PRICE STABILIZATION IN A TWO-SECTOR INDUSTRY

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Abstract

Supermarkets now sell over a third of fresh fruit and vegetables sold in Britain and most of this is obtained directly from prepackers and importers who have contracts with the growers. Greengrocers, on the other hand, buy mainly through wholesale markets. Supermarkets stabilize retail prices more than the greengrocers do, though there need be no difference in their margin. This policy affects the average revenue curves of the growers, making that of the contract growers more elastic, and that of non-contract growers less elastic. The implication of this, in relation to market margin analysis and the implications to growers are discussed.

Introduction

In this paper the effects of market structure and of price stabilization on the derived demand for a product are analysed. The market structure used in the analysis is based on that of the British market for fresh fruit and vegetables, so the discussion opens with an examination of the relevant aspects of the British produce market. A model is then used to compare the effects of this market structure, when combined with price stabilization, with a simpler market structure, rather like the one that existed ten years ago. Conclusions are drawn from this model and finally the implications are discussed, both the implications in relation to market margin analysis and the practical implications to the vegetable industry.

The British fruit and vegetable market

Until 1960 nearly all horticultural produce sold in Britain went through wholesale markets. This type of market has been described in detail by the Runciman Committee (1957), Ellis et al. (1967) and Ellis and Kirk (1968). Under this system growers despatch their produce to commission salesmen in central markets. Greengrocers visit the markets and buy the produce from commission salesmen, who take a percentage commission and a fixed handling fee, and pay the balance to the growers. Prices depend on the quantity supplied and a market price is arrived at by bargaining between greengrocers and commission salesmen. There is no restriction on who can buy or sell in the market. As there is a large number of buyers and sellers, none of whom can affect prices and as the product is gradeable, if not homogeneous, the market is a fair approximation to pure competition - polyopsony.

In the past ten years there has been a major change in the structure of grocery retailing and, following from this, a major change in the market structure for fresh fruit and vegetables. Supermarkets and self-service

stores now have three quarters of the grocery trade. At the same time the grocery industry, especially the supermarket section of the industry, has become concentrated in a few retail chains. The supermarkets sell fresh fruit and vegetables as part of their food retailing business and they have taken a considerable part of the produce market. Bowbrick (1972) has shown that over a third of all horticultural produce is retailed by large supermarket and variety-store chains, those with food turnover of over £10 million, and that these chains buy through only twenty-six buying points. The supermarkets and variety chains have similar procurement systems and can be treated as one type of store for the purposes of this discussion. The supermarkets have developed their own procurement systems for several reasons: they can obtain economies of scale in buying, they can obtain the quality of produce they require, they can obtain produce when they require it, they fear they might influence wholesale market prices if they were to use wholesale markets with their present volume of turnover.

Bowbrick and Hinton (1971) show that the supermarkets buy most of their requirements directly from prepackers, growers and importers, rather than from the wholesale markets. Normally they have agreements or contracts with their suppliers. The quantity to be supplied is specified in advance, usually before planting, and the supplier must deliver this amount, as long as the produce is available and the supermarket is willing to buy it. The growers cannot refuse to supply the supermarket without breaking the contract, except perhaps, when prices are exceptionally low. The contracts and agreements are seldom legally enforceable, but both parties consider them fully binding.

Most supermarket chains have a policy of price stabilization, keeping retail prices steady for as long a period as possible. Parish (1967) uses the term 'levelling' to describe this practice, but he assumes that fluctuations in margins are an integral part of the practice, while this paper examines the effect of stabilization independently of fluctuations in margins. It is, of course, impossible to make small percentage changes when prices are low; the smallest change one can make in an item priced 3p is 16.7%, or, if the supermarket avoids half pennies, as many do, 33.3%. One can of course make an offer of the '5 oranges for 11p' variety. Perhaps the most important reason for keeping prices steady is that supermarkets feel that customers prefer steady prices and resent frequent price changes: people notice price rises more than price falls, especially in an inflationary economy, where price rises are expected to be permanent. Also important are the costs associated with frequent price changes, particularly the confusion caused among supermarket staff, who have to handle hundreds of price changes and special offers in other departments as it is. Other costs, such as the need to change orders and the prediction of the reaction of consumers and competitors, do arise but, as far as supermarkets are concerned, I would place less importance on them than Parish (1967) did when talking of butchers' shops, because a chain of 100 supermarkets incurs much the same costs as a single butcher's shop. Houston (1962) argues that average unit costs may rise sharply if the volume handled is

much above or below the normal quantity and that, for this reason, retailers try to keep a steady throughput. This argument loses much of its force if it is applied to vegetable retailing, as there are substitute fruits and vegetables which the shop can handle with the same staff and equipment, while supermarkets are particularly flexible and can substitute soup or detergents without affecting the unit cost. Parish (1967) points out that retailers maximise profits by price stabilization where the "demand facing individual retailers is more elastic when prices are high than when they are low. This property is possessed by a linear demand function for example". Retailers work on the assumption that there are some prices that housewives perceive to be low; that housewives consider prices like 11d, 1/11d or 2/11d to be much lower than 1.0d, 2.0d or 3.0d. This can encourage stabilization: if, for example, a vegetable is priced at 1/3d, sales may not increase when prices fall to 1/2d and will probably decline if prices fall to 1/1d, a price which housewives see as the result of the retailer's meanness in charging 1d over 1/0d. Of course these preferred prices vanished when Britain adopted decimal coinage. Housewives have not yet adopted a new set of preferred prices, but retailers do tend to adopt prices ending in 9p or 9½p. Housewives also have a concept if the 'right' price for a commodity; for many years 4d a pound was considered the right price for carrots, and any higher price was resented. Where housewives have this view of prices, retailers will stabilize prices but, again, decimalization has upset habits.

Empirical evidence supports this analysis. In the study described by Bowbrick and Hinton (1971) it was found that stabilization is an important factor in supermarket pricing strategy. Of the large grocery and variety store multiples, those with a food turnover of more than £10 million a year, 81% aim at stabilizing prices over a week, and half of them aim at keeping a steady price for a month or more.

Greengrocers also stabilize prices, but they tend to do so over shorter periods and for a smaller range of commodities. It was shown in the same study that only half the large greengrocery multiples aim at stabilizing prices and only 17% aim at keeping a steady price from month to month. This longer-term stabilization is confined to one or two commodities, perhaps mushrooms and apples. A comparison of supermarket prices with the greengrocery prices given by Wicks (1969) confirms this. The general conclusion, that supermarkets stabilize prices to a greater extent than do greengrocers, has been supported by supermarkets, greengrocers and wholesalers in interviews.

If supermarkets stabilize prices more than do greengrocers, it follows that their prices can be different for some weeks without many customers changing from one type of shop to another and that one can treat the demand curves of the different types of shop as being quite independent. This is consistent with the research findings available; for instance Bowbrick and Hinton (1971) found in their study of large multiples that grocers tend to compete with grocers, and greengrocers with greengrocers and that there is relatively little competition between the different types of shop as far as fresh fruit and vegetables are concerned. This is shown in Table 1. This is, of course, a generalization: each individual shop

faces different competition depending on whether it is next to a green-grocer or a retail market or whether it has no immediate neighbours. Shop-window advertising need not be evidence of competition between different types of shop, but only of competition between individual shops of the same type. It may be noted that produce is seldom a main feature in supermarket advertising. Holdren (1960) explains why such advertising would be unsound.

Several firms compete only with a few firms of the same type selling the same quality of produce. A variety store selling produce competes strongly with a neighbouring variety store selling the same