source: Databank. See Appendix.
8 Source: Databank.
9 This is the view reported in interviews by the company's management.
10 Since Galbani's recent acquisition by BSN, advertising expenditures have increased.
11 Source: Databank.
12 And more generally in the fresh products markets.

vendita" (direct sale) Galbani was always able to reach the entire country with much higher frequency and lower unit costs than its competitors[13]. Salesmen with refrigerated vans visit all the sales points (approximately 140,000) to sell them what they need directly, rather than taking orders for fixed quantities. This system generates immediate cash from sales and gives a high turnover of products. It is one of the reasons for the strong liquidity position of the Galbani company[14]. The recent changes in the Italian distribution sector (where concentration has been rising) have not affected the company yet[15]. Galbani sells approximately 50% of its output through supermarkets but generally it supplies their salespoints directly (rather than delivering to central depots).

Galbani also produces for the foreign own-brand sector: for example it produces mozzarella, ricotta, mascarpone for all the major British supermarkets.

The reason why it has never entered other product markets, according to statements by the company's management, is mainly because its distribution network can only be used to sell a limited number of different types of products. The management also thinks it better not to disperse its effort over too many products. The sales agent with his refrigerated van can expect to sell only three or four products to each small shop. Widening the number of products offered would not be expected to lead to a proportionate increase in sales.

Financial management has always been a high priority for the company. Galbani has always had ample liquid funds and an important share of its profits came from its holding of government bonds[16].

Galbani sales and profits/sales[17] for the years 1972-1990[18] are shown in Fig. 4.1 (in logarithmic scale). Over this entire period Galbani did not diversify its activities beyond its two basic businesses.

13 Source: company and food experts interviews.

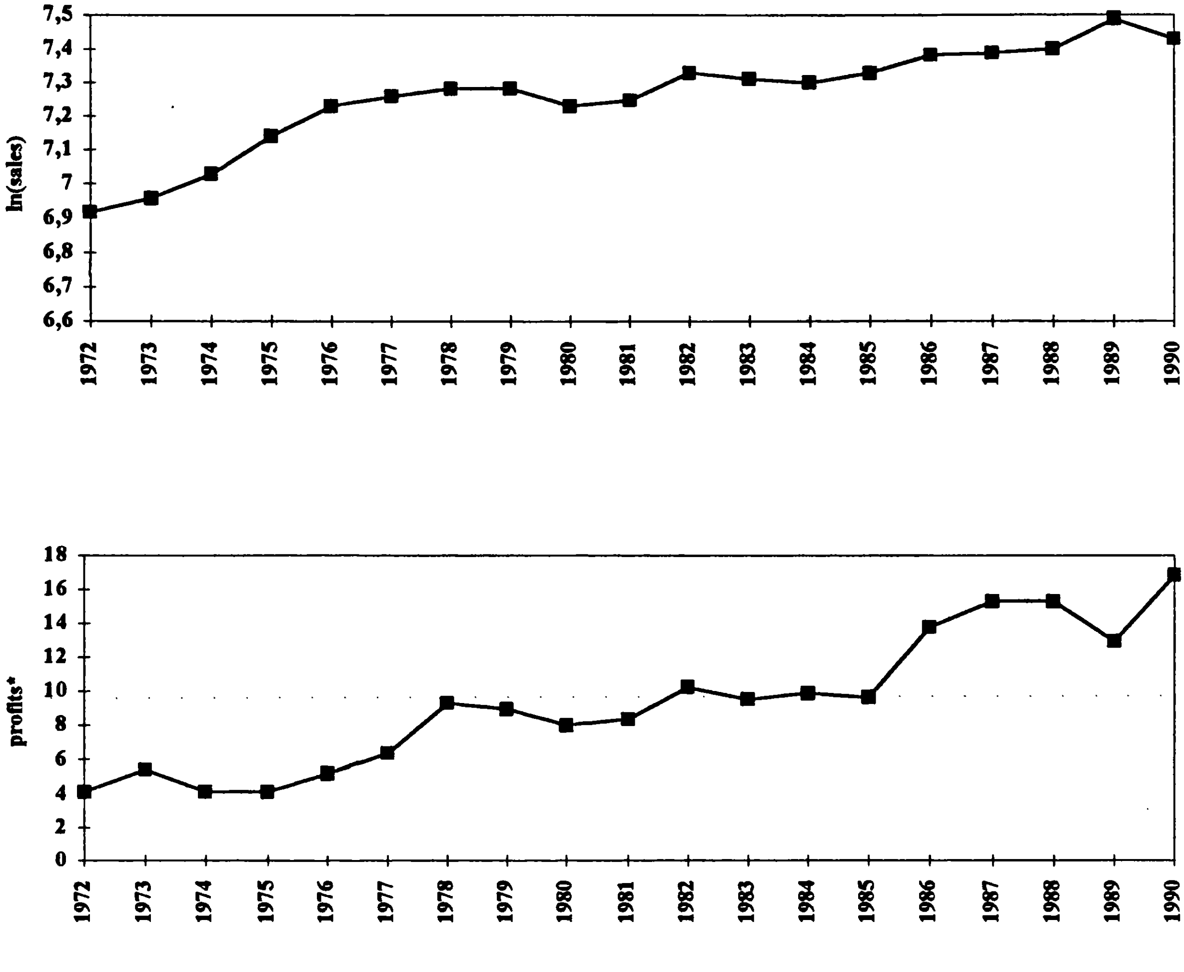
14 Source: Databank.

15 As reported in interviews with management.

16 Source: Databank, food industry experts, balance sheets.

17 Measured as the difference between sales and operating costs, in order to isolate the results of the company's industrial activity from its returns from other activities (holdings of financial assets, etc.).

18 Balance sheets with a standardised structure (hence comparable across firms) are available from 1972 (source: R&S, Milano, various issues).



* profits before depreciation, interests, taxes (as % of sales)

Fig. 4.1

3.2 Barilla[19]

Barilla was founded in 1875 in Parma by Pietro Barilla (grandfather of the current owner) who owned a bakery making bread and pasta. By the end of the century the Barilla family was producing 50 kilos of pasta per day. In 1919 production was up to 30 tons per day and the firm had 300 employees.

During this period, much attention was devoted to other production methods (Barilla personnel frequently visited Germany to study bread

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19 What follows is based on information obtained from R&S publications (issues from 1977 to 1991), Barilla internal publications, Databank, interviews with company management and food industry experts.

production there), to distribution methods (the company's products reached most Italian cities and the Italian colonies), and to questions of company image[20].

During the war period the difficulty of buying raw materials and the fixed per capita quota system led to reduced production and a fall in quality. Between 1943 and 1945 the bakery was taken over by the Germans, and from 1945 to 1946 by the Americans.

After the war Riccardo Barilla, the son of the founder, left the direction of the company to his sons Pietro, who was in charge of the sales department, and Gianni, who was involved in the production area.

After the reopening of free markets in 1948 the number of pasta producers increased from 1000 to approximately 2000. Competition, accordingly, became extremely tough. Barilla in 1952 abandoned the production of bread, and concentrated on pasta. Up to this period pasta was sold unbranded and unpacked. Barilla was the first to introduce packaged and branded pasta with a very successful advertising campaign ("Con pasta Barilla è sempre domenica" - with Barilla pasta it is always Sunday) and became the first Italian industrial pasta producer[21].

In 1965 a new plant was built in Rubbiano di Solignano (Parma). At that time the sales network reached 100.000 sales points. In the same year Barilla also began the production of bread sticks and rusks.

In the mid '60s Barilla lobbied heavily for the introduction of legislation requiring a minimum percentage of durum wheat in the pasta, as well as specific standards for packaging (the law was passed in 1968). This represented a substantial barrier to entry for many small producers, especially in the South, where soft wheat was often used to produce pasta. Moreover the new packaging standards required plants that most of the small producers did not have. The result was an increase in the standard quality of the product and the feasibility of a more organised distribution system (thanks to packaged products). However in the medium-long term it made the product more homogeneous and increased price competition[22].

The year 1968 was one of the most critical in the history of the company. Its expansion plans led Barilla to build a plant which (for the time) was extremely large. The plant was located outside Parma, in Pedrignano, with completely new machines that could produce up to 900 tons of pasta per day[23].

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20 The horses owned by the family were well known, and at that time generated the kind of publicity associated with football league sponsorship today.

21 This information come from internal publications.

22 According to the company's management, as reported in interviews.

23 According to the management there were large brand name economies of scale that could only be reaped with a larger size.

The plant was a technical success[24], although its cost was twice as high as planned (it amounted to 18 billion liras while Barilla's annual sales revenue was 36 billion liras) which led to a substantial increase in the debts of the company. Other difficulties arose; the main competitor (Buitoni), conscious of Barilla's difficulties, began a very aggressive marketing policy. Moreover, in 1968 the political and social situation in Italy was extremely tense. In 1971 the Barilla family finally agreed to sell to the American company Grace. Grace Foods was a holding company which owned plastic, fertilisers, oil, sugar and food firms. In 1966-67 it had started an acquisition campaign in Italy and Europe. In Italy it had already acquired Tanara[25], and had been interested in Barilla for some time. In February 1971 Grace acquired 75% of Barilla and left 25% in the hands of the Barilla brothers who maintained their positions in the company for a while, but left in 1972.

With Grace a new expansion period began, in line with the strategy of the parent company. The company's internal organisation was greatly modified and improved: marketing, market research and new financial and administrative methodologies were introduced[26].

The very high inflation rate in Italy at the beginning of the '70s led the government to freeze some prices in 1973. Among them was the price of pasta[27]. This reduced Barilla's profitability and[28] constituted the initial impulse for diversification into other markets[29]. The choice of which product market to enter, according to Barilla's management, was driven by several considerations: it had to be a large market with growing demand; it should not be too concentrated, but should have high unit margins; finally it should complement the strengths of the company, allowing it to exploit synergies in sales and distribution (and possibly inputs). Market research revealed that there was scope to revitalise the bakery products industry in Italy with new and different images, and a new name. The production of biscuits would allow the firm to exploit its distribution network, which had excess capacity.

Barilla did not initially produce biscuits itself. There was excess capacity in the biscuit industry and Barilla used various small producers for its new biscuit line (Mulino Bianco) which was launched at the end of 1975. After

24 It is still working well today and has never been modified except for the opening of a new plant to produce biscuits.

25 An ice cream producer, owned jointly by the Tanara, Barilla and Marchi families.

26 Source: company interviews.

27 Prices were first frozen, then regulated, which meant that they could rise in response to increases in costs but only if these increases were clearly proved. Finally they were "supervised", i.e. controlled by national authorities. Only in 1978 every form of price regulation disappeared.

28 Together with the more general strategic objectives of Grace.

29 See the case "Mulino Bianco", Bocconi University, 1988.

various experiments the "right" image (linked to tradition and non-sophistication) was found. It was supported by a strong marketing campaign[30], and it was an immediate advertising success[31].

In 1976 Barilla began producing bread sticks under the Mulino Bianco brand name and converted the brand name of the Barilla rusks into Mulino Bianco. Shortly afterwards pastries and industrial patisserie were introduced.

Meanwhile, Barilla's parent, Grace, was facing difficulties in the European market and a series of financial problems, which eventually caused it to abandon its project of creating a large European food conglomerate. The last of its European acquisitions to be sold, in July 1979, was Barilla[32].

Pietro Barilla, then 66 years old, bought back 25% of the company through Finbarilla (a financial company) with an option to buy the rest by 1987. The remaining 75% was owned by the Dutch financial company Relou. In 1980 Finbarilla incorporated Barilla and took its name. In 1987 the Barilla family acquired the remaining 26% which gave it control of the company (the rest is still owned by the Relou Italia financial company)[33]. Over the same period, Barilla extended the production of biscuits to its Pedrignano plants[34].

Barilla's entry in the biscuit sector was extremely successful. The company was highly innovative, and it developed a strong brand image. The other companies in the sector did not at the time realise the change in strategy which Barilla's activities represented[35]. Using its pasta distribution network allowed Barilla to achieve a reduction in unit cost.

At the beginning of 1988 Barilla tried to acquire 40% of Lustucru-Rivoire et Carret, the second French pasta producer (with a market share of 30%, after Panzani of BSN), but the acquisition failed because of the opposition of the majority shareholder[36].

In 1989 Barilla adopted a holding structure, and separated the activities related to pasta, ready sauces and bread sticks, now performed by Barilla Alimentare, from those related to bakery products, now organised under Barilla

30 Which also used for the first time the idea of distributing presents to customers who had collected enough proofs of purchase.

31 "Mulino Bianco", Bocconi, 1988.

32 Source: company interviews.

33 Source: Barilla internal publications.

34 However it was only after the acquisition of Pavesi with its biscuits plants that internal production came to account for most of Barilla's sales.

35 The sector was still relatively fragmented; Saiwa was Barilla's main competitor.

36 Source: La Repubblica, 15.1.88.

Dolciaria, both owned by Barilla. Barilla Alimentare Dolciaria is the distribution and sale company owned by the two[37].

In 1989 Barilla began a series of acquisitions in the fresh bread sector, acquiring Giannotti, Buralli and Panem[38], which now use the Barilla distribution network[39]. Barilla is now the market leader in the Italian bread industry.

Subsequently it launched a new line of ready tomato sauces, with an innovative process (labelled 'mild technologies')[40]. Finally, at the beginning of 1990 it entered the fresh pasta sector. This is a growing market, where the leader (Rana) has a very strong brand image. Investments have been high because production methods differ from those for dry pasta. The competition according to the management is still very strong.

In October 1990 Barilla acquired 49% of Pavesi (owned by Alivar, of the SME company) which produces biscuits and crackers, and in June 1992 the remaining 51%[41]. In January 1991 it acquired 25.5% of Nuova Forneria (owned by Alivar) which produces snacks.

Sales and profits/sales for the years 1972-1990 are shown in FIG. 4.2 (in logarithmic scale), with the dates of diversification or contraction.

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37 Interviews with food industry experts suggested that this in some cases has created competition between the two companies vis-à-vis the distribution outlets (in terms of shelf space for products).

38 Without replacing their management.

39 Source: CESCOM data on acquisitions in the food industry.

40 That preserves the original taste and characteristics of the products.

41 Source: Milano Finanza, 1.5.92.

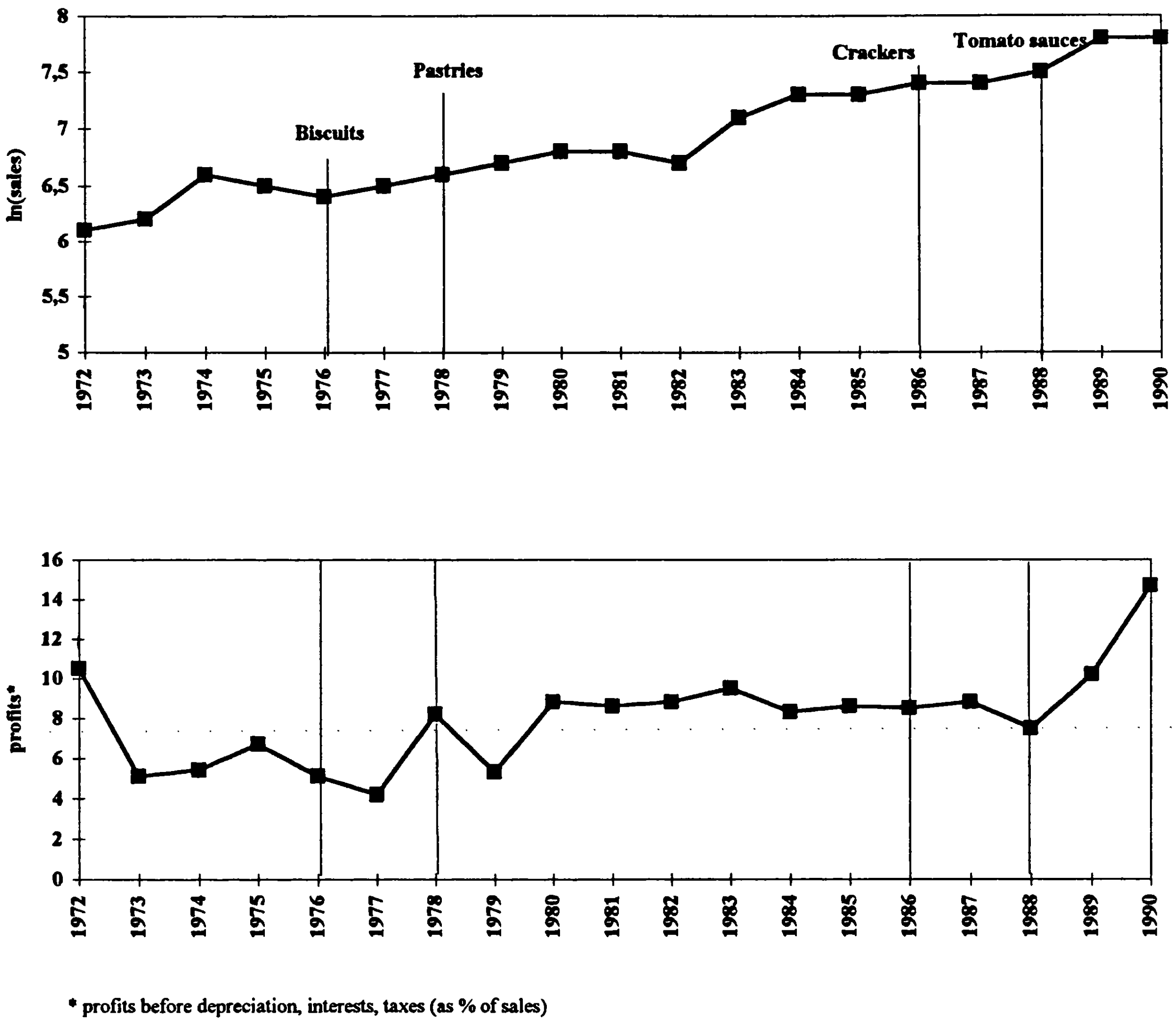

Fig. 4.2

3.3 Parmalat

The company was founded (as Dietalat-Latte dietetici parmensi) in 1961 in Parma by Calisto and Anna Maria Tanzi. The Parma area had a long tradition in the production of hams and parmesan cheeses and the grandfather of the current owners operated a small firm for the slaughter and maturing of pigs where he produced hams and salami[42]. When Calisto Tanzi inherited the firm, he decided to move out of this market, which was extremely fragmented and

42 Source: company interviews.

lacked any brand awareness. He began by producing milk in paper cartons[43]. In Italy at the time milk was distributed only by the Centrali del latte (publicly owned) and was basically considered an urban service. Dietalat began producing fresh milk sold in so-called tetrapack. Originally it was distributed only in Parma, but later also in the Tirrenic coast area (La Spezia).

In 1966 the firm started producing UHT (ultra high temperature) milk (i.e., long life milk). This was an important innovation in the Italian market, since it allowed the consumption of milk in those areas that previously could not be reached by the distribution of fresh milk, especially the South of Italy. The launch was also based on an aggressive policy within the trade, in that it involved promoting long life milk as opposed to fresh milk. This was facilitated by the limited competition from publicly owned fresh milk producers. For the first time in Italy milk became a branded product[44].

The wide distribution of the product led to a large distribution network, which was fully developed by the mid '70s. It was based on an indirect sales force ("concessionari") who bought the products from Parmalat for resale.

Soon the firm began to expand into other product markets. Initially it expanded into markets sharing inputs with milk: in 1969 long life cream, in 1972 yoghurt, in 1974 cheeses. The last one however proved a difficult market; highly segmented and fragmented, it needed a large and dedicated distribution network to cover the national market, and it always remained a minor product. In 1976 Parmalat began producing desserts (which shared part of the inputs, machinery and distribution system with yoghurt) and in 1979 packaged industrial bechamelle[45] [46].

In 1981 Parmalat began its "new" diversification program, outside its original (and related) market. First it introduced fruit juices in paper cartons. Fruit juices as such were not sold on the Italian market at that time. Nectars[47] were the only fruit drinks and they were sold in bottles[48]. The production "shared" the machinery and packaging with milk and some of the other dairy products. Secondly, in 1982 it began producing processed tomato ("passata") in paper cartons (again an innovation in the Italian tinned tomatoes market). This

43 It seems that the idea came after a trip to Sweden where paper packaged milk was already used at the time.

44 Source: company interviews.

45 Which previously did not exist as an industrial product.

46 Source: Parmalat publications.

47 The difference between nectars and fruit juice is that the former has up to 40% of fruit content; juices need to have 100% fruit content.

48 Though Zuegg had produced some paper packaged nectars.

shared only the last part of the production process with the other products. The same year it began producing paper packaged wine[49].

In 1984 Parmalat entered a very different market; that of biscuits and bakery. In this case there was no apparent synergy in technology with any of the previous products. The decision was taken after market research showed that the pastries and biscuit market was growing rapidly (17-18% a year), that most of the incumbents were not very aggressive producers, and that Barilla, the market leader, was very strong but not likely to be able to supply the entire market. Parmalat assumed that its new biscuits and pastries line, sold under the 'Mister Day' brands would be perceived by consumers as a complement to its main breakfast product (milk)[50].

The product has never been very successful. The competition from Barilla[51], and the use of a distribution network designed for fresh products[52] were all factors that, according to the management, made the product less successful than expected[53].

Later Parmalat introduced other products with an innovative image: packaged dry bread ("focaccia"), mousses and vegetable soups.

Entry in all these markets was accompanied by the opening of new plants. Only in biscuits did Parmalat (like Barilla) begin by producing only a small amount itself until its market shares increased.

Following an unsuccessful attempt to enter the television sector with a television channel, ODEON TV, the company became strongly indebted and a large part of its cash flow was absorbed by interest payments: in 1989 debts amounted to approximately 550 billion liras (revenues were 800 billion liras)[54]. In 1988 Parmalat sold its shares in Odeon TV and was approached by Kraft who offered to acquire the company. The proposal was not accepted[55].

In 1989 C. Tanzi acquired Finanziaria Centro Nord (a financial company in which he had some shares) and transformed it into a holding company to own Parmalat: a major capital increase was organised with the support of an investment bank (Akros). Finanziaria Centro Nord increased its assets from 100 to 680 billion lira. The largest shareholders were Tanzi (56%), Akros (5%), Morgan Stanley (3%), Credit Agricole (2%) and Eridania (3%). Finanziaria

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49 Source: Parmalat publications and company interviews.

50 Source: company and industry experts interviews.

51 Just before the launch of the product, Barilla pre-empted its sales to supermarkets by filling shelves with its biscuits sold at a discount.

52 Moreover according to some analysts the quality of the product was lower than Barilla's.

53 After a while the distribution networks were separated.

54 Source: Milano Finanza, 28.7.90.

55 Sole 24-ore, 4.9.88.

Centro Nord changed its name to Parmalat Finanziaria and acquired control of Parmalat with a 70% holding[56] [57].

In 1990 Parmalat restructured its sales organisation (the largest in the food sector after Galbani) which is now grouped in three lines: 360 sellers for the bakery line, 410 sellers for fresh products, and nearly 1000 for milk[58].

Parmalat is now moving back to its core business and is expanding in the fresh milk sector. This is still a relatively fragmented sector. The leader is SME, with a 10% market share, while Parmalat has 1.7% of the market[59]. The market is currently undergoing major changes since a large number of Centrali del Latte are being privatised. Parmalat has distribution agreements with the Centrale del Latte of Taranto, and has acquired Centrale del Latte of Genova (Nov. 1991), and of Como (Jan. 1992)[60]. In March 1992 Parmalat has acquired also 30% of the Giglio group (which has 7% of the long life milk market)[61]. It is now expanding its milk and tomato sauces plants in the South, where it was previously producing essentially bakery products.

In August 1992 Schroder acquired 3.26% of Parmalat Finanziaria. Accordingly the current ownership structure of Parmalat is: Tanzi family owns 51.4%, Akros 5%, Schroder Inv. 3.26%, Eridania 3%, Credit, Agricole, 2.2% and others 35.14%.

Sales and profits/sales of the company for the years 1976-1990 are shown in FIG. 4.3 (in logarithmic scale), with the dates of diversification or dediversification.

56 This indirectly implied that Parmalat was quoted on the stock market through Parmalat Finanziaria.

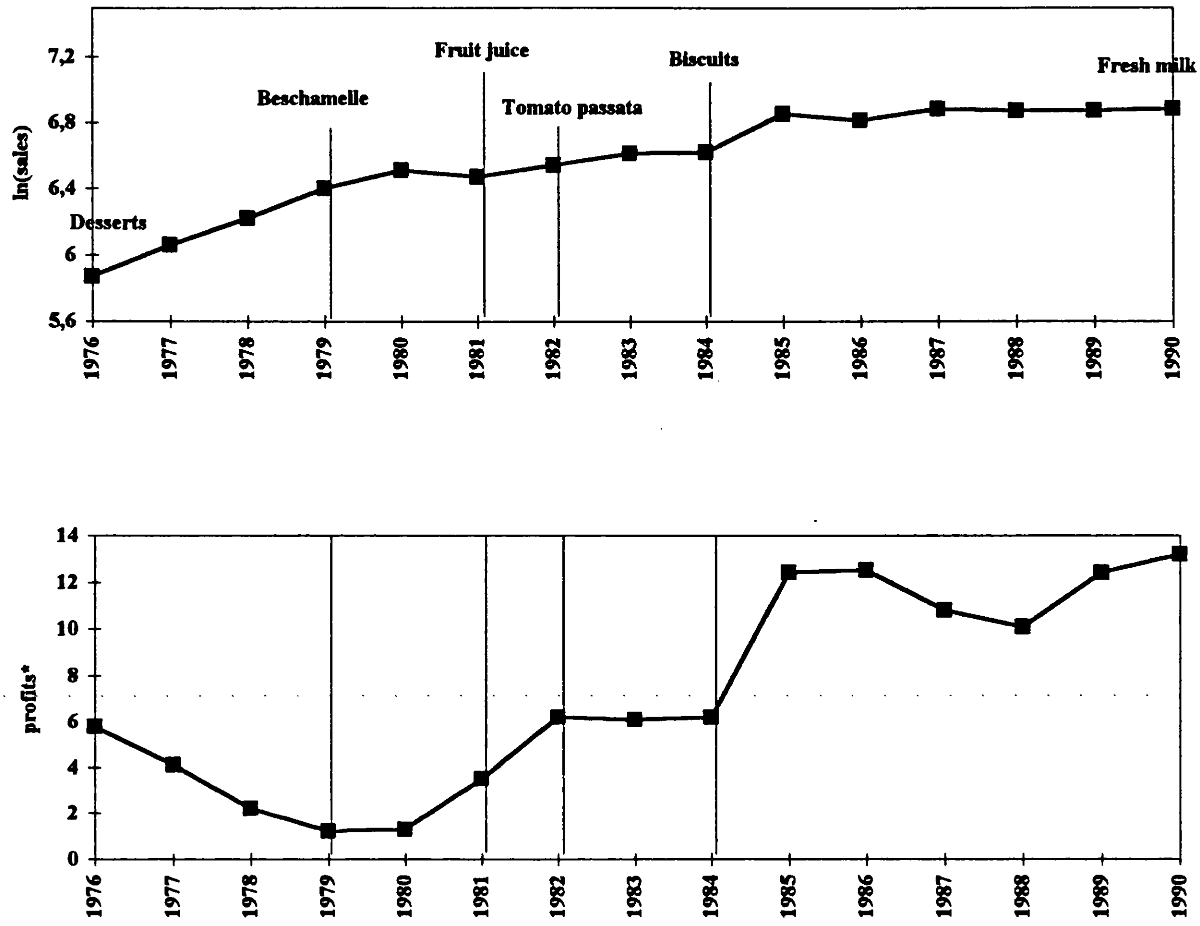
57 La Repubblica, 21.9.89; 20.12.89; Mondo Economico, 28.10.89; Sole 24-Ore, 14.7.90; 20.7.90.

58 Source: Databank.

59 Source: La Repubblica, 8.2.91; Corriere della Sera, 11.9.91; Sole 24-ore, 13.11.91.

60 The company aims at acquiring more of them. Centrale del Latte di Roma and Centrale del Latte di Milano will be probably soon privatised and are the major objects of interest.

61 Sole 24-ore, 26.3.92.



* profits before depreciation, interests, taxes (as % of sales)

Fig. 4.3

3.4 STAR

Star was founded by Danilo Fossati in 1948 and produced canned meat in a small plant in Muggiò (Milan). Almost immediately Fossati began the production of stock cubes (Dadi Star). With this product the firm became well known and grew rapidly; the market for stock cubes grew with the company. Since the beginning, the company's main strength was its extremely well developed distribution network, with hundreds of salesmen visiting a large number of shops at regular intervals. Star became one of the first large food companies in Italy, and was able to build up a strong brand image[62]. In 1962 the firm was already active in a large number of markets (margarine, tea, soup preparations and flavouring powders[63]. It had a relatively strong presence in the South and was still growing rapidly. By 1970 it was also producing canned tomatoes, marmalades, tuna, coffee, mayonnaise and water powders[64]. It had opened new plants in Corcagnano (Parma) to produce canned tomatoes, and in Sarno (Salerno) to produce tuna, tomatoes and jam.

In 1971 SME-Società Finanziaria Meridionale acquired 50% of Star, but Fossati maintained the management of the firm[65]. With the payment from SME, Fossati created a holding company, FINDIM (with 10 billion of capital) which owned 50% of STAR.

In 1972 SME, through STAR, acquired Società LUIPA, active in beverages preparations, which was subsequently incorporated into STAR. It also acquired Mellin d'Italia from the Mantovani family[66]: Mellin produced baby food and the Mantovani soaps and shampoos for delicate skin, in Carnate (Milano) (the company was incorporated in STAR in 1977).

By 1977 Star also produced ravioli, barley, camomile, preparations for home made pizza and seed oil, all in Agrate[67]. Star distributed products for foreign companies (one of the most important was Kellogg's' cereals) and was producing for the catering and industrial market as well.

In 1985 FINDIM bought back from SME its 50% share in STAR. The company subsequently began a reorganisation plan involving the creation of six divisions with separate commercial and sales organisations, a process which took two years and implied heavy investments[68]. The divisions are:

- a consumer products division, the most important in terms of sales, which manages the production and sale of consumer food products. It has two separate sales forces, one selling "agricultural related" products, the other "industrial type" products;

62 Source: company interviews.

63 Kompass, 1962.

64 Kompass, 1990.

65 Source: Ori, 1974. SME was created in 1899 as Società Meridionale Elettricità and was active in the electricity sector until 1962. In 1963, after the nationalisation of electricity, it became a financial company. The sum received for the electricity activities was invested mainly in the food industry. It is now owned by IRI (the largest state owned holding) and owns Alivar (a holding company with activities in biscuits, crackers, panettone, snacks, chocolate and sugar confectionery), Bertolli-Cirio-De Rica (olive oil, tomato sauces and milk), Italgel (frozen food, ice-cream), G.S. Generale Supermercati (supermarket chain) and Autogrill (motorway bars and restaurants) (R&S, various issues).

66 Mellin was a company of English origin, established in Italy in 1935. Managerial mistakes by the heirs of the Mantovani family had led the company into a crisis. The company's creditors forced the family to sell to a financially stronger group. After some contacts with Gerber and Plasmon-Heinz they decided to sell to Fossati (Ori, 1974).

67 Source: Kompass, 1977; R&S, 1977.

68 Source: Star, Balance sheets, 1986, 1987.

- a catering division, which organises the production and sale of over 100 diverse products covering all aspects of meal preparation, and which has its own distribution network;
- an industrial product division, producing and selling raw material for other firms, with two sales channels, one selling intermediate products, the other selling materials for bakery, confectionery and ice-cream;
- the Mellin division, which sells babyfood products;
- the Mantovani division, which sells soap and shampoo;
- an international division, with two separate organisations for the overseas sale of its own brands and third parties' brands[69].

The distribution system has also been reorganised and the number of sales agents increased. The most important customers (supermarket chains) are now dealt with directly, while retail distribution is still organised through a network of salesmen[70].

In 1987 the company entered the fresh pasta market investing 10 billion lira[71]. In the summer 1987 FINDIM acquired 30% of Ponti, a vinegar producer with a 50% of market share. In February 1988 it acquired 35% of Monini, the market leader in olive oil[72].

In March 1989 FINDIM sold 45% of Star shares to IFIL and BSN[73]. BSN acquired 35%, IFIL 10%. In return FINDIM obtained 4% of BSN, becoming the third biggest shareholder of BSN after Lazard and IFIL, and 5.8% of ordinary shares of IFIL, becoming the second biggest shareholder of IFIL after IFI[74]. BSN and Fossati agreed on a joint venture to develop new markets (especially pasta, ready meals and biscuits) in Europe[75].

In December 1991 IFIL sold its shares of STAR to BSN[76]. Thus two holding companies currently hold Star's shares: FINDIM (Fossati family) hold 55% and BSN, 45%.

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69 Star originally founded branches in most major European countries, but subsequently closed them, and thereafter relied on the Italian sales organisation.

70 See Star, balance sheet, 1987.

71 Star, balance sheet, 1988.

72 Source: R&S, various issues.

73 IFIL is a holding company controlled by IFI, owned by the Agnelli family. BSN is a French holding company active in the food sector. BSN had already acquired Sangemini-Ferrarelle and Peroni-Whurer in Italy. It is co-operating with IFIL (which is its second largest shareholder), in trying to exploit the relatively low concentration level of the food industry in Italy and the fragmented and old distribution system. It also aims at competing directly with Barilla in the pasta sector (having acquired various Italian pasta producers).

74 Source: Il Mondo, 24 Feb.-2 Mar. 1992.

75 BSN can use its distribution network to sell Star products abroad (in particular ready meals and tomato sauces).

76 Together with its holdings of Sangemini and Peroni.

During 1989 Kellogg's' broke its distribution contract with Star, which was due to end in December 1992[77]. In the same year a company called Italfresco was created jointly by Star and Gervais Danone Italia (50% Star, 50% Gervais) to produce and distribute fresh pasta[78].

In October 1991 STAR sold the plants and brand name of the Suerte coffee to Lavazza[79]: Suerte had approximately 2% of the coffee market[80]. It also left the fresh pasta market and closed Italfresco. Finally, in January 1993 Star sold its soap and shampoo division to the British company Reckitt & Colman.

Sales and profits/sales of Star for the years 1974-1990 are shown in FIG. 4.4 (in logarithmic scale), with the dates of diversification[81] or dediversification.

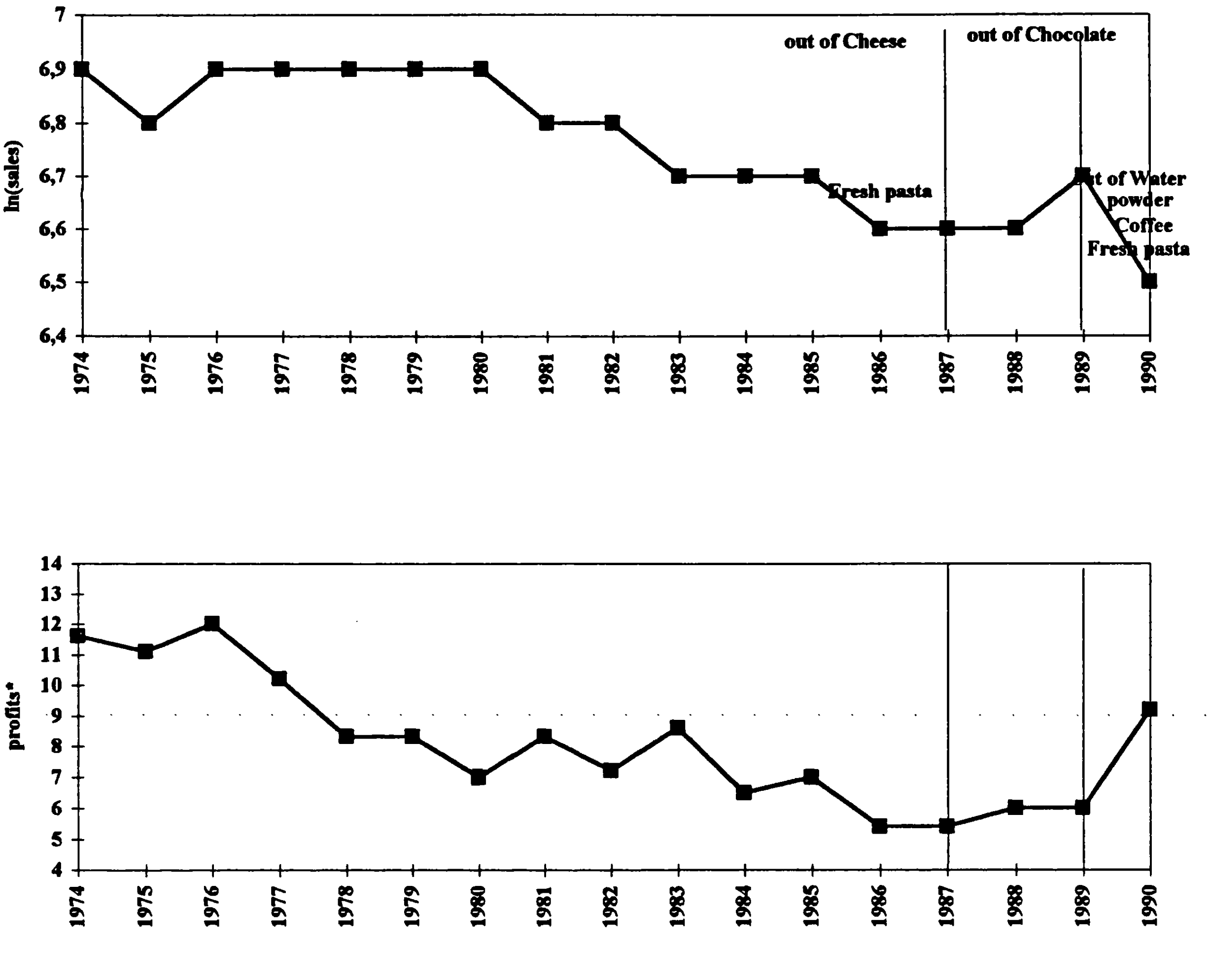
77 This might be related to the acquisition by Kellogg's' of GRAM, the only Italian cereal producer, in April 1991, and to the growing importance of modern distribution in Italy. With this Kellogg's' can easily deal with directly (without intermediation).

78 Star, balance sheet, 1989.

79 The first Italian coffee producer, which had already acquired Coinca and Bourbon from Nestlè.

80 Source: Il Mondo, 24 Feb.-2 Mar. 1992.

81 Since most of the diversification moves occurred before 1974 they do not appear on the Figure.



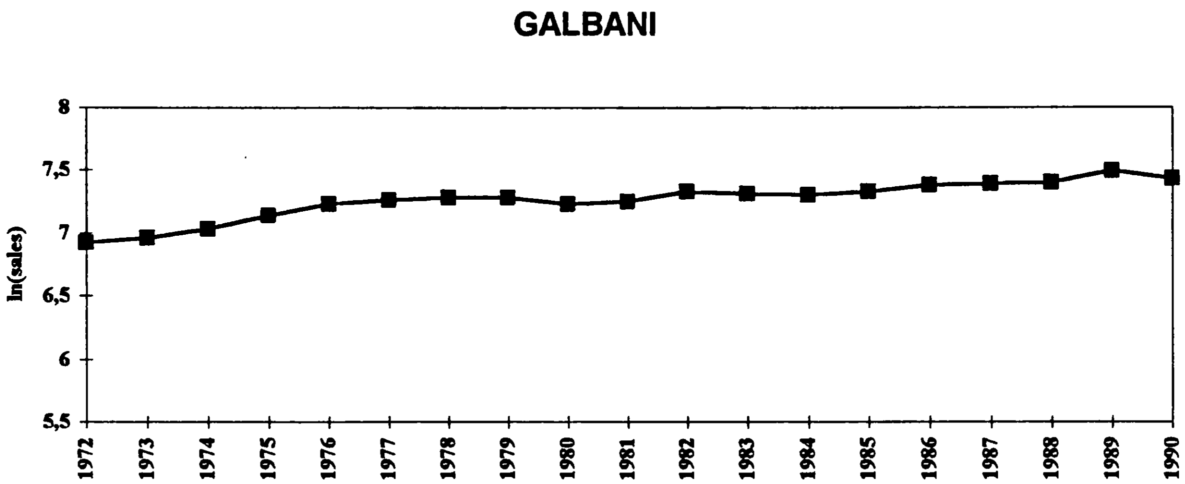
* profits before depreciation, interests, taxes (as % of sales)

Fig. 4.4

4. Diversification Analysis

In order to give an account of the diversification strategies of the firms, we summarise in Figs. 4.5-4.8 their diversification moves together with the postulated motivations. These figures do not constitute a complete picture, since a few of the diversification moves occurred before 1972. This is true especially of Galbani (which diversified after the war) and Star (which diversified before 1972). These other moves will be discussed in what follows.

Postulated reasons for diversification



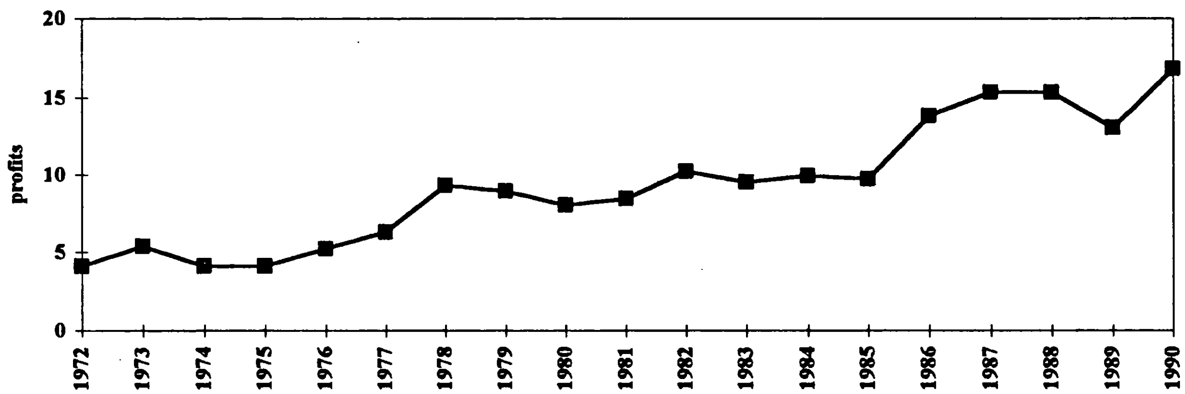


Fig. 4.5

BARILLA

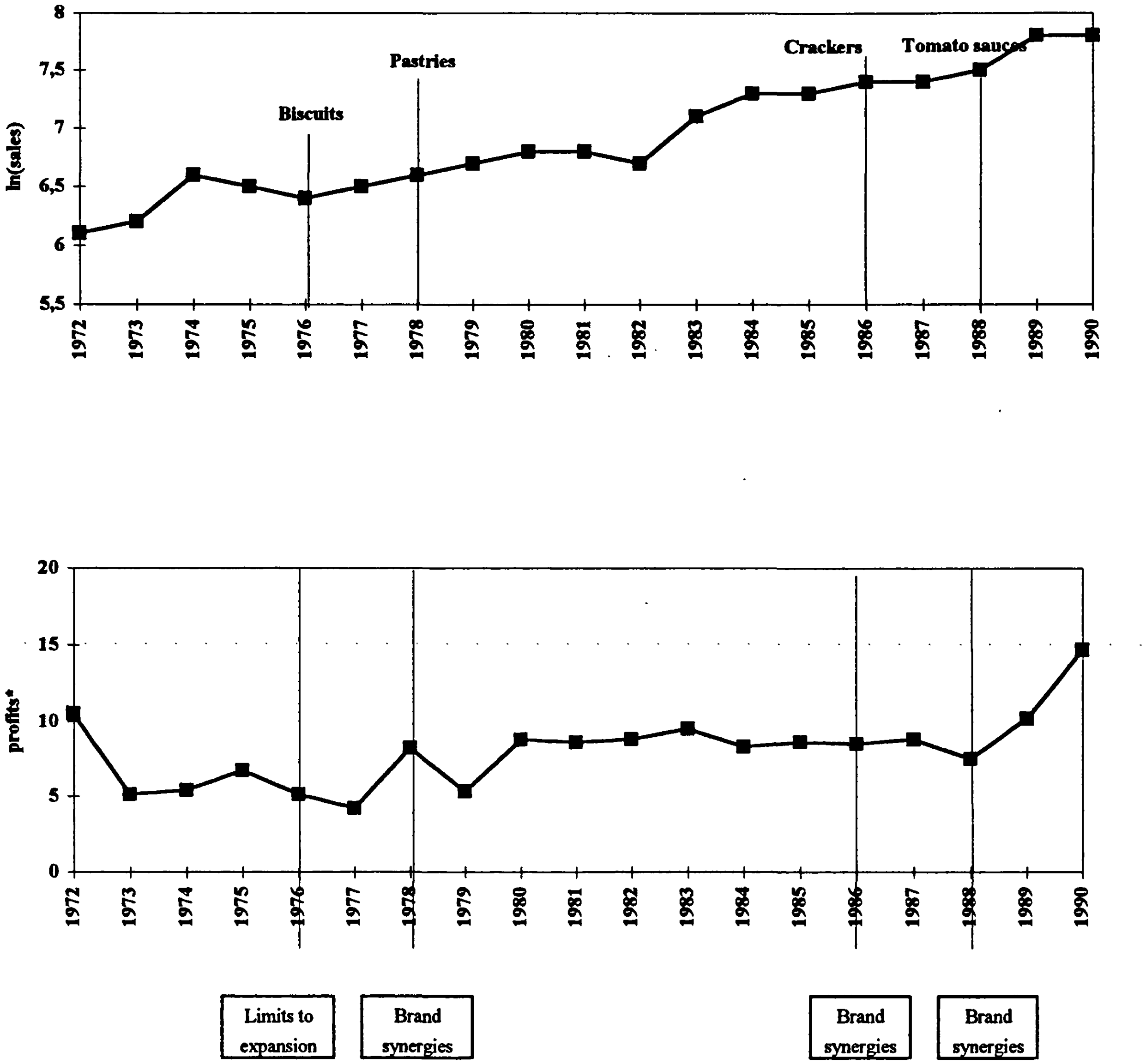


Fig. 4.6

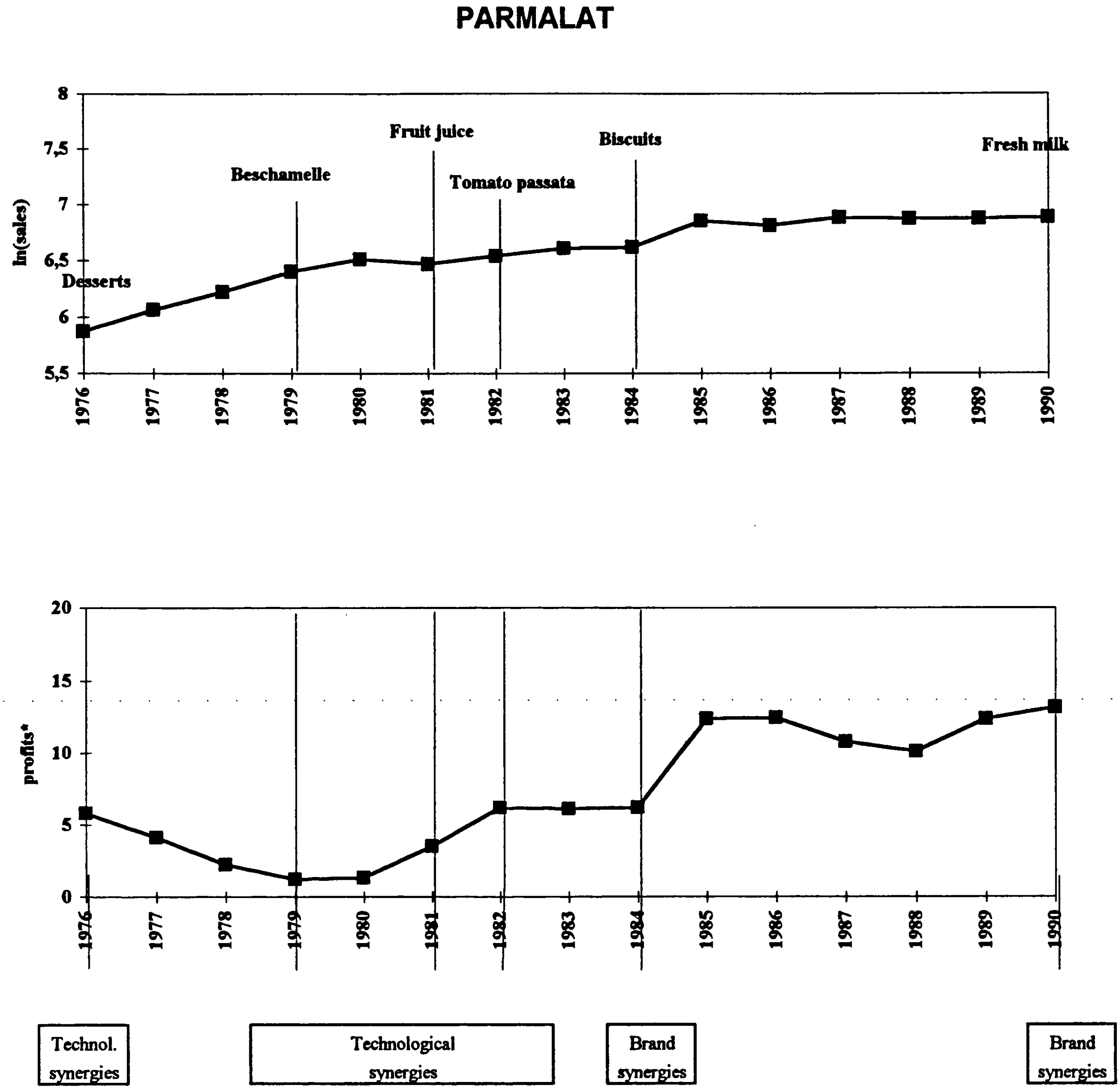

PARMALAT
ln(sales)
8
7,5
7
6,5
6
5,5
Desserts
Beschamelle
Fruit juice
Tomato passata
Biscuits
Fresh milk
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
profits*
20
15
10
5
0
Technol. synergies
Technological synergies
Brand synergies
Brand synergies

Fig. 4.7

STAR

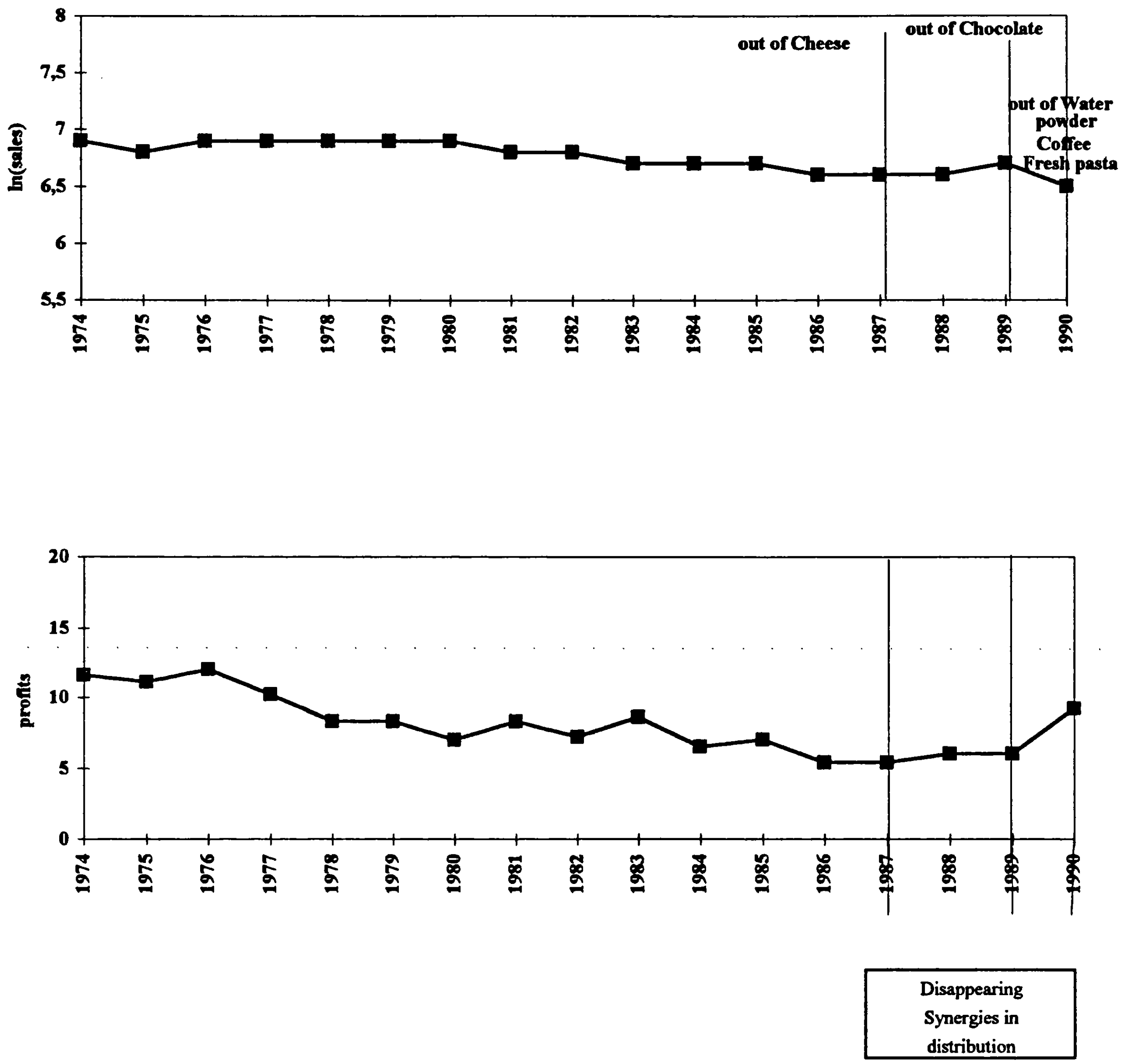


Fig. 4.8

We consider each of the diversification reasons proposed in section 2 in more detail and assess how well they account for diversification (or non diversification) of the firms.

Galbani was originally active in the cheese market. From this it moved into the processed meat (salami) market and into the yoghurt, butter, cream markets. While the second diversification move is typical if compared to our previous analysis (it occurs within the dairy cluster), the first move is more atypical since it spans two different clusters: the dairy cluster (milk, yoghurt, cheese) and the processed meat cluster (processed meat, poultry).

Barilla moved from the pasta market into the biscuit sector and then into the pastries, cracker and bread sector. Its first diversification move was atypical in terms of the clusters analysed in chapter 3, while the others were more typical.

Parmalat was originally active in the milk market. Its first diversification moves occurred within the dairy cluster, where it began to produce cream and yoghurt. But then it moved out of it and entered the fruit juice market, the production of processed tomatoes[82], and the biscuits market. Its activity spans at least three of the clusters identified in chapter 3.

Finally STAR is the most diversified and operates in most of the clusters of chapter 3, producing chocolate, processed vegetables, tea and coffee, and also stock cubes, margarine, tuna fish and other products.

We argue that this kind of wide diversification is special to very large firms and it reflects the fact that some types of economies of scope only emerge at relatively large firm size. We argue that 'within cluster' diversification is typical of those smaller firms active in the same market as these four large firms. Diversification 'across clusters' is induced by one of the three factors identified above as relevant to very large firms (constraints to expansion, brand name economies, distribution economies) or by special technological economies which only appear at large production scales.

We now consider each of the four motives for diversification proposed in section 2 (one push factor, three pull factors), and discuss how well they account for the diversification activities of the four firms.

4.1 A Push Factor: Constraints to Expansion

If the source of excess capacity is a factor of production specific to the firm and the market[83], the firm will try to expand within the same market, where it is most profitable. However there may be cases where this expansion is constrained: if the firm is already large relative to the market and the demand is rigid; if demand is either unstable or expected to decline; if antitrust regulations do not allow the firm to obtain a greater market share than it already has; if an exogenous constraint limit the profitability of the activity.

82 Which appear in the same cluster in the Italian dataset.

83 In the sense of Montgomery and Wernerfelt (1988), i.e., a factor that generates rents for the firm.

In these cases the firm will have the choice of either selling its excess capacity, or using it internally to produce a different product. When the factor generating capacity is highly firm specific (such as managerial ability), it is likely that transaction costs in selling it are high. The firm diversifies if a market close to the original one exists, so that the rents earned on the specific factor are not reduced excessively[84]. We expect to observe this move out of the market in cases where the firm has experienced high growth, but met some constraints that impeded further expansion[85].

Let us consider each firm in turn.

GALBANI: After expanding from the cheese market into the salami market, Galbani entered only other dairy markets. Both diversification moves can be explained by reference to economies of scope. Limits to expansions did not play any role. The firm has reached a market share of approximately 20% in the cheese market and approximately 3.5% in the salami market (see tables 4.1, 4.5 and 4.6 in the Appendix), but has not grown beyond that. Hence, even though it is one of the largest Italian food companies (the largest in 1989), it did not need to move out of these markets to grow[86] [87]. Moreover there were no obvious constraints to its profitability in the original markets. The same is true for the other product markets (butter, yoghurt, cream) where Galbani's market share is limited.

BARILLA: Barilla is[88] the market leader in the pasta market (see tables 4.2 and 4.7 in the Appendix). This was an extremely fragmented market, and began concentrating after the introduction of legislation specifying a minimum durum wheat content and requiring packaging[89].

At the beginning of the 1970's, when Barilla was acquired by Grace, its market shares in the pasta market were approximately 15% (in durum wheat pasta) and 25% (in the egg pasta)[90]. The firm was growing and there were

84 See Montgomery and Wernerfelt (1988).

85 In these cases the diversification move may reduce average rents.

86 For example, the growth (in nominal terms) in cheese sales of Galbani in the period 1983-88 (49.1%) matches that of the cheese market almost perfectly (46.2%) (see Appendix, table 4.1; source: Databank.). The difference is accounted for by a slight growth in market share from 19.2 to 20.9.

87 During its activity Galbani accumulated a large amount of cash. This was partially due to its "tentata vendita" distribution system, under which shops buy goods directly from sales agents for cash, rather than placing orders. This gives the firm much greater liquid funds than a system with orders. But since these funds are not specific capital or internal know how, they do not need to be reinvested internally. Galbani had a large part of its profits from financial activities, and more precisely government bonds (Source: R&S, various issues).

88 It has always been.

89 Source: company interviews.

90 See Appendix, table 4.2.

no obstacles to growth in the pasta market. As noted above, in the spring of 1973 the Italian government imposed "administered prices" for all goods in the "cost-of-living basket": pasta was among them[91]. The consequence for Barilla was a reduction in profits[92]. As noted above, this provided the initial impetus behind Barilla's first diversification strategy, in which it developed a position in the biscuit industry.

After this first diversification move, others followed. Barilla entered the snacks and pastries market and the crackers market. None of these entries was driven by the need to move out of the main markets. In 1978, when Barilla entered the pastries market, its pasta market shares were 16% and 25%[93] and the biscuit market share was only 7-10%[94]. The same is true for the crackers market, where Barilla entered in 1986, when its market shares in pasta were 28% and 40% and in biscuits and pastries were 26% and 34% (see Tables 4.2, 4.8, 4.9 in the Appendix).

PARMALAT: Parmalat began to produce UHT milk in 1966[95]. Being the first industrial producer of long life milk, it basically "created" this market. Its expansion was rapid and was limited only by the availability of a sufficiently wide distribution network. This covered the whole country by the mid '70s. In the meantime the firm was growing more rapidly than was the market for UHT milk. At the time this market size (essentially determined by the extent of Parmalat's distribution network) limited the growth of the firm, and company interviews suggest that this was one of the main reasons for the introduction of other ancillary products (long life cream in 1969, yoghurt in 1972, cheeses in 1974). The choice of products was influenced by the possibility of using some of the same machinery as was used for long life milk, as well as the same distribution network (all of the products initially were sold with a single network)[96]. Economies of scope in the use of inputs (mainly milk) were also present.

However subsequent diversification moves cannot be explained in these terms. When Parmalat entered the fruit juice, tomatoes and biscuits markets, it was not because of any constraint to expansion in its existing markets[97].

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91 See "Mulino Bianco", Bocconi, 1988.

92 Which decreased from 1973 to 1976 - with the exception of 1975 - and rose again only after then (see the Appendix, table 4.2).

93 And no obvious obstacle to growth was at work.

94 See the Appendix, table 4.2.

95 Company publications.

96 Both company interviews and trade publications showed this to be the case.

97 Market shares were not so large as to suggest this. See the Appendix, tables 4.3, 4.10, 4.11.

STAR: Star's first product (stock cubes) rapidly gained a large market share. The firm had pioneered the use of this product in Italy and it was growing in step with the new market[98]. Its growth was limited by the size of this market and the only route to faster growth lay in diversification. The choice of which market to move into was influenced by the possibility of distributing new products through the network that Star was building at the time.

We have seen that the push factor has provided the initial impetus for diversification in three of our four cases. In two of these cases it was linked to a fast expansion of the firm; in the third it originated in the reduced profitability of the main activity due to an exogenous shock.

4.2 Pull Factors: (a) Technological Economies of Scope

Technological economies of scope arise when indivisibilities in fixed (physical) capital induce excess capacity, or when the possibility arises of sharing some inputs. Here we consider the types of inputs used in the production of each good and assess whether some of these can be shared or whether by-products from the production of one good can be used as an input in the production of another. We also examine whether the type of machinery used gives rise to excess capacity from indivisibilities, as well as whether other possible sources of technological synergies (e.g. the type of packaging used) may be present.

GALBANI: Galbani's first diversification move was partly induced by the presence of economies of scope. These arose from the possibility of using a by-product of the cheese industry as an input for the salami industry. Only 10% to 15% of the milk used becomes cheese. Approximately 80% becomes "siero", a liquid with a high protein content, that is normally a waste product but which can be used to feed pigs[99]. Raising pigs near a cheese factory exploits the synergy. However this does not explain why the two products are sold together. Rather, this reflects distribution synergies, which are discussed below (section 4.3). The firm's other diversification moves (into yoghurt, butter and cream) are typical of the dairy cluster and may be explained both

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98 In Italy before the war there was no industrial market for stock cubes. The market was essentially created by Star.

99 Company interviews.

in terms of a common input (technological synergies) and of distribution synergies.

The firm's other diversification moves (into yoghurt, butter and cream) are typical of the dairy cluster and may be explained both in terms of a common input (technological synergies) and of distribution economies (see section 4.3).

BARILLA: We discussed above how Barilla's first diversification move was induced by a very specific push factor (a price control on pasta). The choice of the product into which Barilla diversified was determined by the presence of some synergies associated with the use of common inputs[100]. The importance of this consideration is arguable, however, in that pasta is produced with durum wheat while biscuits are produced with soft wheat; secondly, no other pasta producer entered this second market. We shall see in section 4.3 how distribution economies also played a role. Technological economies of scope do seem to have played a role in the later diversification from biscuits into pastries and then into crackers and bread. All of these used the same inputs and costs could be shared across more than one product[101]. Actually, these diversification moves are 'typical' as they fall within the bakery cluster[102]. Under this respect Barilla adopted an innovative strategy for the Italian standards, that only later was followed by other biscuits manufacturers.

PARMALAT: The first diversification moves of Parmalat, induced by its rapid growth in the long life milk sector, were into supply related markets. Long life cream, yoghurt, desserts and cheese shared with UHT milk the basic input, milk. Even if its price was fixed through regional bargaining, the knowledge of the input market and synergies in purchasing certainly determined the choice of the market. Moreover, for milk and cream the packaging was similar[103]. Hence, Parmalat's first diversification move was typical of the industry, and fell within the dairy cluster.

Parmalat's second diversification move was much more "innovative". From the dairy market, Parmalat entered the fruit juice market in 1981. At that time

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100 In particular, a relevant consideration was linked with the possibility of sharing the costs of quality controls over the input (wheat) (Company interviews).

101 Among them are the research costs: Barilla has a large research centre, which employs 212 people. Research costs are approximately 1.4% of sales. These are obviously shared across all the products.

102 However they are more typical for the English cluster (which includes biscuits, crackers, bread and pastries) than for the Italian cluster (which only includes biscuits and crackers).

103 Company interviews.

the fruit juice market was relatively concentrated (the four firm concentration ratio was approximately 45 per cent) and the product sold was nectar, sold in bottles. Parmalat began producing 100% fruit juice in paper cartons. The final step of product processing could be performed with the same type of machinery used to process milk[104]. A second source of synergy was related to the adoption of the same packaging used for milk. This allowed both economies in packaging and in the final stages of production[105]. This move was innovative and atypical (in that it does not conform to the typical clusters identified earlier) and exploited economies which were only available at a large scale. The choice of 100% juice and paper carton packaging allowed Parmalat to position itself as a high image, high price producer[106].

In 1982 Parmalat entered the processed tomatoes market. Peeled tomatoes and fruit juice shared the same type of packaging but also economies in purchasing of inputs. This move was closer to the typical diversification pattern of other fruit juice producers (see the Italian cluster and the behaviour of smaller producers, such as Massalombarda, Zuegg, Del Monte, whose sales are 60% in the fruit juice-nectar market and 40% in peeled tomatoes or other processed vegetables[107]).

STAR: Technological synergies have not been generally exploited by Star. Its products do not share inputs, nor can they be produced by the same machinery. A large number of its products are in fact produced for Star by others and then sold and distributed by Star. This is confirmed by the fact that only a few of its products belong to well defined clusters (fruit juice and peeled tomatoes; coffee and tea), while most of the others do not belong to any cluster, and are mostly produced either by widely diversified multinationals or by specialised manufacturers (this is the case for stock cubes, margarine, baby food, seed oil, chocolate spreads, camomile).

Thus while some aspects of the diversification strategy can be seen as diversification within clusters, other parts of the strategy can not. Rather, these reflect economies of scope which only emerge at a large scale of production.

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104 Company interviews.

105 The exploitation of this type of synergy added to the possibility of using Parmalat's large distribution network which allowed the company to achieve a large market share in a limited time.

106 See Databank, fruit juice reports.

107 See the Appendix, table 4.12 and Databank market reports.

4.3 Pull Factors: (b) Distribution Economies of Scope

The distribution sector in Italy is still highly fragmented[108]. Due in part to administrative laws (imposed at the beginning of the '70s) concerning the location of new salespoints, strong barriers to entry limit the expansion of large supermarkets and hypermarkets. This in turn has made it more difficult for food manufacturers to achieve a large scale. In order to gain a large national market share, firms had to organise a national sales network, which reached a very large number of small sales outlets[109] [110].

In order to sell to the entire internal market a firm needs an extremely large sales force, which regularly (possibly often) visits the sales outlets[111]. Costs of distribution are difficult to compare across companies; however for large companies they may reach approximately 10% of sales[112].

Different producers have adopted different types of sales organisation. Some use a direct sales force, others an indirect one. The former is made up of salesmen directly employed by the firm. The latter involves independent salesmen who may either deal with a single firm's products ("monomandatari") or with products from many firms ("generali")[113].

In the first case salesmen either collect orders and send them to the firm, which then distributes its products from depots (this is the case of Barilla), or they travel with the goods and sell them in the quantities needed directly by the shops ("tentata vendita") (as in the case of Galbani, and in general for fresh products producers).

In the second instance firms either use salesmen who are independent (not directly employed by the firm) but only deal with the firm's products (Star), or have further intermediaries: these may be "concessionari", who only sell the firm's products (Parmalat), or wholesalers, who sell other products as well[114] [115].

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108 By distribution sector (as opposed to distribution network) we mean here the channels through which food products are sold to the final consumer. It includes hypermarkets, supermarkets, food chainstores (co-operatives or not) and individual shops. We define as modern distribution channels hypermarkets, supermarkets and chainstores; and as traditional distribution channels small retailers, either specialised in one product (normally fresh, e.g., cheese, salami or vegetables) or selling a wider range of goods. The distribution network of the firm instead is the organisation internal to the firm that intermediates between the firm and the salespoints.

109 CESCOM interviews.

110 Intermediaries (wholesalers) only rarely cover the whole national market, due to high transport costs, but concentrate only on some areas. This has led to vertical integration of firms into intermediation.

111 The alternative choice is not to expand beyond the size given by the local market.

112 Own computations from various sources: balance sheets, Databank.

113 Normally they do not sell competing products.

114 This would be the choice of small firms. As said above, wholesalers usually cover limited areas.

115 Databank, various reports; interviews at CESCOM.

Excess capacity in the distribution network arises when new products can be added without reducing the sales of the existing lines. The distribution network is usually made of a salesforce (salesmen) who visit the shops and take orders, and of a transport system, which delivers products[116].

The distribution network will be a source of economies of scope (and hence a pull factor to diversify) if it is sufficiently large, if it deals only with the firm's products, and if there exist products with similar durability - transportability characteristics as the original one, which are sold by the same retailers[117]. This implies that distribution economies of scope only arise at a relatively large scale of production, if the firm has created a wide distribution network.

The recent evolution of the distribution sector (and in particular the increase in concentration and the diffusion of large supermarkets and hypermarkets) has affected these considerations[118].

GALBANI: In the cheese and in the salami markets the distribution sector has always been (and still is) highly fragmented. Even if supermarkets have recently begun to sell fresh products, small specialised retailers are still the major outlets[119]. The product is usually sold fresh, unpackaged and hence unbranded. Selling to the entire home market requires regularly visiting 150,000 points of sales, which are often small. As table 4.21 in the Appendix documents, Galbani has a very large distribution network (300 sellers in 1983, and 4200 in 1988, with 150 deposits). Salesmen are employees of Galbani and are based around the depots[120]. Galbani has the largest Italian distribution network in the food industry (in the 1960's Invernizzi, one of the main producers, had a distribution network of comparable size, but after the acquisition by Nestle', much more attention was devoted to modern distribution).

Galbani's costs of distribution and transport amount to approximately 15% of sales (which is less than that of other cheese companies[121].

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116 These two functions may be carried out by the same agents (as is the case with the "tentata vendita" system).

117 These two conditions must be jointly verified if salesmen also transport products.

118 As more products are sold through modern distribution channels, the power of firms to sell more products together is reduced and has to rely mainly on the strength of firm's image. Hence we expect to observe a reduction in the scope of diversification, in cases where this was mainly motivated by the distribution synergy.

119 As is documented in Databank reports.

120 The Galbani distribution network is organised in the following way. Each deposit "purchases" products from Galbani plants at a price which includes a margin, and sells them to the salespoints (through his agents, with the "tentata vendita" system) at a price which just covers distribution costs.

121 As interviews with food industry experts and CESCOM confirmed.

The impact of modern distribution is still limited in this market, since in Italy most of the large chains do not yet have large deposits and distribution centres. Most of the producers (especially of fresh products) are required to supply the point of sales directly, which partially offsets the bargaining power of distributors[122].

The large distribution network of Galbani is the source of the synergies explaining its diversification moves. The main reason is that retailers selling cheese are often specialised, that is, they usually keep only dairy products and salami[123]. Secondly cheeses and salami need the same type of refrigerated distribution chain, since they are fresh products[124] [125](transport economies).

Since the war Galbani has had 70-80% of its sales in the cheese market and 20-30% in the salami market (see table 4.1 in the Appendix). The same is true for the other major cheese producers (except for Kraft who imports cheese in Italy[126], see tables 4.5 and 4.6 in Appendix). This is a rather atypical diversification relative to the clusters discussed in chapter 3. The dairy cluster includes milk and yoghurt, dried milk, cheese, and is separated from the processed meat cluster, which includes meat and poultry. The first cluster is dominated by the behaviour of milk producers who also produce cheese (rather than vice-versa)[127]. Distribution economies also allow us to explain why no cluster emerges across cheese and processed meat products in terms of a scale factor. For low production scales, it is too costly to set up a distribution network for both cheese and pork; none of the smaller cheese producers sells salami.

BARILLA: Barilla's distribution network has always been one of the firm's main strengths. Only recently have sales through modern distribution channels become more important than sales through small retailers.

During the '70s Barilla had a sales force of approximately 500 employees to distribute pasta[128]. Some excess capacity existed[129] and could be exploited to

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122 Interviews with the company.

123 Source: Databank, cheese market reports.

124 In fact Galbani produces also a limited quantity of yoghurt and butter.

125 According to the management, agents are usually able to sell 3 or 4 products to each salespoint from the vast product range in the cheese and salami market that Galbani produces. One or two of them are well known products with a high turnover, while the others are pushed by the seller. The company feels that pushing other products would reduce its power to sell many cheese products (Source: company interviews).

126 Using the waste from cheese production was typical of the poorer Italian farmers, but was not usual in other countries.

127 Company interviews. However Galbani also produces yoghurt, albeit in small quantities.

128 Source: Databank and company interviews.

sell other products with similar transport-durability-joint sale characteristics. Biscuits had these characteristics: they were sold by the same type of retailers as pasta and had, thanks to the new packaging which Barilla introduced, a relatively long life. Hence for the first diversification move, the availability of excess capacity in the distribution network played a role, albeit an ancillary one.

However the rapid growth in sales of biscuits led to a saturation of capacity and to the need to enlarge the distribution system. This was done in the first instance by adding an indirect sales force[130]. In 1989, after a substantial increase in market shares in both the pasta and the biscuit market, an independent trade and distribution company was set up, with 700 employees, which sells both products and deals directly with the modern distribution channels[131] [132].

For Barilla, distribution synergies played an ancillary role in the first diversification move, but did not play a role in the moves that followed.

PARMALAT: The distribution network of Parmalat is the second largest in the food industry, after Galbani. Its development followed the expansion of the firm in the long life milk market, since a wide and penetrating distribution network is one of the main factors leading to success in the market[133]. This factor has played an ancillary role in Parmalat's diversification processes. The first diversification moves were within the dairy cluster, and the choice of the products was only partly determined by the possibility of using the same distribution network. However at some point diseconomies arose and it was necessary to separate the fresh products line from the long life line[134].

The products introduced afterwards (fruit juice and processed tomatoes) could be sold through the sales network for long life products where excess capacity was still available[135]. However, adding bakery products to this distribution line damaged the other products. This was probably due both to

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129 According to the management.

130 See the Appendix, table 4.23. In 1986 the firm had both an internal salesforce and "concessionari".

131 With modern distribution relationships have not always been easy: on the one side supermarket chains try to use leaders' product to attract consumer (selling them at discounts), on the other producers and supermarkets conflict over the shelf space. Barilla in 1986 was excluded from one of the major supermarkets (Esselunga), following a conflict over the price at which Barilla products were sold, and only in 1989 it returned on the shelves.

132 Source: R&S and internal Barilla publications.

133 All large producers have a well developed network (see table 4.24).

134 As company interviews clarified.

135 Company interviews.

the different life duration of the products (bakery products have a longer life than dairy products) and to the different salespoints[136].

STAR: Star has always had a very large distribution network. It was based on an indirect sales force, i.e., agents not directly employed by Star, but selling only Star products. In the '50s Star was one of the first large industrial food firms with a wide distribution network. It served mainly small retailers, which were ready to buy more than one product. Salesmen themselves suggested which ones could be profitably added to the product lines.

In Star's case the creation of a wide distribution network was the main factor leading to diversification. Products with similar characteristics (in terms of durability - long life - and the possibility of being sold by the same salespoints) were introduced. Possibly a confirmation of the importance of this factor is the fact that the changes in the distribution sector are affecting Star's diversification policy. The increased importance of supermarkets as compared to small retailers reduces the bargaining power of manufacturers. Only large firms with a national brand image can impose a vast range of products: supermarkets tend to buy leading products or low cost (own brand) products. Selling a large bundle of different products through the firms' own distribution network is much less effective nowadays. For Star, this has implied a reduction in the range of products it offers and the firm's exit from various markets where it was not strong enough relative to leading brands (coffee, water powders, chocolate spreads, fresh pasta, soap). Secondly it has induced a search for new sources of synergies, in particular brand synergies (see section 4.4).

To see whether distribution economies are an important reason for diversification in Italy, it is appropriate to look at the diversification policies of those manufacturers who have the largest distribution networks. If distribution economies matter, these firms will be diversified into "related" products (that can be sold by the same sales outlets and have similar durability/transportability characteristics).

Among the food manufacturers with the largest distribution networks are: Ferrero, Kraft, Alivar, Cirio Bertolli De Rica, Unil-it, Lavazza, Nestlè, Trinity, Nabisco, Invernizzi, Locatelli, Cerpl, Polenghi. Some of them (Locatelli,

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136 For the majority of the large firms active in the milk/dairy market the distribution network is separated into two different lines, one which sells fresh products and the other for long life products. These normally use different sales systems, "tentata vendita" for fresh products, and orders for long life ones. Hence economies of scope hold only across a limited range of products.

Invernizzi, Cerpl, Polenghi) are similar to Galbani (i.e., they sell fresh products to specialised salespoints) and have followed a similar diversification strategy. Alivar and Cirio are actually widely diversified across a range of long life products that can be sold through the same points of sales. Ferrero and Lavazza instead are not diversified, the former being active in chocolate products only, the latter producing only coffee. Both companies sell long life products, both to non specialised retailers and to coffee bars. The reason why both are not diversified even with a large distribution network may be due to the fact that the second distribution channel is relatively important and would not support other products. A last group includes Kraft, Unil-it, Nabisco, Nestlè: they are widely diversified multinationals and it is difficult to establish whether their strategies in Italy are affected by the possibility of exploiting a single distribution network.

4.4 Pull Factors: (c) Brand Name/Advertising Economies of Scope

Finally synergies may be generated by a well known brand name. If the firm has developed a brand name (usually through intensive advertising) it might be able to exploit this to introduce other products without a proportionate increase in advertising expenditures.

In order for this to be possible, it must be that the brand name is already well known, and that the new product's image is sufficiently close to the previous ones to share the brand. The latter consideration depends in part on consumer perception, which in turn is linked to various factors (history of the firm, the quality of its products, product sophistication) and may have changed over time.

For firms who exploited this factor as a source of synergies we should observe relatively large advertising expenditures with the feature that the total advertising expenditures of the firm for different products is lower than the sum of advertising of non diversified companies active in the corresponding markets. However this is hard to verify. A proxy for this comparison will be to compare market shares with advertising share of the firm. Economies should exist if the advertising share of the firm is less than the market share (that is, the firm exploits capacity from other product markets). The comparison is obviously made difficult by the limited availability of time series data on advertising outlays on specific products[137].

GALBANI: The firm has shared its advertising expenditures and brand name across its wide range of cheese products, but not across its other products.
Its advertising expenditures have always been relatively low (between 0.5 and 1.5% of total sales[138]) since in a market where distribution is highly fragmented and the product is often sold unpackaged and hence unbranded, it is the relationship with the distributor that matters rather than the relationship with the final consumer. Hence, after a relatively strong marketing campaign in the '60s, Galbani has substantially reduced its advertising outlays. Hence Galbani represents an exception to the usual rule, in that it did not exploit a national brand name in introducing other products. According to the company's management, associating the Galbani brand name with the sale of salami would have been damaging to both products[139] [140].
This is consistent with the observation that even cheese producers with a relatively high advertising/sales ratio do not use their brand names to diversify outside the cheese market[141].

BARILLA: Barilla has strongly increased its advertising expenditures since its entry into the bakery market. In 1974 advertising expenditures amounted to 1% of total sales, while in 1989 they were 7.2%. When the firm entered the biscuits sector, the brand name chosen for the new line was different from Barilla, since it was clear that consumers would not consider pasta and biscuits as similar markets[142]. However, after the introduction of biscuits, all the subsequent new products (snacks/pastries in 1978, crackers in 1986, but also rusks and bread sticks, which were renamed after the introduction of biscuits) shared the new name Mulino Bianco. Evidence that economies of scope from brand name/advertising played a role in the diversification process in the bakery sector can be found in the fact that the advertising

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137 Here we shall compare advertising expenditure over the years 1981-1986 (Source: AGB). Even with these detailed data, some caveats are necessary for what concerns yearly comparisons.

138 See table 4.5 in the Appendix.

139 Galbani is planning to launch its salami products with a brand name in a few months, but the brand name will be different from that of the cheeses.

140 Company interviews.

141 Only Kraft, the multinational firm that imports cheese into Italy, with an advertising/sales ratio of approximately 11-15%, has a significant proportion of its sales outside the cheese market sold with the Kraft brand name - 18% of sales (mayonnaise, other sauces). Locatelli and Invernizzi, the other two major cheese producers with advertising/sales ratio of approximately 3% only produce salami (Source: Databank, cheese market reports).

142 This was the management's perception.

shares in these markets (except for rusks) are smaller than the corresponding market shares[143].
The recent introduction of fresh pasta and tomato sauces seems to rely on the same mechanism, where the brand name in this case is Barilla[144].

PARMALAT: Although Parmalat's advertising expenditures are relatively high[145], and creating an image for its products has always been one of the main concerns of the firm[146], there is no clear evidence that this is a source of economies of scope across products. It is possible that the firm believed that brand synergies might hold between milk and biscuits as both are used for breakfast in Italy[147]. However this proved not to be true[148], and even with heavy advertising there were losses, until the production was reduced. This is consistent with the hypothesis that products were too unrelated in consumers' perception to enjoy brand economies.

STAR: For Star it is much less clear whether economies in branding are present. Star has always supported its products with strong marketing campaigns. Promotional and advertising expenditures were increasing from 1984 to 1990, from 12% of sales to 16%[149], and a large number of the firm's products use the Star name. Hence we might expect some brand economies shared across the products. We can offer some suggestive evidence on this by comparing market shares and advertising shares for the period 1981-1987. If we consider only the products with the Star brand name (i.e. tea, tuna, stock cubes, margarine, ready sauces, tomatoes preserves) (see figures A7) we observe an initial period where advertising expenditures are larger than market shares (except for stock cubes), suggesting diseconomies in brand name. In the following years, however, market shares are larger than advertising shares in most of the product markets (except in ready sauces). One possible interpretation for this pattern is that while originally Star exploited economies of scope in distribution, with the increased importance of modern distribution it became more important to push products through heavier advertising. The changes in the organisation of distribution seem to have led to a shift in the relative importance of the sources of synergies.

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143 See Figure A.5 in the Appendix.
144 But the entry is too recent for us to be able to analyse it.
145 Data on product advertising underestimate the actual expenditure since Parmalat has used its sponsorship of sports' teams as one of its main advertising channels.
146 Source: Databank, various market reports.
147 This is what food market experts believed.
148 See market and advertising shares in the Appendix.
149 See the Appendix, table 4.4.

Distribution has become less relevant, while supporting the product with advertising is essential. This interpretation seems to be consistent with Star's actions over the period. While it increased advertising expenditures to a very high level, it seems to have begun to benefit from synergies associated with its brand name only after some interval.

This change in the relative importance of the sources of synergies has consequences for the range of diversification. It implies that, since the distribution network can no longer push all the products in Star's portfolio, fewer synergies arise across these. This means that the firm has to support the products which do not carry the Star name with increased advertising, or has to exit from these markets. This occurred for Suerte coffee (whose market share had fallen from 5% at the beginning of the 80's to 2% in 1987[150]) whose brand name and machines were sold to Lavazza; for Starlette sliced cheese (whose market shares had fallen from 6% in 1981 to 4% in 1985) which was no longer produced after 1986; for water powders, which were sold to the market leader in 1990; for chocolate creams, which were not produced after 1989; for shampoo and soap (Mantovani products), which were sold to an English company in January 1993.

The change in the source of synergies is forcing Star to reduce its range of products. If it is true that consumer perceptions are also changing, Star may have to reduce its range even further, in order to produce only products where consumers perceive Star to have some expertise.

5. Managerial Ability and Ownership Changes

In the previous section we argued that the diversification processes of the firms under consideration can be explained in terms of two sets of factors: constraints to expansion in their own market (push factors), and economies of scope (pull factors)[151]. We did not discuss another source of synergies, the managerial ability factor, which was mentioned in chapters 2 and 3. This is actually more difficult to assess and any judgement must be rather subjective. Here, we offer some impressions based on interviews.

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150 See figure A.7 in the Appendix.

151 We ruled out risk diversification considerations both because there is no theoretical consensus on their relevance and because empirically they have not been found to be important. Moreover the food industry, to which this analysis is limited, is even less exposed to the cyclical fluctuations that might induce firms to take this risk into account.

The managerial ability argument is based on the idea that managers might develop "excess capacity" (with better knowledge of their job, they might be able to do more in less time), or that some skills may be transferred to other fields and induce correlated results (see chapter 2). Hence, if a manager's skills lead to a high performance in one market, he might be able to produce the same performance in other markets with related characteristics. Here the evidence is only suggestive since it is hard to form objective evaluations on managerial ability and on whether this ability (actual or presumed) induced diversification.

In the case of Galbani considerations of managerial ability argued against diversification. Management explicitly pursued a policy of "doing what one is good at". Since they believe that the skills developed in the cheese market are not easily transferable, their policy is to remain in that market.

Barilla, after its first move outside the pasta market, seems to have taken the approach of remaining in markets extremely close to its original ones, in a way similar to Galbani.

Star based its diversification on the relationship with the distribution network and managerial ability does not seem to have played an important role.

The active diversification program of Parmalat, on the other hand, seems to be supported by the belief that the marketing skills of the firm could be used in different markets, together with a rather innovative approach on the part of their management[152].

Notwithstanding Star's experience, the overall impression from discussions with executives is that the argument for managerial economies seems to add little in explaining the overall diversification pattern of these firms.

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152 A further consideration that might be relevant relates to the ownership structures of the firms. In principle, this might have affected diversification choices. However this seems not to be the case for the four firms considered here. Galbani was sold before the '60s to financial companies. Both before and after that, the strategy of the firm has been identical. Moreover a similar strategy has been followed by the other large Italian cheese producers. It is still too early to evaluate the effects of the acquisition by BSN, except in terms of a more aggressive advertising policy. Barilla was sold to Grace in 1971. In this case there is evidence that the holding company was pushing for diversification. However the main push came from the price freeze of 1973. Parmalat never changed ownership; the financial restructuring of 1989 did not affect control of the company, which has always been with the Tanzi family. Finally, as to Star, the exchange of shares with S.M.E. in 1971, did not affect the company's management. Some changes might be expected from the increased participation of BSN to the management. Again, it is too early to evaluate changes.

6. Reassessment of the Cluster Analysis

The main theme of this chapter is that the factors shaping the diversification strategies of the largest Italian firms are actually rather different from those determining diversification patterns among small and medium size firms, whose behaviour dominated the statistical pattern described in the cluster analysis of chapter 3. There diversification was mainly induced by technological economies of scope, and more specifically by common inputs.

Central to the case studies in this chapter is the role played by other factors, relevant only to the largest firms. The role of the distribution network was central in two cases out of our present four (Galbani and Star) and it played an important ancillary role in two other. Star built its entire diversification strategy around its distribution network. Galbani's distribution network was one of the main reasons for its choice to diversify.

The other two cases are rather different. Parmalat's expansion can be understood as involving a mix of technological synergies and distribution network effects.

Barilla's first diversification move was induced by constraints to growth in its market. Its following moves were driven by a mixture of technological and brand synergies.

Only some of these moves were within clusters. Often they were the first moves. The more innovative moves were out of the clusters and were based on distribution economies, advertising economies and constraints to the firm's growth.

Appendix

The information and the data used in this chapter were collected from various sources. The main sources of data about firms' history were: R&S, a Mediobanca publication, with standard balance sheets, information on company history and its products; Business newspapers: Il Mondo, Mondo Economico, Sole 24 Ore; Company interviews: Ing. E. Sbarbaro, general manager of Galbani; Dott. Maestri, planning manager of Barilla; Dott. Manarini, vice-general manager of Parmalat; Dott. Corno, general manager of Star.

The main source of data and information on markets were: Databank: yearly reports on most of the relevant markets (including data on market size, number of firms, employment, market shares, concentration, advertising expenditures, distribution networks); food industry experts: Prof. Bertelè, Dott. Vento, Dott. Monici, Dott. Guidotti, Dott. Zancani, Dott. Piani (all from Databank). Data on advertising expenditures (for the years 1981-1988) were obtained from AGB Italia.

The information were complemented with interviews with the food industry experts: Prof. U. Bertelè (Politecnico di Milano), Prof. Luca Pellegrini (CESCOM and Università Bocconi).

In the Appendix we include all the Tables with data used in the analysis. Data are not homogeneous, nor are they available for uniform periods of time. The main sources were: R&S (Mediobanca), Databank (market researches), AGB (advertising agency), company interviews.

In tables 4.1-4.4 company data are assembled. Sources are: R&S, Databank and in some cases (Barilla) company publications.

Tables 4.5-4.20 present data on the most relevant markets. These include: size, concentration of the market; market shares, advertising and diversification of the main competitors. The source is Databank.

Tables 4.21-4.27 describe distribution networks of the firms (and of their competitors) in terms of both the type of channels used and the size of the network. The source is Databank. These data are not homogeneous but are sufficient to allow some comparisons.

Tables 4.28-4.49 have figures on firms' advertising in each market. The source is AGB. Figures A.5-A.7 compare market share with advertising share in most of the product markets. The sources are AGB and Databank.

Figures A.1-A.4 compare market shares with firm's returns. The sources are Databank and R&S.

COMPANY DATA - GALBANI

Table 4.1

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Turnover (bill.L.)	119	138	177	230	295	357	410	471	542	660	836	935	1027	1162	1288	1360	1449	1595	1677
Products:																			
CHEESE																			
share of prod.					80.7	82.9	82.8	82.2	80.7	80.8	81.4	81.4	81.1	81.0	79.7	79.8	81.2	80.4	81.1
market share											14.0	14.0	14.0		13.3	13.6	15.2	17.0	17.0
SALUMI/MEAT																			
share of prod.					19.2	16.8	17.1	17.7	18.9	19.1	18.5	18.6	18.8	18.9	20.0	20.0	18.7	19.4	18.7
market share											8.0	8.0	8.0						
PORK																			
share of prod.					0.1	0.1	0.1	0.02											
market share																			
COSTS (%sales):																			
raw materials	66.5	64.3	66.5	66.9	67.2	67.0	63.9	64.5	63.6	63.3	62.8	62.4	61.6	60.9	58.8	56.7	56.3	57.4	52.6
wages	19.4	19.6	20.9	21.2	19.9	19.4	19.7	19.2	19.2	18.9	18.1	18.7	18.8	19.5	18.3	18.7	18.9	19.6	19.4
advertising																			
distribution																			
other	10.0	10.7	8.4	7.8	7.7	7.3	7.0	7.3	9.1	9.3	8.9	9.4	9.7	9.9	9.1	9.3	9.5	10.0	11.2
OPER.RETURN	4.1	5.4	4.1	4.1	5.2	6.3	9.3	8.9	8.0	8.4	10.2	9.5	9.9	9.7	13.8	15.3	15.3	13.0	16.8
financial costs	1.0	0.5	0.8	0.4	0.6	0.2	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.5	1.0
PRETAX PROFIT	1.4	2.3	2.5	2.4	4.6	6.0	9.4	9.4	9.3	10.7	12.2	11.8	12.2	11.8	15.6	17.2	18.2	15.0	13.6
NET PROFIT	0.3	1.5	1.3	1.1	1.1	1.6	3.6	4.0	4.4	4.5	5.6	5.3	5.5	6.0	6.9	8.0	8.5	8.7	6.4
employment	5599	5887	6411	6558	6609	6672	6632	6653	6709	6682	6795	6931	6923	6986	6959	6941	6978	6947	6636
n. plants					9	9	9	9	9	9	9	8	8	8	8	8	8	8	8

Source: R&S, Databank, Company interviews.

COMPANY DATA - BARILLA   Table 4.2

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989*	1990*
Turnover (bill.L.)	54.3	63	109	117	129	160	207	261	350	436	585	728	981	1145	1265	1418	1548	2068	2389
Products:																			
PASTA																			
share of prod.			90	87	84	79	74	70	68	64	60	54	50	50	49	48	49	50	
market share			15	15	16	16	16	18	20	21	22	22	24	26	28	30	32	34	
BISCUITS																			
share of prod.					4	6	8	8	9	10	13	17	17	18	16	15	17	15	
market share					4	7	10	12	13	17	22	24	25	26	27	27	28	28	
PASTRIES																			
share of prod.							2	5	7	9	11	15	19	18	17	19	19	15	
market share							5	8	11	14	18	24	32	34	35	38	36	33	
TOMATO SAUCES																			
share of prod.					6.5													2	
market share																	19	43	
BREAD STICKS																			
share of prod.			3	2	2	3	3	3	3	3	3	3	2	2	2	3	3	3	
market share			10	8	9	11	14	20	23	27	30	33	33	33	36	39	41	42	
RUSKS																			
share of prod.			4	4	4	5	6	7	7	7	6	6	6	6	6	6	7	6	
market share			15	15	16	20	24	26	28	32	33	36	39	41	41	43	45	47	
BREAD																			
share of prod.																			
market share																			
CRACKERS																			
share of prod.															2	2	2	2	
market share															11	15	17	18	
COSTS (%sales):																			
raw materials			73.1	68.6	67.6	71.7	71.4	72.3	69.0	70.1	66.4	65.1	67.1	64.5	62.4	60.7	59.4	75.2	71.0
wages			11.9	14.1	15.3	13.6	12.5	11.5	10.5	10.8	10.6	10.1	8.7	8.8	9.4	9.5	10.5	14.5	14.3
advertising					1.3														
distribution																			
other			9.7	10.6	11.9	11.7	12.7	14.5	13.3	14.4	15.3	15.8	18.0	19.7	21.8	22.6			
OPER.RETURN	10.5	5.1	5.4	6.7	5.1	4.2	8.2	5.3	8.8	8.6	8.8	9.5	8.3	8.6	8.5	8.0	7.5	10.2	14.7
financial costs			2.3	2.3	1.4	1.6	1.0	0.9	2.3	1.7	1.9	2.1	1.5	1.1	0.7	1.0	1.7	2.3	2.6
PRETAX PROFIT	1.3	0.9	0.5	1.1	1.2	1.7	5.1	3.4	4.8	4.9	4.1	5.4	5.5	6.5	6.7	6.7	5.8	4.6	8.5
NET PROFIT	1.28	0.86	0.63	0.82	0.54	0.59	1.95	2.18	3.19	3.03	2.53	2.76	3.22	3.68	3.64	4.23	3.91	3.25	4.17
employment	2014	2030	1997	1945	1913	1899	1857	1872	1922	1986	2070	2161	2225	2332	2428	2543	2679	5896	6020
n. plants	3	3	3	3	3														

Source: R&S, Databank, Company interviews.
* not comparable (consolidated).

COMPANY DATA - PARMALAT

Table 4.3

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Turnover (bill.L.)	75	108	143	196	263	303	381	466	520	716	730	815	848	856	969
Products:															
MILK															
share of prod.	75	71.9	68.9	66.0	59.7	59.0	58.7	61.5	53.9	40.9	42.4	40.8	42.2	46.3	45.2
market share					30.0	24.9	23.4	23.0	23.0			23.6		23.0	24.8
CHEESE/BUTTER															
share of prod.	9.4	7.4	6.5	5.7	7.6	7.7	7.2	7.4	6.4	4.7	2.5	2.3	2.2	2.2	1.9
market share															
CREAM															
share of prod.	9.0	6.5	6.1	6.6	7.4	6.8	6.2	7.5	6.8	5.5	6.3	6.2	6.1	6.2	5.9
market share					18				40			33.8		25.0	24.3
YOGHURT/DESERT															
share of prod.	6.5	5.1	5.5	5.6	6.0	5.1	5.3	7.6	8.0	8.0	8.1	9.3	8.9	8.7	14.1
market share					12.0				15.0	11.4	11.2	11.1		6.0	13.7
SALUMI															
share of prod.			0.9	1.0	1.4	2.2	2.8	3.2	3.0	3.1	1.3	1.3	1.0	1.0	
market share															
TOMATO SAUCE															
share of prod.							1.3	5.1	8.7	14.7	10.1	9.2	8.6	8.0	7.7
market share													4.3	17.0	15.0
DRINKS															
share of prod.						1.9	3.6	5.5	6.5	5.9	8.2	7.6	8.9	9.2	9.8
market share														11.0	13.3
BAKERY															
share of prod.								0.8	4.5	10.6	13.4	12.8	12.6	12.0	10.5
market share														5.0	4.0
OTHERS	0	0.1	0.1	0.4	1.5	0.8	0.8	1.3	2.0	6.5	7.7	10.5	10.0	6.4	4.8
IN SUPERMKT.		8.8	11.8	14.5	16.3	16.2	14.1								
COSTS (%sales):															
raw materials	62.9	65.1	66.9	82.9	81.8	74.0	68.6	64.6	59.1	61.7	60.0	54.9	57.6	56.8	53.9
wages	6.6	6.4	6.2	5.7	5.5	6.7	6.7	6.9	7.5	6.1	6.3	6.3	7.0	7.6	7.4
advertising	1.3	1.3	2.0	2.6	2.9	4.3	6.5	7.3	9.8	4.9	5.9	7.4	7.2	7.9	8.8
distribution															
other	24.7	24.4	24.6	10.2	11.5	15.8	18.5	22.4	27.2	19.8	21.2	27.9	25.2	23.2	25.4
OPER.RETURN	5.8	4.1	2.2	1.2	1.3	3.5	6.2	6.1	6.2	12.4	12.5	10.8	10.1	12.4	13.2
financial costs	3.5	3.0	2.9	2.2	2.2	4.1	4.7	5.4	6.0	6.7	7.4	5.7	6.4	8.2	6.8
PRETAX PROFIT	1.1	0.9	0.9	0.8	1.2	1.2	1.0	0.7	1.3	0.9	0.8	0.8	1.0	1.6	4.3
NET PROFIT	1.12	0.92	0.85	1.06	1.11	1.14	0.94	0.86	1.15	0.90	0.46	0.37	0.59	0.77	2.95
employment	573	604	644	700	788	850	871	972	1078	1087	1080	1086	1089	1135	1217
n. plants					1				6					10	11

Source: R&S, Databank, Company interviews.

COMPANY DATA - STAR

Table 4.4

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Turnover (bill.L.)	101	125	164	171	216	255	278	338	385	441	475	519	584	596	594	633	676	710	676
Products:																			
STOCK CUBES																			
share of prod.							15		10						11		11		
market share							50.0		49.8	49.0	50.0	50.0	50.0	50.0	49.0	48.0	48.7		
MARGARINE																			
share of prod.							5		5		6		6		6.2		6		
market share							20.0		24.0		18.0		18.4		22.6	22	22.9	25.0	
SEED OIL																			
share of prod.									8		6		5		9.8		5.5		
market share									8.3		5.5		4.8		6.2		6.5		
SAUCES																			
share of prod.																	9.9		
market share																	8.5		
COFFEE																			
share of prod.							9.0		8.0		8.0		5.8		6.5		2.6		
market share							3.5		3.3		1.6		1.6		1.5		0.9		
BARLEY																			
share of prod.																			
market share																			
TEA/CAMOMILE																			
share of prod.															6.7		6.7		
market share															23.1		25.5		
BABY FOOD																			
share of prod.								4.0	5.0					3.9					
market share								10.9	5.2					7.0					
TUNA FISH																			
share of prod.									2.8		4.0		9.9		12.5		11.1		
market share									7.9		8.0		6.5		6.3		10.9		
COSTS (%sales):																			
raw materials	74.4	80.0	64.2	61.2	58.3	58.3	60.0	59.2	57.3	56.7	55.2	52.5	53.9	52.9	49.5	49.1	48.2	47.8	45.8
wages	10.7	10.6	10.2	12.6	11.7	12.4	13.6	13.9	13.8	14.1	15.5	15.5	14.9	14.7	15.4	16.3	16.3	16.7	17.2
advertising													10.9	11.9	14.5	15.1	15.2	15.6	16.6
distribution													12.5	12.5	13.4	13.6	13.1	12.2	12.1
other			14.3	14.9	17.8	19.1	18.1	18.7	21.4	20.9	22.1	23.4							
OPER.RETURN	9.5	8.5	11.6	11.1	12.0	10.2	8.3	8.3	7.0	8.3	7.2	8.6	6.5	7.0	5.4	5.4	6.0	6.0	9.2
financial costs	2.0	2.1	4.3	4.8	4.4	3.8	3.5	2.7	3.8	4.0	2.5	2.7	2.6	2.2	1.2	0.9	0.4	0.4	0.6
PRETAX PROFIT	5.0	4.8	3.9	3.7	3.7	3.0	3.9	3.6	2.5	4.1	3.7	4.1	3.0	3.9	4.2	4.7	5.1	4.8	6.7
NET PROFIT	3.28	2.64	2.01	1.93	2.16	1.97	2.18	2.08	1.56	1.84	1.92	2.57	2.35	2.35	2.56	3.18	3.48	3.26	3.42
employment			3091	3103	3084	3302	3344	3330	3405	3263	3109	2877	2775	2502	2486	2449	2393	2399	2166
n. plants					5	6	5	4	4	4	4	4	4	4	4	4	4	4	4

Source: R&S, Databank, Company interviews.

Table 4.5

MARKET DATA

CHEESE	1982	1983	1984	1985	1986	1987	1988
SALES (1)	2500	3680	4303	4724	4955	5052	5386.5
N. FIRMS		1700	1700	1700	1600	1500	1450
EMPLOYMENT	12000		19000	19000	19000	17000	17000
% EXPORT		4.3	4.1	4.7	5.0	5.8	6.9
CR4		51.4	37.9	37.6	40.2	41.5	42.3
ADVERT. (bill.L.)		26	61	72	100	116	
MARKET SHARES:							
Galbani	20.0	19.2	18.1	18.9	19.6	20.2	20.9
Locatelli	9.0	7.0	6.4	6.1	6.4	7.0	7.2
Kraft	6.0	7.9	7.1	7.2	7.5	7.5	7.5
Invernizzi	8.0	6.8	6.3	6.5	6.7	6.8	6.7
Osella					0.8	1.1	1.2
ADVERTISING SHARE:							(2)
Galbani		9.0	6.0	7.0	6.0	5.0	1.0
Locatelli		16.0	10.0	10.0	10.0	12.0	3.0
Kraft		41.0	32.0	32.0	26.0	35.0	13.0
Invernizzi		15.0	12.0	12.0	13.0	9.0	4.0
Osella							
DIVERSIFICATION:							
(% sales in market)							
Galbani	80	71	71	70	69	70	72
Locatelli	80	78	78	76	76	71	79
Kraft	75	86	74	82	83	82	75
Invernizzi	80	70	70	71	72	74	76
Osella							

(1) market value (bill.L.)
(2) % of sales
Source: Databank.

Table 4.6

MARKET DATA

SALAMI	1984	1985	1986
SALES (1)			10835
N. FIRMS			2100
EMPLOYMENT			30000
% EXPORT			2.8
CR4			11.7
ADVERT. (bill.L.)			
MARKET SHARES:			
Fiorucci	3.6	3.9	4.0
Galbani	3.2	3.4	3.2
Vismara	2.2	2.1	2.2
Citterio	1.8	2.0	1.8
Negroni	1.4	1.4	1.4
ADVERTISING SHARE:			
Fiorucci			
Galbani			
Vismara			
Citterio			
Negroni			
DIVERSIFICATION:			
(% sales in market)			
Fiorucci			
Galbani			
Vismara			
Citterio			
Negroni			

(1) market value (bill.L.)
Source: Databank.

Table 4.7

MARKET DATA

PASTA	1984	1985	1986
SALES (1)			1980
N. FIRMS			185
EMPLOYMENT			10000
% EXPORT			20.9
CR4			31.9
ADVERT. (bill.L.)			
MARKET SHARES:			
Barilla	21.2	20.6	20.7
Buitoni	3.9	4.1	4.8
De Cecco	3.3	3.6	3.7
Agnesi	3.6	3.6	3.1
Amato	2.9	2.8	3.9
ADVERTISING SHARE:			
Barilla		58	74
Buitoni		10	5
De Cecco		3	1
Agnesi		9	4
Amato		2	2
DIVERSIFICATION:			
(% sales in market)			
Barilla			
Buitoni			
De Cecco			
Agnesi			
Amato			

(1) market value (bill.L.)
Source: Databank.

Table 4.8

MARKET DATA

BISCUITS	1982	1983	1984	1985	1986	1987	1988
SALES (1)			2312				1860
N. FIRMS			180				750
EMPLOYMENT			22312				7000
% EXPORT			6.4				
CR4			39.9				
ADVERT. (bill.L.)							
MARKET SHARES:							
Barilla	12.4	14.4	16.6		15.7	16.4	16.9
Alivar	12.5	10.9	10.6		11.3	11.4	11.9
Saiwa	8.6	8.6	7.9		8.3	8.5	8.0
Sidalm	3.4	4.0	4.8				
Colussi	4.7	4.4	4.2		3.7	3.6	3.3
Parmalat			1		4.6	4.8	4.8
ADVERTISING SHARE:							
Barilla						18.3	13.7
Alivar						16.9	12.8
Saiwa			7.3			10.0	11.0
Sidalm			5.5				
Colussi			10.0				
Parmalat			9.0			7.7	
DIVERSIFICATION:							
(% sales in market)							
Barilla			26				
Alivar			30				
Saiwa			83				
Sidalm			16				
Colussi			100				
Parmalat			2				

(1) market value (bill.L.)
Source: Databank.

Table 4.9

MARKET DATA

BREAD SUBSTITUTES	1986	1987	1988	1989	1990
SALES (1)					980.3
N. FIRMS					146
EMPLOYMENT					3700
% EXPORT					4.3
CR4					76
ADVERT. (bill.L.)			60	45	
MARKET SHARES:					
Barilla	32	33.6	35.8	3.8	45
Buitoni	14.9	12.8	12.1	12.4	12.9
Alivar	11.3	10.4	10.0	10.0	10.0
Saiwa	8.7	8.1	8.7	8.7	8.1
Plada	6.4	5.8	5.6	5.6	5.8
ADVERTISING SHARE:					
Barilla			22.6	23.1	
Buitoni			24.5	14.5	
Alivar			12.8	16.0	
Saiwa			6.2	13.3	
Plada			14.9	3.3	
DIVERSIFICATION:					
(% sales in market)					
Barilla		11.8	11.9	15.0	
Buitoni		27.9	23.6	23.9	
Alivar		9.8	9.7	10.6	
Saiwa		26.7	26.0	26.7	
Plada		7.6	7.0	8.0	

(1) market value (bill.L.)
Source: Databank.

Table 4.10

MARKET DATA

MILK	1981	1982	1983	1984	1985	1986	1987	1988	1989
SALES (1)			2000	2318	2425		2780	2780	2891.9
N. FIRMS			193	193	191		200	200	200
EMPLOYMENT			6900	6900	7300		7300	7300	7250
% EXPORT			0	0.8	0.1				
CR4 UHT milk			27.9	34.9	48.1		48.8	48.8	48.8
CR4 fresh milk				22.2	24.2		25.5	25.5	28.3
ADVERT. (bill.L.)			8.58			11.7	13.5	13.0	20.0
MARKET SHARES:	(2) (4)	(2) (4)	(2) (4)	(3)	(3)	(3)	(4) (3)	(4) (3)	(4) (3)
Parmalat	24.9	23.4	23.0	14.8	14.2	13.4	23.6 14.6	23.5 14.8	24.3 14.9
Cerpl	4.6	5.2	5.5	4.8	8.9	7.2	4.8 7.1	5.0 7.5	5.5 9.8
Polenghi	6.1	6.4	6.5	4.2	4.0	5.1	6.1 5.3	6.3 5.4	6.3 4.8
Ala	5.1	4.7	4.9	4.6	5.5	5.0	4.2 4.8	4.7 5.3	4.0 5.1
Sole	5.9	6.4	6.8	5.0	5.1	3.8	5.1 4.3	4.1 4.9	3.4 3.4
Giglio				3.7	4.0	3.7	4.5 3.5	4.8 3.6	4.6 3.6
ADVERTISING SHARE:									
Parmalat			23.4	30.2	45.0				40.7
Cerpl			15.5	10.4	6.7				17.0
Polenghi			5.5	14.0	27.1				1.0
Ala			5.4	12.2	12.3				
Sole			17.0	6.4					
Giglio			19.4	22.2	0.2				10.7
DIVERSIFICATION:									
(% sales in market)									
Parmalat			53	47	47			48	42
Cerpl			69	35	56			50	51
Polenghi			31	38	39			34	37
Ala			62	59	64			54	53
Sole									86
Giglio									23

(1) market value (bill.L.); (2) volume; (3) total milk market; (4) UHT milk only

Source: Databank.

Table 4.11

MARKET DATA

YOGHURT	1982	1983	1984	1985	1986	1987	1988	1989
SALES (1)							699.2	889
N. FIRMS							60	100
EMPLOYMENT							1700	3400
% EXPORT								
CR4							71.5	41.6
ADVERT. (bill.L.)		10.3					71.8	62.3
MARKET SHARES:	(2)	(2)	(3)	(3)				
Sitia Yomo	35.0	35.9	27.7	26.3	40.0	37.0	35.4	10.9
Gervais Danone	14.0	15.0	18.0	20.4	18.3	19.5	21.6	4.4
Parmalat	6.4	7.7	19.5	11.4	11.2	11.0	9.4	16.1
Torre in Pietra	5.1	5.3	2.6	2.7	3.3	3.6	3.4	4.8
Mandria			1.9	2.2				5.2
Galbani	2.6	2.9	15.6	15.8	2.2	2.0	1.8	
ADVERTISING SHARE:								
Sitia Yomo					25.0	21.2	11.7	11.5
Gervais Danone					17.9	23.3	33.6	0.6
Parmalat					17.3	11.7	22.7	26.5
Torre in Pietra								5.5
Mandria					10.8	1.9	16.0	6.3
Galbani								
DIVERSIFICATION:								
(% sales in market)								
Sitia Yomo			100	100			90	
Gervais Danone			72	65			66	86
Parmalat			6	6			6	84
Torre in Pietra				23			36	44
Mandria				100			94	7
Galbani			8	7				

(1) market value (bill.L.); (2) in volume; (3) yoghurt and desserts
Source: Databank.

Table 4.12

MARKET DATA

FRUIT JUICES	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SALES (1)				230							889
N. FIRMS				40							100
EMPLOYMENT				1500							3400
% EXPORT											
CR4				48.5							41.6
ADVERT. (bill.L.)	0.6	0.7	1.5	2.1							62.3
MARKET SHARES:											
Massalombarda			27.0	14.0	13.5						10.9
Salfa				12.5	11.2						4.4
Zuegg			15.4	10.0	10.8						16.1
Conserve Italia				11.5	10.2						4.8
Parmalat			12.4		7.5						5.2
Star				4.5	3.4						
ADVERTISING SHARE:											
Massalombarda		34.4	24.6	27.0							11.5
Salfa											0.6
Zuegg		17.8	17.8	15.4							26.5
Conserve Italia											5.5
Parmalat		0.1	27.4	12.4							6.3
Star	17.4	18.2		35.7							
DIVERSIFICATION:											
(% sales in market)											
Massalombarda				70	70						
Salfa				96	95						86
Zuegg				60	60						84
Conserve Italia				22	23						45
Parmalat				1	3						7
Star											

(1) market value (bill.L.)

Source: Databank.

Table 4.13

MARKET DATA

TOMATOES PRESERVES	1988	1989
SALES (1)		859.9
N. FIRMS		356
EMPLOYMENT		5900
% EXPORT		57.9
CR4		31.4
ADVERT. (bill.L.)	35.3	33.1
MARKET SHARES:		
Cirio Bertolli De Rica	22.2	23.1
Star	8.5	8.9
Conserve Italia	5.5	5.1
Santarosa	4.8	4.8
Parmalat	4.3	4.3
Parmasole	2.4	2.5
ADVERTISING SHARE:		
Cirio Bertolli De Rica	30.2	66.2
Star	24.0	8.9
Conserve Italia	7.4	3.8
Santarosa	26.0	5.7
Parmalat	12.0	15.3
Parmasole		
DIVERSIFICATION: (% sales in market)		
Cirio Bertolli De Rica	36.0	36.2
Star	10.8	9.9
Conserve Italia	36.6	36.6
Santarosa	36.1	34.8
Parmalat	5.6	5.3
Parmasole		

(1) market value (bill.L.)
Source: Databank.

Table 4.14

MARKET DATA

STOCK CUBES	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
SALES (1)					60	72						162.3	165.6	160
N. FIRMS					23	25						30	30	30
EMPLOYMENT					871	900						770	390	880
% EXPORT														
CR4					95	94						98	98.7	98.4
ADVERT. (bill.L.)	1.1	1.3	1.5	2.1	2.5	2.8					17.3	18.7	33	27.3
MARKET SHARES:														
Star				50		49.8						48.3	48.9	48.7
CPC Monda				30		32.5						32.7	32.4	32.5
Nestle												11.8	12.8	11.9
Panzani				12		7.6						5.2	4.4	4.8
ADVERTISING SHARE:														
Star	52.3	38.5	33.3	42.9	38.4	36.8					36.4	29.9	35.9	67.0
CPC Monda	29.0	23.1	33.3	28.6	33.1	38.9					23.1	41.7	50.3	27.5
Nestle											34.7	16.6	13.5	5.1
Panzani	1.8	23.1	26.7	23.8	23.5	14.1					5.2	9.1		
DIVERSIFICATION:														
(% sales in market)				15	10	9								
Star				38	38	40						11.0		11.0
CPC Monda												38.0	45.6	38.7
Nestle				12	28	30						5.9	7.0	6.0
Panzani												31.0	9.9	6.6

(1) market value (bill.L.)

Source: Databank.

Table 4.15

MARKET DATA

MARGARINE	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
SALES (1)			81.7	97	105				240				260
N. FIRMS			15	18	19				22				20
EMPLOYMENT			1040	950	860				900				750
% EXPORT			0.2	0.5	0.2				3.5				8
CR4			68	72	68.5				57.4				89.8
ADVERT. (bill.L.)	1.4	1.7	2.6	2.4	2.5	3.6	3.9	4.1					9
MARKET SHARES:													
Unil-It			33	32	32			24.4	23.7			35.6	35.4
Star			20	24	24			17.5	18.4			22.6	22.9
Kraft			6	4.7	5.5			6.2	6.3			7.3	6.8
Unigra									7.9			4.8	5.9
Sipal			5	4.5	5.5				5			5.4	5.2
Igor			8	10.5	7			5	7.4			4.2	5.1
ADVERTISING SHARE:													
Unil-It	35.7	47.1	53.8	45.8	40.0	50.0	51.3	58.5				41.1	
Star	42.9	41.2	30.8	37.5	36.0	27.8	25.6	24.4				58.9	
Kraft	28.6	11.8	11.5	12.5	20.0	19.4	23.1	17.1					
Unigra													
Sipal													
Igor													
DIVERSIFICATION: (% sales in market)													
Unil-It									6			8.5	8.3
Star			5	5	5				6			6.2	6
Kraft			5	5	5				4			3.5	3.3
Unigra												73	73.3
Sipal					75				90			95	100
Igor				50	40				40				

(1) market value (bill.L.)
Source: Databank.

Table 4.16

MARKET DATA

COFFEE	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
SALES (1)			721(2)	875(2)	956	1200	1360	1525	1760	2272	2601		1919
N. FIRMS			1500	1483	1480	1300	1500	1500	1500	802	780	750	750
EMPLOYMENT			6950	7710	7100	6500	7100	7000	7000	7400	7300	7200	7200
% EXPORT			1.1	1.2	1	1.4	1.7	1.7	2.4	2.9	3.4		4.6
CR4			39.8	39.3	42.7	42	36.9	40.1	46.5	41.2	46.4		52.3
ADVERT. (bill.L.)	4.9	5.1	6.1	6.1	8.9	10.8	11.2	13.9		48	68	85	129
MARKET SHARES:								(2)	(2)				
Lavazza			21	23.9	22.6	23.6	23.2	24.3	23.7	22.6	23	23.3	26.5
Sao Cafe			9.5	7.9	8.2	8.4	8.1	8.1	8.2	8.4	8.4	7.7	2.9
Procter&Gamble			6.3	6.1	7.8	5	4.7	5.5	5.5	6.6	6	5.7	5.6
Segafredo						5.4	5.5			4.7	4.6	4.4	5.3
Cafe do Brazil					3.8					3.8	4	4.3	4.5
Star			3.5	3.2	3.3	1.6	1.6	1.4	1.6	1.6	1.5	0.9	0.9
ADVERTISING SHARE:													
Lavazza	30.6	33.3	34.4	24.6		37.0	30.4	33.0		36.0	46.0	34.0	40.0
Sao Cafe	10.2	15.7	13.1	9.8		10.0	11.6	10.0		9.0	3.0	4.0	1.0
Procter&Gamble	18.4	13.7	13.1	16.4		25.0	21.4	21.0		24.0	24.0	27.0	20.0
Segafredo						6.0	4.5	4.0		1.0		5.0	7.0
Cafe do Brazil											7.0	11.0	14.0
Star	10.2	7.8	6.6	8.2			8.0					1.0	
DIVERSIFICATION:													
(% sales in market)					100	100	100	100	100	100	100	100	100
Lavazza					100	100	100	100	100	100	100	100	100
Sao Cafe				24	24	24	24	19.4		24.5	22	16.2	12.8
Procter&Gamble					100	100	100	100	100		99.1	98.9	95.8
Segafredo											100	100	100
Cafe do Brazil				9	8	8	8	4	5.8	6.0	6.5	3.2	2.6
Star													

(1) market value (bill.L.)
(2) production.

Source: Databank.

Table 4.17

MARKET DATA

BABY FOOD	1979	1980	1981	1982	1983	1984
SALES (1)						
N. FIRMS						
EMPLOYMENT						
% EXPORT						
CR4						
ADVERT. (bill.L.)						
MARKET SHARES:			(2)	(2)		
Plada	55.2	56.1	68.4	66.8	52.7	62.7
Nipiol	12.4	14.2	12.1	14.5	10.9	
Nestle	8.5	8.5	6.0	6.8	10.2	10.7
Star	10.9	5.2	4.0	3.2	7.0	7.0
Monda	6.5	5.4			6.2	6.6
Milupa	8.5	4.6			5.8	6.0
ADVERTISING SHARE:						
Plada	49.7	62.0	73.3	65.1		
Nipiol	20.0	16.5	9.0	11.1		
Nestle	7.2	6.0	1.3	5.4		
Star	9.6	6.8	5.6	10.6		
Monda	9.9	6.4	10.8	7.2		
Milupa	2.8					
DIVERSIFICATION:						
(% sales in market)						
Plada	90	70	70		72	77.8
Nipiol	7.8	5	5		5	
Nestle	20	13	13		14	12.9
Star	4	5	5		5	3.9
Monda	23	19	19		23	21.1
Milupa						69.2

(1) market value (bill.L.)
(2) production.
Source: Databank.

Table 4.18

MARKET DATA

TUNA FISH	1977	1978	1979	1980	1981
SALES (1)			325	440	565.1
N. FIRMS			249	250	
EMPLOYMENT			3500	5200	
% EXPORT			6.4	5.4	
CR4			45	43.7	
ADVERT. (bill.L.)	1.5	2.0	2.7	3.1	
MARKET SHARES:					
Trinity			11.4	13.5	
Simmenthal			4.8	6.2	
Star			8.3	7.9	
Mazzola			11.8	12.3	
Palmera			9.0	9.5	
AL.CO.			8.4	9.0	
ADVERTISING SHARE:					
Trinity	13.3	15.0	11.1	12.9	
Simmenthal	26.7	15.0	14.8	9.7	
Star	6.7	6.7	3.7	3.2	
Mazzola	20.0	15.0	14.8	12.9	
Palmera	4.7	20.5	15.2	13.2	
AL.CO.					
DIVERSIFICATION:					
(% sales in market)					
Trinity				70	
Simmenthal				19	
Star					
Mazzola					
Palmera					
AL.CO.				85	

(1) market value (bill.L.)
Source: Databank.

Table 4.19

MARKET DATA

TEA	1986	1987
SALES (1)	220	228
N. FIRMS	30	32
EMPLOYMENT	480	360
% EXPORT		1
CR4	76.5	74.6
ADVERT. (bill.L.)	19.7	22.6
MARKET SHARES:		
Star	23.1	25.3
Nabisco	20.9	20.9
Bonomelli	17.1	19.0
Unil-It	15.4	3.6
D&C	9.3	9.1
ADVERTISING SHARE:		
Star	25.9	21.7
Nabisco	9.6	21.7
Bonomelli	34.6	35.9
Unil-It	21.3	11.9
D&C	7.6	8.8
DIVERSIFICATION:		
(% sales in market)		
Star	6.7	6.7
Nabisco	61	57
Bonomelli	47.7	44
Unil-It	3	2.2
D&C	20.3	18.6

(1) market value (bill.L.)
Source: Databank.

Table 4.20

MARKET DATA

SEED OIL	1980	1981	1982	1983	1984	1985	1986	1987	1988
SALES (1)	365	474	528.7	883		912(2)	650		608
N. FIRMS	200	200	200	200		200	200		160
EMPLOYMENT	2300	2500	2500	2500		2500	2400		1900
% EXPORT									
CR4	47.6	37.4	31.1	34		30.8	37.3		31.3
ADVERT. (bill.L.)	6.9	2.8	4.4	8.4			33		36
MARKET SHARES:				(2)		(2)			
Quacker Chiari e Forti	25.3	19.0	20.9	14.5		15.6	21.6		21.5
Unil-It	5.2	4.8	4.6	3.1		10.0	7.4		7.8
Star	8.3	5.8	5.5	4.8		5.4	6.2		6.5
Salov	2.8	1	1.7			2.1	3.9		5.6
Icic		2.7		3.1		5.0	4.8		5.3
Carapelli	3.3	3.9	4.0	3.8		2.4	3.8		4.0
ADVERTISING							(3)		
SHARE:									
Quacker Chiari e Forti	27.5	35.7	45.5	54.8			10.0		59.4
Unil-It	17.4	10.7	6.8				14.6		32.3
Star	24.6	17.9	13.6	10.7			8.4		5.2
Salov									
Icic									
Carapelli									
DIVERSIFICATION:									
(% sales in market)									
Quacker Chiari e Forti	81.8	79.7	75.0	70.0		52.0	58.8	50.6	44.4
Unil-It	4.5	4.8	4.0	4.0		9.0	5.3	3.7	3.4
Star	8.0	6.3	5.0	5.0		5.0	9.8	5.4	5.5
Salov	31.5	40.4				43.7	29.5	15.3	19.4
Icic			6.0	6.0		12.2	12.5		
Carapelli	30.0		28.0	28.0		25.0			

(1) market value (bill.L.)
(2) production.
(3) advert./sales.
Source: Databank.

Table 4.21

DISTRIBUTION NETWORKS
Comparison of the four firms' networks
with those of the main competitors

GALBANI

A) Relative importance of channels used

	1983				1986				1988			
	A	B	C	D	A	B	C	D	A	B	C	D
Galbani	+++	-	+	+	+++	-	+	+	+++	-	+	+
Kraft	++	+++	++	+	10%	30%	55%	5%	10%	30%	55%	5%
Locatelli	+++	-	++	+	72%	-	17%	5%	50%	-	45%	5%
Invernizzi	+++	+	+	+	83%	-	9%	8%	83%	-	5%	12%

A = retail
B = wholesale
C = modern distribution directly
D = catering
+,++,+++ indicates the relative importance when no other data are available

B) Details of network

	1983					1986					1988				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Galbani	3000	-	148	-		3100	-	150	-	4000	4200	-	155	-	4300
Kraft	180		10			200	25	9	-	-	200	25	9	-	-
Locatelli	1000	-				900	-	100	15	1000	900	-	100	15	1000
Invernizzi	1000	-				1250	-	110	10	1200	940	-	110	6	1150

A = salesman (employed)
B= agents (independent)
C = deposits
D = "concessionari"
E = own means of transport
Source: Databank.

Table 4.22

DISTRIBUTION NETWORKS
Comparison of the four firms' networks
with those of the main competitors

BARILLA - PASTA

B) Details of network

1986

	A	B	C	D	E
Barilla	380		21	650	
Buitoni	70	140	10		
De Cecco			40		
Agnesi	16	14	90		

A = salesman (employed)
B= agents (independent)
C = deposits
D = "concessionari"
E = own means of transport
Source: Databank.

Table 4.23

BARILLA - BISCUITS

A) Relative importance of channels used

1988

	A	B	C	D
Barilla	45%		55%	
Alivar	50%		35%	
Nabisco	31%		69%	
Parmalat	53%		47%	

A = retail
B = wholesale
C = modern distribution directly
D = catering

B) Details of network

1988

	A	B	C	D	E
Barilla	400				
Alivar					
Nabisco		200			
Parmalat		650	100		

A = salesman (employed)
B= agents (independent)
C = deposits
D = "concessionari"
E = own means of transport
Source: Databank.

Table 4.24

DISTRIBUTION NETWORKS
Comparison of the four firms' networks
with those of the main competitors

PARMALAT

A) Relative importance of channels used

1989

	A	B	C	D
Parmalat	50%		40%	10%
CERPL	48%	2%	20%	6%
Polenghi	55%	35%	10%	
Ala	58%	10%	30%	2%

A = retail
B = wholesale
C = modern distribution directly
D = catering

B) Details of network

1989

	A	B	C	D	E
Parmalat	36	2000		300	
CERPL	285	187	10	650	411
Polenghi	250	300	67	330	360
Ala	45	80	26	50	90

A = salesman (employed)
B= agents (independent)
C = deposits
D = "concessionari"
E = own means of transport
Source: Databank.

Table 4.25

DISTRIBUTION NETWORKS
Comparison of the four firms' networks
with those of the main competitors

STAR - STOCK CUBES

A) Relative importance of channels used

	1988 A	B	C
Star	15%	25%	60%
CPC Monda	-	-	-
Nestlé	25%	45%	30%
Panzani			

A = retail
B = wholesale
C = modern distribution directly

B) Details of network

	1988 A	B	C
Star		960	
CPC Monda			
Nestlé		125	
Panzani		230	

A = salesman (employed)
B= agents (independent)
C = deposits
Source: Databank.

Table 4.26

DISTRIBUTION NETWORKS
Comparison of the four firms' networks
with those of the main competitors

STAR - TUNA

A) Relative importance of channels used

1989

	A	B	C
Star	58%	15%	20%
Trinity	-	-	-
Simmenthal	10%	10%	60%
Mazzola	9%	40%	50%

A = retail
B = wholesale
C = modern distribution directly

B) Details of network

1989

	A	B	C
Star		625	
Trinity	300	20	
Simmenthal	150		
Mazzola		50	

A = salesman (employed)
B= agents (independent)
C = deposits
Source: Databank.

Table 4.27

DISTRIBUTION NETWORKS
Comparison of the four firms' networks
with those of the main competitors

STAR - TEA

A) Relative importance of channels used

1987

	A	B	C
Star			
Nabisco	20%	55%	25%
Bonomelli	15%	10%	75%
D&C			

A = retail
B = wholesale
C = modern distribution directly

B) Details of network

1987

	A	B	C
Star		300	
Nabisco	30	85	
Bonomelli		140	
D&C		160	

A = salesman (employed)
B= agents (independent)
C = deposits
Source: Databank.

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.28

CHEESE

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
GALBANI	Certosa Bel Paese	7.10	4.63	8.25	5.68	6.99	6.19	2.29
KRAFT	Jocca Philadelphia Kraft	32.05	37.41	36.36	33.45	30.96	26.85	37.77
INVERNIZZI	Invernizzi	8.91	15.67	12.94	11.38	12.23	13.18	9.72
LOCATELLI	Pizzaiola Mio Fruttolo	20.00	16.21	14.57	13.60	11.03	10.12	11.58
PARMALAT	Parmalat	0.00	0.00	0.00	4.13	0.00	0.00	0.00
STAR	Starlette	6.13	4.55	0.00	0.00	0.00	0.00	0.00
TOTAL (mill. Lit.)		9,683.4	11,698.4	23,538.3	60,776.1	71,506.7	99,792.1	104,868.6

Source: AGB Italia

Table 4.29

SALUMI

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
CITTERIO	Citterio	19.79	23.08	18.69	17.08	13.55	18.66	14.72
FINI	Fini	0.00	0.00	0.00	0.00	3.49	1.84	3.47
FIORUCCI	Fiorucci	0.00	0.00	5.88	6.14	7.45	6.83	3.62
GALBANI	--	2.38	2.14	3.93	2.79	3.65	2.27	2.43
INVERNIZZI	Invernizzi	0.00	0.00	0.00	0.00	0.00	0.00	5.38
NEGRONI	Negroni	37.65	14.67	22.88	18.14	21.97	15.23	1.97
VISMARA	Vismara	13.56	7.03	18.40	13.58	8.72	18.00	8.77
TOTAL (mill. Lit.)		100.00	3,651.2	5,153.3	13,313.2	12,374.2	14,064.3	23,031.6

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.30

PASTA

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
AGNESI	Agnesi	5.22	0.00	0.13	0.47	9.13	4.18	17.25
BARILLA	BArilla	63.71	68.56	63.66	74.73	58.10	73.92	63.86
IBP	Buitoni	7.90	5.98	11.41	0.03	10.15	5.41	0.01
DE CECCO	De Cecco	0.53	1.98	0.40	0.92	2.51	0.62	0.08
PONTE	Ponte	2.89	0.61	0.05	0.00	0.00	0.00	4.10
VOIELLO	Voiello	11.40	9.29	10.89	8.83	4.83	7.35	7.33
FEDERICI	Federici	0.00	0.00	0.00	0.00	0.00	3.12	1.18
TOTAL (mill. Lit.)		3,456.5	6,548.3	8,780.1	15,701.3	40,137.0	46,495.9	50,646.1

Source: AGB Italia

Table 4.31

BISCUITS

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
DORIA	Doria Bucaneve	3.77	3.71	3.35	2.47	3.41	3.98	0.53
ALIVAR	Pavesi	24.13	23.93	16.29	15.90	16.33	14.47	17.22
PARMALAT	Mister Day	0.00	0.00	3.82	4.38	13.03	5.34	7.98
GALBUSERA	Zalet Galbusera	3.21	3.40	4.63	4.49	5.67	0.80	5.43
COLUSSI	Colussi	17.41	16.62	7.48	3.12	0.86	2.89	0.33
LAZZARONI	Lazzaroni	3.68	6.10	4.19	6.11	4.56	3.22	3.08
BARILLA	Mulino Bianco	14.64	6.59	13.04	12.12	16.87	27.36	20.34
SAIWA	Saiwa	10.03	7.46	14.18	11.95	7.51	14.56	10.03
SIDALM	--	3.53	3.14	2.27	0.00	0.00	0.00	0.00
TOTAL (mill. Lit.)		9,990.9	13,703.6	30,779.0	66,412.4	93,772.1	88,484.6	80,338.8

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.32

RUSKS

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
BUITONI	Buitoni	30.81	43.01	37.55	0.00	39.94	4.00	58.24
PLASMON	Cracottes	13.13	16.10	11.50	7.85	3.64	0.00	0.00
ALIVAR	Croccodi	13.39	0.07	0.00	0.00	0.00	0.00	0.00
BARILLA	Mulino Bianco	25.60	40.59	3.75	92.15	56.43	60.05	41.76
S.CARLO	S.Carlo	0.16	0.04	0.00	0.00	0.00	0.00	0.00
STAR	Volette	16.92	0.00	6.36	0.00	0.00	0.00	0.00
COLUSSI	Colussi	0.00	0.00	6.95	0.00	0.00	0.00	0.00
TOTAL (mill. Lit.)		4,579.7	4,980.3	6,054.5	4,374.2	8,926.5	9,965.6	10,453.1

Source: AGB Italia

Table 4.33

BREAD STICKS

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
BUITONI-MECO	Gioppini*	0.00	0.00	98.33	100.00	94.51	69.68	65.14
BARILLA	Mulino Bianco	96.78	0.00	1.54	0.00	5.49	30.32	6.23
DESCO	Monviso	0.00	0.00	0.00	0.00	0.00	0.00	28.63
VALLEDORO	Valledoro	1.32	0.00	0.14	0.00	0.00	0.00	0.00
TOTAL (mill. Lit.)		372.3	0.0	1,237.3	2,744.9	4,695.0	2,274.5	621.0

*Owned by Meco before 1984.
Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.34

CRACKERS

FIRM	BRAND	1983	1984	1985	1986	1987
BUITONI	Buitoni	0.00	19.03	5.80	4.84	0.95
DORIA	Doriano	6.58	7.46	6.17	3.62	6.15
GALBUSERA	Frumens Galbusera	21.29	25.13	14.71	7.90	20.24
ALIVAR	Gran Pavesi Motta	31.12	16.38	36.33	27.63	17.42
BARILLA	Mulino Bianco	0.00	0.00	0.00	14.77	14.35
PLASMON	Misura	0.00	6.06	10.59	14.51	14.65
SAIWA	Premium	9.63	22.71	25.11	10.92	20.18
ITALU	Tuc	3.58	0.56	0.03	1.63	4.91
STAR	Wasa	0.00	1.39	0.79	0.58	1.15
TOTAL (mill. Lit.)		8,863.8	17,925.9	25,947.3	29,152.7	38,714.6

Source: AGB Italia

Table 4.35

READY SAUCES

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
BARILLA	Barilla	20.75	0.00	13.31	13.84	5.75	12.73	117.22
STAR	Star Grand'Italia	49.18	73.64	53.91	51.11	82.94	61.59	81.85
TOTAL (mill. Lit.)		1,468.6	2,143.2	1,176.7	6,059.2	16,286.1	8,846.1	8,426.3

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.36

MILK

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
PARMALAT	Parmalat Dietalat	23.04	16.10	23.43	26.37	45.00	44.63	72.01
CERPL	Granarolo	7.01	24.84	14.54	10.46	6.76	2.51	0.37
.POLENGHI	Polenghi	9.00	10.54	5.45	13.72	27.08	17.08	13.21
ALA	Ala	1.94	0.83	5.38	12.22	12.27	4.55	0.26
SOLE	Sole	8.35	0.00	17.04	0.00	0.00	0.00	0.00
GIGLIO	Giglio	29.41	32.13	19.37	22.29	0.17	0.00	0.00
TOTAL (mill. Lit.)		3,060.6	2,551.9	6,599.9	7,759.9	7,042.4	11,691.7	13,388.4

Source: AGB Italia

Table 4.37

CREAM

FIRM	BRAND	1983	1984	1985	1986	1987
PARMALAT	Chef	52.58	43.00	100.00	60.18	99.39
SOLE	Sole	0.28	43.33	0.00	0.00	0.00
GIGLIO	Giglio	33.65	13.34	0.00	39.56	0.00
TOTAL (mill. Lit.)		1,012.7	1,492.0	1,349.1	3,322.6	1,050.4

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.38

YOGHURT

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
YOMO	Yomo	69.77	65.70	59.08	55.74	50.04	61.93	55.89
DANONE	Danone	22.71	22.39	17.83	29.68	23.71	19.73	28.73
PARMALAT	Parmalat	6.36	11.36	20.70	4.69	23.61	11.68	13.16
TORRE IN PIETRA	Torre in Pietra	0.00	0.00	0.05	4.71	2.42	0.00	0.00
MANDRIA	Mandriot	0.00	0.00	0.00	0.00	0.00	2.10	0.48
TOTAL (mill. Lit.)		2,500.0	4,350.2	7,948.8	26,285.7	49,331.3	65,766.6	64,630.2

Source: AGB Italia

Table 4.39

FRUIT JUICES

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
NABISCO	Del Monte	0.28	0.00	9.30	8.25	0.07	0.03	4.18
PARMALAT	Santal	27.23	9.37	14.18	10.48	18.41	15.24	13.74
ZUEGG	Zuegg Skipper	17.68	11.66	8.24	8.64	18.93	34.22	26.92
SALFA	Derby	0.00	0.00	0.00	0.00	2.20	11.94	5.02
STAR	Go'	0.03	40.17	16.58	7.21	0.00	0.00	2.27
COLOMBANI	Jolly	11.28	5.00	3.22	4.39	10.42	5.47	6.66
MASSALOMBARDA	Yoga	24.40	20.46	11.01	7.93	9.16	9.08	9.69
CONFRUIT		0.00	0.00	0.00	0.00	1.56	4.67	0.00
TOTAL (mill. Lit.)		1,487.6	2,789.2	6,908.3	19,148.2	25,604.7	22,874.7	43,960.2

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.40

STOCK CUBES

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
CPC MONDA	Knorr	20.74	25.80	26.31	14.20	23.11	41.94	50.25
PANZANI	Liebig	8.84	3.17	7.70	12.13	5.00	9.14	0.21
NESTLE	Maggi	21.17	22.36	29.49	41.91	34.53	16.86	13.60
STAR	Star	45.91	43.87	35.67	29.77	36.23	29.89	35.89
TOTAL (mill. Lit.)		5,011.1	5,693.3	9,049.4	14,532.1	17,348.4	18,676.8	32,632.6

Source: AGB Italia

Table 4.41

MARGARINE

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
STAR	Foglia d'Oro Star	29.43	25.68	23.91	32.50	45.31	15.30	58.89
VAN DEN BERG	Gradina Maya Rama	50.62	50.90	58.70	39.30	38.29	53.70	41.06
KRAFT	Valle'	19.95	23.42	17.39	28.20	16.40	31.00	0.00
TOTAL (mill. Lit.)		3,562.8	3,911.1	4,140.7	9,177.9	7,397.2	8,938.5	12,905.8

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.42

TUNA

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
ALCO	Alco	10.52	18.72	13.96	11.51	3.41	4.21	8.25
SIMMENTHAL	Mareblu	9.40	4.55	0.05	3.02	22.38	16.27	11.99
MAZZOLA	Maruzzella	9.58	7.09	6.52	7.82	6.63	4.18	6.03
SAFICA	Nostromo	14.97	10.96	4.25	0.43	4.15	4.91	5.24
PALMERA	Palmera	8.47	21.63	11.10	24.23	21.43	15.84	14.39
TRINITY	Rio Mare	34.49	22.18	38.18	24.29	19.96	65.05	39.86
STAR	Star	13.88	0.00	15.66	6.57	6.56	8.35	7.29
TOTAL (mill. Lit.)		4,463.2	5,185.6	7,303.1	19,966.3	37,520.3	57,201.9	62,659.0

Source: AGB Italia

Table 4.43

BABY BISCUITS

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
PLASMON	Dieterba	13.12	92.31	51.93	90.13	93.59	91.30	88.85
STAR	Mellin	78.52	7.66	5.71	9.09	6.22	8.25	11.15
MILUPA	Milupa	0.00	0.00	0.16	0.00	0.00	0.00	0.00
IBP	Nipiol	8.36	0.03	0.00	0.00	0.00	0.00	0.00
TOTAL (mill. Lit.)		2,132.0	2,767.1	5,315.7	4,100.5	12,781.3	16,507.7	18,240.2

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.44

CAMOMILE

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
BONOMELLI	Bonomelli	31.01	20.58	2.91	36.37	35.52	28.63	49.39
NABISCO	Montania	30.41	23.63	28.47	29.56	26.70	24.90	22.28
STAR	Sogni d'Oro	38.57	28.28	25.26	24.13	27.06	33.75	23.77
MILUPA	Milupa	0.00	0.00	2.40	9.93	10.73	0.00	0.00
TOTAL (mill. Lit.)		1,386.2	2,055.4	2,708.3	5,245.3	6,041.9	9,830.0	10,402.2

Source: AGB Italia

Table 4.45

TEA

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
UNIL-IT	Lipton	22.52	27.81	0.00	19.60	20.76	20.18	11.68
STAR	Star	35.47	34.54	39.58	28.47	21.71	24.63	21.44
NABISCO	Ati	21.29	22.20	20.60	4.19	17.14	9.35	21.12
BONOMELLI	Bonomelli	0.00	0.00	31.02	38.40	27.41	32.90	35.07
D&C	Twinings	15.04	13.89	8.42	7.75	8.66	7.51	8.74
TOTAL (mill. Lit.)		2,230.7	2,489.2	2,914.9	10,971.2	15,773.0	20,943.8	23,270.3

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.46

COFFEE

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
LAVAZZA	Lavazza Paulista	34.31	36.22	34.63	36.14	35.83	39.71	28.84
ILLY	Illy	0.03	0.31	0.19	1.54	2.87	3.56	7.60
CAFE DO BRAZIL	Kimbo	0.00	0.00	0.00	0.00	0.01	7.13	11.14
SAO	Sao	9.88	12.19	7.32	7.89	9.26	3.18	4.15
PROCTER&GAMBLE	Spendid	25.17	25.37	15.23	26.95	23.97	24.00	26.80
STAR	Suerte	7.44	9.95	5.98	3.29	0.00	0.00	1.43
TOTAL (mill. Lit.)		8,593.3	9,312.6	15,514.2	29,052.0	47,804.1	67,866.1	84,333.3

Source: AGB Italia

Table 4.47

PROCESS. TOMATO

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
STAR	Pummarò	30.03	21.71	25.71	23.27	11.89	14.10	14.23
CIRIO	Cirio	39.20	44.73	26.83	20.10	18.28	12.76	43.87
DE RICA	De Rica	15.04	8.35	10.32	14.54	6.56	0.00	0.00
PARMALAT	Pomì	0.00	7.45	23.84	9.13	23.46	15.19	8.96
TOTAL (mill. Lit.)		4,148.3	5,265.1	7,823.9	19,307.7	39,185.1	25,226.9	18,043.0

Source: AGB Italia

ADVERTISING EXPENDITURES
daily, weekly newspapers, TV, radio
(% of total market expenditures)

Table 4.48

SEED OIL

FIRM	BRAND	1981	1982	1983	1984	1985	1986	1987
QUACKER CHIARI E F.	Cuore, Topazio	37.63	46.30	55.78	71.80	46.34	50.14	34.18
UNIL-IT	Maya, Oio	10.69	7.43	0.03	14.38	24.00	33.75	35.30
STAR	Olita	18.61	13.93	11.13	12.12	9.43	15.73	9.46
SALOV	Sagra	0.72	0.00	0.00	0.00	0.00	0.00	5.80
ICIC	Sigillo	2.12	0.81	1.72	0.49	0.53	0.33	0.15
TOTAL (mill. Lit.)		2,819.6	4,396.1	6,516.8	17,750.7	19,268.2	30,961.0	33,235.4

Source: AGB Italia

Table 4.49

CONDENSED SOUPS

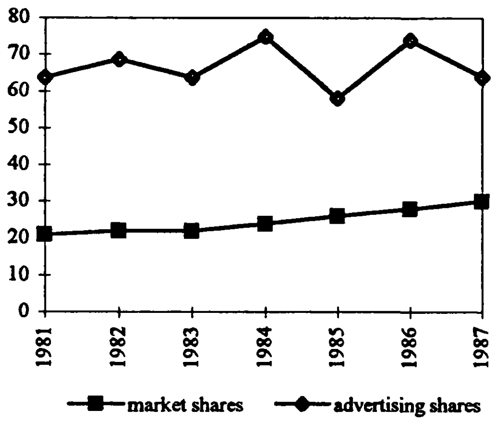
FIRM	BRAND	1984	1985	1986	1987
CAMPBELL'S	Campbell's	100.00	0.00	8.21	13.98
STAR	Grand'Italia	0.00	0.00	12.24	12.64
CPC MONDA	Knorr	0.00	100.00	79.55	51.69
NESTLE	Maggi	0.00	0.00	0.00	11.23
PARMALAT	Pais	0.00	0.00	0.00	10.45
TOTAL (mill. Lit.)		305.2	1,214.6	11,266.0	14,666.0

Source: AGB Italia

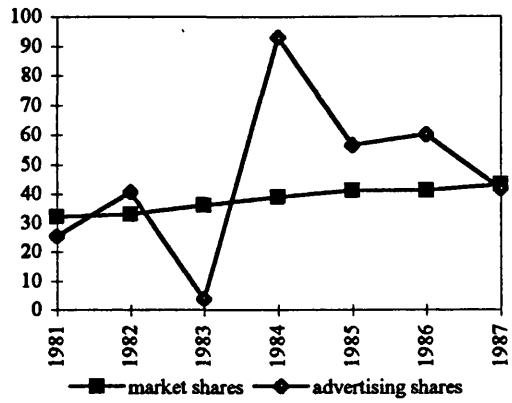
Fig. A5

BARILLA
MARKET SHARES VS. ADVERTISING SHARES

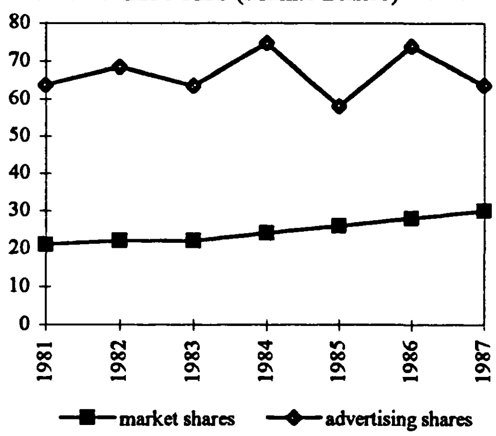
PASTA (Barilla)



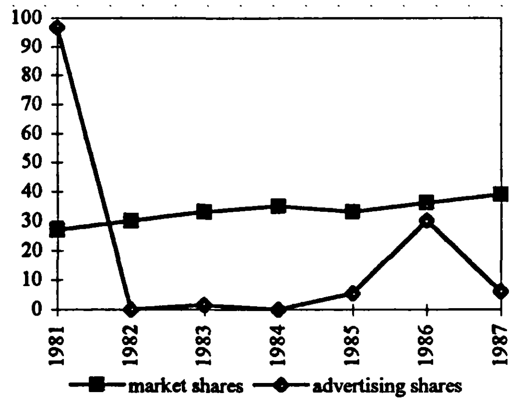
RUSKS (Mulino Bianco)



BISCUITS (Mulino Bianco)



BREAD STICKS (Mulino Bianco)



CRACKERS (Mulino Bianco)

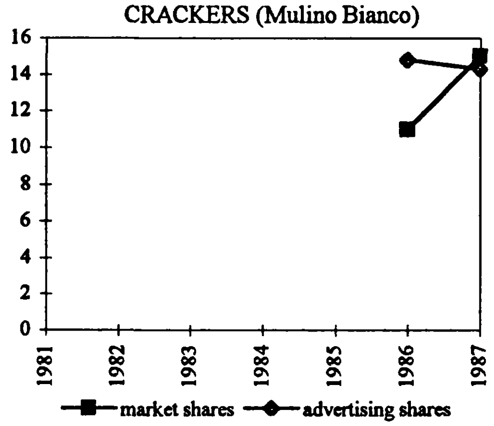
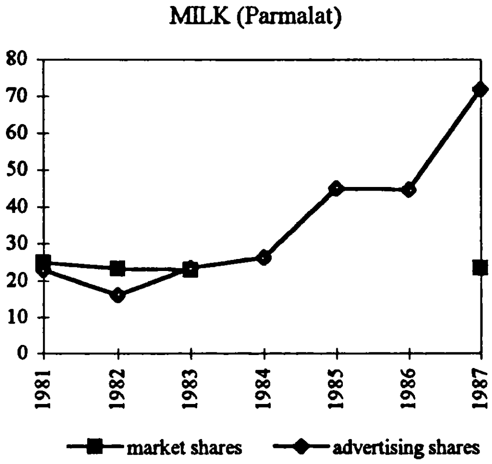
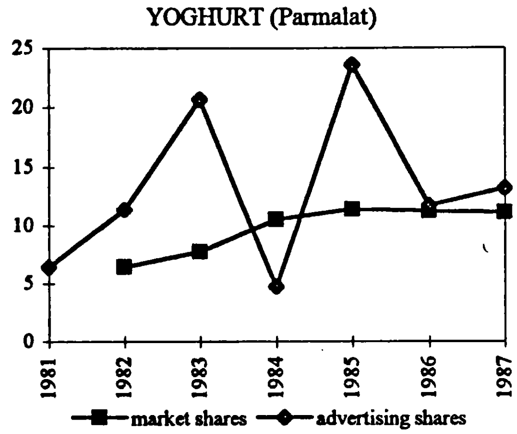
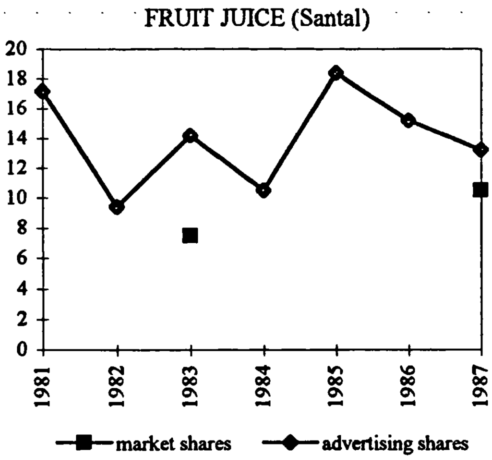


Fig. A6

PARMALAT
MARKET SHARES VS. ADVERTISING SHARES







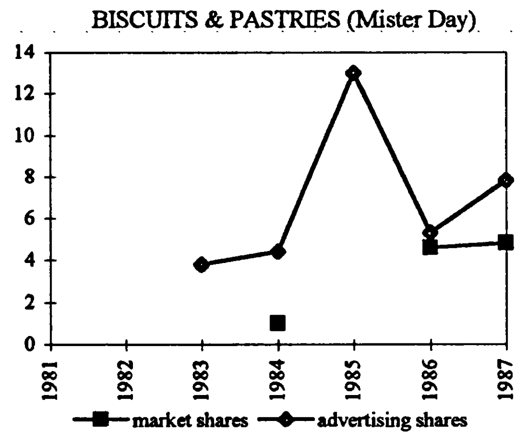
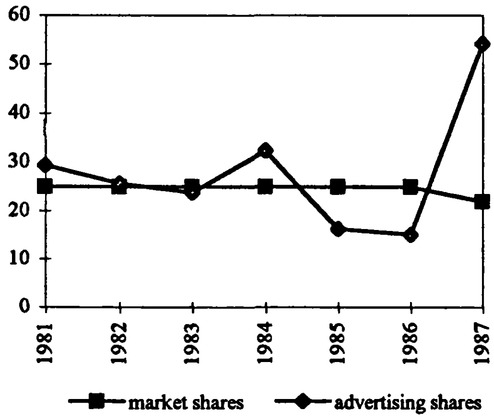


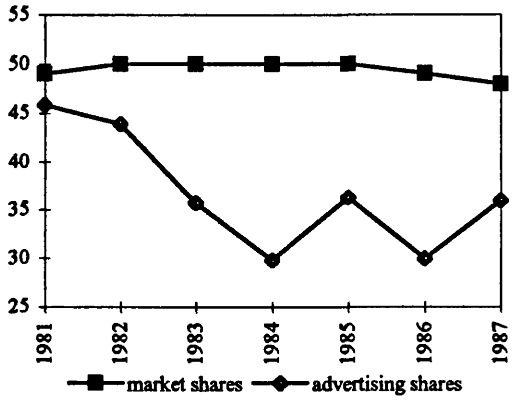
Fig. A7

STAR
MARKET SHARES VS. ADVERTISING SHARES

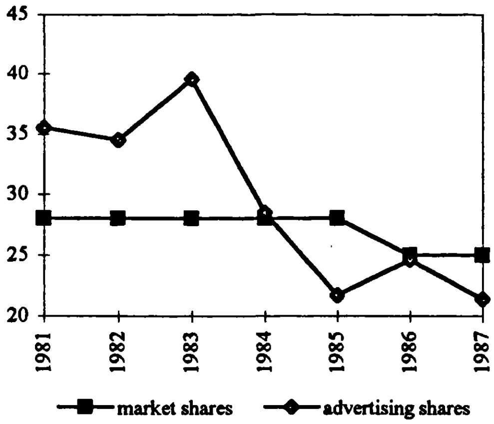
MARGARINE (Star)



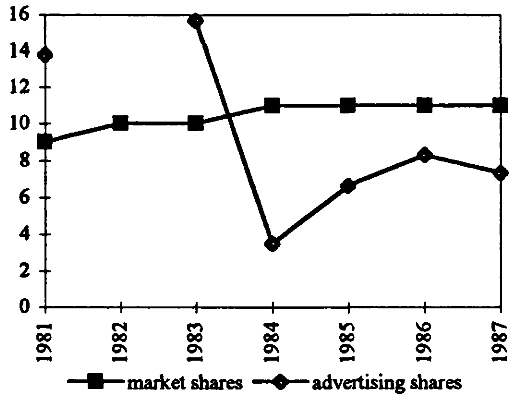
STOCK CUBES (Star)



TEA (Star)



TUNA FISH (Star)



BABY BISCUITS (Mellin)

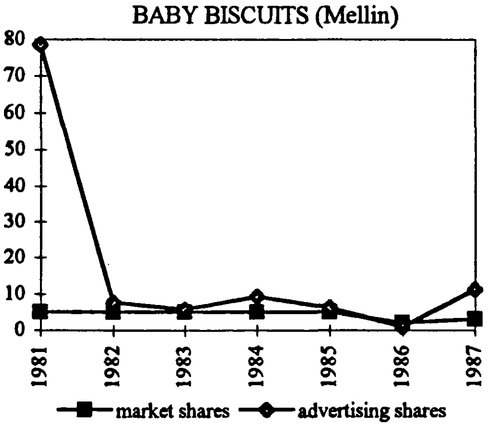
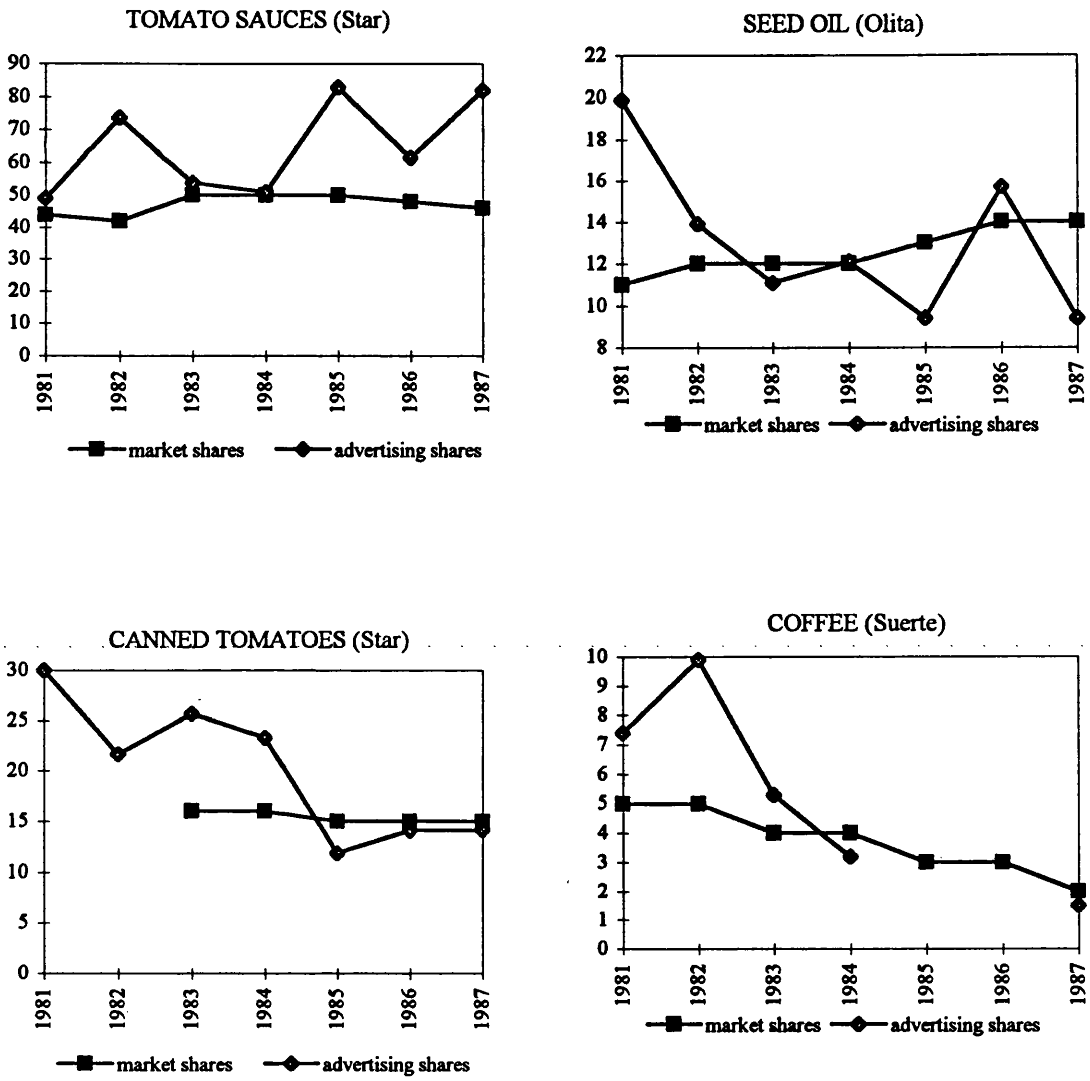


Fig. A8

STAR
MARKET SHARES VS. ADVERTISING SHARES



Chapter 5

Summary and Conclusions

1. Introduction

Diversification is a widespread phenomenon. A high proportion of firms are diversified, including relatively small firms, many of which are diversified in a modest way. In fact diversification seems to be a relatively "natural" step in the firm's growth process.

For these reasons it is important to understand when this process occurs during a firm's life cycle, under what conditions it happens and to ask whether this process is consistent with profit maximising behaviour. What effects does diversification have on firms' performance? What are its implications for efficiency and welfare?

In the present thesis we concentrated mainly on the former issues. It was decided, partly because of lack of data on ownership structure, to focus on firms' internal diversification within a single broad sector, the food and drink sector, rather than on conglomerate diversification obtained by means of mergers and acquisitions. In other words, we have focused on "narrow" diversification strategies.

In what follows we briefly discuss the main findings of the thesis, both theoretical and empirical, in the context of the literature. We review the methodological contribution of the thesis and discuss the interpretation of results. Some suggestions are made as to further research that is suggested by our conclusions.

2. The Motivations for, and Advantages of the Present Approach

The existing literature clearly identifies a number of reasons for diversification. In chapter 1 it was shown that a combination of various supply side approaches (economies of scope, transactions costs, theories of growth) generate a coherent "story" as to why firms diversify. Demand side factors - such as demand rigidities and/or exogenous constraints on growth or profitability - complete this picture. Strategic models have added further reasons for diversification.

The empirical literature on motives for diversification, however, has developed almost independently of theory and has been based on rather *ad hoc* assumptions aimed at relating <u>levels</u> of diversification to a list of (mainly industry based) variables. There are some exceptions to this approach. A limited number of studies explain patterns of diversification by reference to variables that describe industries' "relatedness".

Most empirical analyses on the relationship between diversification and firms' performance have been based on the (somewhat vaguely defined) concept of synergies across industries, arguing that these should induce better performance among diversified firms. With some notable exceptions, the results of such studies seem not to be very robust.

The approach taken here involves two steps: on the one hand we have developed an empirical methodology for the analysis of patterns of diversification, which is complemented by case study analysis; on the other hand we have developed a theoretical model on the relationship between diversification and performance that identifies some possible sources of bias in traditional empirical analyses and offers some suggestions that might lead to better founded empirical work.

2.1 Analysing Motives for Diversification Empirically: a New Methodology

The approach developed in the empirical analysis of chapter 3 has been based on a number of objectives that, in the light of the preceding discussion of the literature, appear relevant.

First, the analysis should be centered on patterns of diversification rather than on levels alone. Even if this may not allow us to address explicitly the issue of diversification driven by demand constraints (the "push factor" for diversification), it nevertheless allows us to analyse theories that relate to the supply side: an analysis of patterns should better uncover the motivations underlying diversification.

Secondly, an international comparison seemed useful in identifying structural reasons for diversification, and in distinguishing these from contingent reasons or motivations related to institutional factors. A time dimension was added in order to probe further the structural character of some of these forces. Italy and U.K. are interesting examples because of certain institutional differences (in regard to antitrust legislation and in respect of the structure of the distribution sector) that might be relevant for our analysis.

Thirdly, it seemed important to use a more detailed dataset than the ones usually employed in the literature; in particular, given the definition of diversification used here (which is based on a low value of cross-elasticities of demand), it seemed important to use a product definition based on a demand side description rather than a production-based measure.

In the light of these requirements, an extremely detailed dataset was constructed, which describes the diversification patterns of a large number of Italian and U.K. food firms in 1986 and, for the U.K., in 1962.

A methodology different from the approach traditionally used in the literature was developed to uncover and analyse diversification patterns.

As noted earlier, empirical analyses are usually based on regressions of diversification levels against firm and industry characteristics. A very limited number of studies concentrate on patterns: these use probit regressions in which the dependent variable takes the value 0 or 1 depending on whether the firm is diversified or not, or on whether a firm mainly active in industry i is also active in industry j.

Here, we developed a new method that allowed us to describe patterns of diversification and to measure them. This method was based on the use of a "clustering algorithm" to identify related groups.

On the basis of a preliminary grouping of industries, we developed two approaches.

The first approach is an adaptation of a traditional method of analysis of categorical data organised in contingency tables to the analysis of diversification. The use of log-linear models allowed us to uncover interdependencies among variables and appeared to be an obvious candidate method of analysis (though surprisingly it has not been used before in analysing diversification).

Some issues had to be resolved in order to permit the use of this method: data had to be rearranged in contingency tables in which the variables were taken as the industries. Some degree of arbitrariness was introduced in this process in the definition of some cells' values. Moreover - due to computational limitations - we had to limit ourselves in using this method to the analysis of the previously identified groupings.

Despite these limitations, the method proved reasonably powerful - in the sense of statistical significance - in describing interdependencies across industries and in uncovering potentially complex links. Its use might in principle be extended to analyse more "distant" diversification strategies, or even occurrences of "multimarket contact". Even if the method is applicable only to groups that include a fairly small number of industries, it may nevertheless be useful in confirming hypotheses formulated on the basis of *ad hoc* methods.

Some of the limitations of this procedure, and in particular both the arbitrariness in some steps of the analysis and the difficulty of giving a structural interpretation to the parameters estimated, motivated a search for some alternative method. The method developed in chapter 3 is based on a simulation of the theoretical models presented in the preceding chapter. In these models, diversification is driven by cost correlation or by economies of scope. The aim in chapter 3 is to find out whether the patterns we observe can be adequately described by reference to these models. If this is the case, we obtain an interpretation of estimated parameters in terms of the degree of cost correlation or the relevance of economies of scope across the industries concerned.

The appeal of both these empirical approaches (the log-linear and the simulation methods) lies in the possibility of extending their use to the analysis and comparison of different datasets. Both methods offer a useful way of comparing datasets and of identifying sources of relatedness. The second method in particular allows us to evaluate separately the pattern of diversification, and the level of diversification.

A complementary analysis of some kind is still needed if we are to pin down the interpretation of the empirical results obtained from this approach. Various lines of attack could be followed. One possibility would have been to perform a more detailed statistical analysis of the groupings of industries identified, in order to uncover the sources of relatedness (cost correlation or economies of scope) in a more precise way. This would have involved analysing data at an industry level, looking at the technology used in the various industries and the economies of scope it might generate, at the intensity of advertising, and at other possible sources of relatedness. However data on industries as defined here, at a very fine level, are extremely difficult to obtain.

A different line of attack was followed here. This involved looking at some case studies on specific firms (rather than industries) with a view to unravelling their diversification history, uncovering the motivations for diversification, and asking whether these are consistent with the findings of the statistical analysis.

The design of a case study analysis involves a degree of arbitrariness: it was decided to concentrated on one of the two countries in order to assess the impact of some specific institutional factors. It was further decided to focus on large firms with widely different diversification strategies.

The objective of this approach was to help reveal whether the theoretically postulated motivations for diversification could explain differences in observed strategies.

As discussed in the first chapter, the case study approach has occasionally been used in the empirical literature on diversification but with a focus on analysing performance. The case study approach is more common in the business literature, where in most cases it has involved an analysis of industry and firm characteristics and of the "type" of diversification moves that firms have made in order to evaluate reasons for the success of such strategies. The studies do not usually involve any detailed analysis of the degree of correspondence between theoretically predicted patterns of diversification and firms' actual choices. Even if it the case study approach does not allow us to generalise results further, it can be an important instrument for the analysis of reasons for diversification since it allows us to understand better underlying motivations and to give a clearer content to certain theories.

2.2 A Theoretical Model for the Performance of Diversified Firms

The results of most empirical analyses on the relationship between diversification and performance are rather unsatisfactory, in that they do not rest on a satisfactory link between theory and testing[1].

It is the dissatisfaction with this literature that motivated the theoretical model used in chapter 2 to analyse the relationship between diversification and firms' performance.

A simple model was developed in which diversification is driven either by the presence of cost correlations across industries or by economies of scope. These are often thought to be circumstances in which diversification enhances efficiency or profits. The model was kept as simple as possible in order to concentrate on the effects of these two elements. Firms were assumed to be characterised by different levels of efficiency, as represented by differences in the "fixed" component of costs.

In the literature, the theoretical analysis of diversification is performed either in a perfectly contestable framework, where all firms diversify if there are economies of scope; or in a strategic framework, where firms diversify also in absence of synergies.

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[1] As discussed in the thesis, there are some exceptions to this including, for example, the studies of Montgomery and Wernerfelt (1988a, 1988b).

The essential novelty of the present approach is to model entry decisions, taking firm characteristics as given. The self selection of firms in the light of this intrinsic efficiency differences drives the main results.

The model addresses the relationship between diversification and performance and identifies possible reasons why the correlation between the two variables might be negative. It shows that, even when diversification is driven by the search of synergies (such as cost correlations or economies of scope across industries), diversified firms are not necessarily the most profitable firms on the market. Diversified firms might appear to perform badly if they are inefficient firms which are able to survive on the market only because of the synergies they exploit. If this is so, then it is not diversification *per se* which reduces firms' profitability.

A negative relationship between diversification and performance is observed, in the model developed in chapter 2, under certain conditions with respect to the cost function of the firms on the market, when the synergies across the industries are not strong (we might interpret this as being more likely in the case of conglomerate diversification as opposed to "related" diversification).

The empirical results reported in the literature might then be explained either in terms of missing variables or in terms of selection bias. As to the former, the fact that efficiency measures are hard to obtain, and are normally excluded in empirical studies means that these studies typically explain bad performance by reference to diversification strategies rather than by reference to underlying firm characteristics. If the regressions included cost variables, these two effects could be disentangled. The selection bias arises from the fact that, in terms of the model, almost all "bad performers" who are able to exploit the synergies are diversified at equilibrium. If this were so empirically, we could not observe "bad performers" who were not diversified, except by following the history of individual firms. These estimation problems may explain the negative correlation reported in the literature, while suggesting a very different interpretation to that normally offered.

Many interpretations suggested in the literature rely on disequilibrium explanations, or are based on non-profit maximising behaviour of firms (in particular they are often linked to the supposed behaviour of managers). The appeal of the results developed here is that they are obtained within an equilibrium framework, and assume profit maximising behaviour by firms.

Our results are particularly interesting in the context of a very recent analysis on the wave of de-diversification that occurred in the United States in the 1980s. Lang and Stulz (1995) compare the performance of conglomerate firms with that of specialised firms in the 1980s. They use Tobin's q as a measure of performance and adopt a "chop-shop" approach for the comparison: the performance of a real conglomerate firm is compared to a weighted average of the performance of specialised firms in all the industries where the former is active. The authors find that conglomerates are consistently worse performers than specialised firms in the period considered. More interestingly, in the context of the present results, they find some preliminary evidence that firms which diversify are poor performers relative to firms that do not. Our theoretical result on the negative correlation of diversification with profitability holds for firms diversifying into industries that are not too closely related and relies on the fact that diversified firms might be the poorest performers. Hence the evidence of Lang and Stulz appears to be consistent with our explanation of a negative correlation.

2.3 The Empirical Findings

The main findings obtained in chapter 3 are that diversification patterns appear to be very similar within the U.K. over a long time period, and reasonably similar too between the U.K. and Italy in the reference (1986) year. In this respect the two methods (log-linear analysis and simulation) produce reasonably consistent results.

However the levels (or, more precisely, the intensity of the links across industries) are quite different in the U.K. and in Italy: in particular the Italian levels appear to be lower than in the U.K. even when we compare Italy in 1986 with the U.K. in 1962.

The broad similarities of patterns observed across countries and time suggest that diversification patterns are explained by stable structural factors.

An evaluation of these factors and hence of the sources of the linkages across industries is however difficult without a detailed analysis of the industries involved and of some firms' diversification patterns. Certain possible sources of relatedness (advertising relatedness, R&D relatedness, input/output relationships) are identified in the literature, which finds them significant in explaining diversification patterns.

The case study analysis developed in chapter 4 allowed us to clarify the importance of some further sources of linkages. First, it showed that relatedness in production technology and the possibility of using common inputs are among the main sources of relatedness for all firms, and are particularly relevant in explaining small firms' diversification. This factor is not usually stressed in the empirical literature both because it is difficult to measure and because it has often seemed more important for small firms, which are generally not included in the analysis.

Secondly, it showed that additional factors are relevant in explaining large firms' diversification: some of these (the possibility of exploiting a brand name) have been considered in the literature (and have been proxied by relatedness in advertising expenditure), while others have not been discussed (for example distribution economies).

Hence the empirical analysis of diversification patterns developed here offers both a more precise and deeper content to the notions of economies of scope and cost correlation, relative to previous studies, and new methodologies to analyse patterns and levels of diversification in a rigorous and easy to interpret way.

3. Suggestions for Further Research

The approach taken in this thesis and the results obtained suggest some further lines of research that might be investigated, both at the theoretical level and at the empirical.

3.1 Theoretical Lines of Analysis

From a theoretical point of view it would be valuable to analyse further reasons for diversification beyond those analysed in chapter 2 within the context of a model in which entry decisions are endogenised. In particular, the effects of ownership structure on firms' diversification strategies were not considered here. Some hypotheses have been proposed in the literature in relation to conditions where there is a separation between ownership and control. It has been suggested that in those cases conglomerate diversification (or better diversification not specifically driven by the search of synergies) might be driven by managers' "search for power". In this context it would be interesting to investigate whether different ownership structures (for example those in which banks or other firms have large shareholding in the firm) generate different incentives for related or conglomerate diversification, or indeed for vertical integration.

As to the relationship between diversification and firms' performance it would be worthwhile to extend the theoretical model developed in chapter 2 to make it more directly testable. One extension would be to consider more than two product markets and to introduce different degrees of correlation across markets, with a view to obtaining predictions about the effect of different degrees of correlation across markets on the relationship between diversification and performance. Other generalisations of the model could be considered that allow for strategic interactions within the firm or that take into account financial factors.

Finally, as to the welfare effect of diversification - which has not been considered here - even if multimarket contact and its antitrust implications have been sufficiently analysed, it remains worth asking about the incentives to grow and diversify that are not welfare enhancing, especially in the context of some kinds of ownership structure. Certain analyses on U.S. conglomerate firms suggest that, when ownership is extremely dispersed, diverging interests between managers and shareholders might lead to excessive diversification (even if it is extremely difficult convincingly to demonstrate a link between unprofitable diversification strategies and the influence of managerial interests).

One valuable approach would be to look at different ownership and control structures, such as the pyramidal group structure. When a pyramidal group is used by a parent company to raise external capital from minority shareholders (without loss of control), this might be a serious problem. The interests of the parent company, which coincide with those of the group as a whole, might conflict with those of minority shareholders of single companies. One relevant hypothesis here would be that, in hierarchical groups, the controlling shareholder might be able to divert funds from one company to another and that this might be more easily done in groups where vertical integration or related diversification make transfers of financial resources easier.

3.2 Empirical Lines of Analysis

Further work would also be interesting on the empirical side. The present analysis has been limited in certain respects by a lack of suitable data. The availability of new micro-data on firms that allow the break down of each firm sales by product markets would enable us to apply the method developed in chapter 3 to different measures of diversification and to check the robustness of results.

A particularly interesting development of that analysis would consist of a time comparison for the Italian case, in order to evaluate more precisely the effect of the two main institutional factors that differentiate the Italian case from the U.K. industry. In 1990 an antitrust law was introduced in Italy. Moreover in the second half of the 1980s and at the beginning of the 1990s concentration has risen rapidly in the distribution sector. The results on the 1986 diversification patterns might be usefully compared with those of a more recent year to evaluate the effects of those changes.

The method developed might also be used to analyse "less narrow" diversification strategies across wider sectors. It could be applied to cases of conglomerate diversification (for example across two-digit industries) in order to evaluate whether in these cases we also observe some common patterns and links across industries. These might be due to a correlation across industries in terms of different positions of the products in their life cycle, or by the search for multimarket contact.

Much could be learned from a theoretically well-founded empirical analysis of diversification and profitability. To uncover the effects of diversification, it is appropriate to take into account all those variables that affect performance, and especially those that might be correlated with diversification (and would induce a bias in the estimation), such as firms' intrinsic efficiency levels. Were such factors measurable, regression analyses could be performed with data on firms' costs. Failing that, it might, at least, be possible to reduce the effect of firm-specific efficiency through the use of panel data. Another possibility would be to look at firms' profitability over time, in particular in the years preceding the diversification move, and to compare this with those of "matching" single product firms that do not diversify.

Much of the work that now seems attractive demands datasets containing richer information than those now available. Progress in this area is likely to depend very heavily on the laborious construction of new and more comprehensive datasets. The joint efforts of researchers and institutions is making this aim closer.

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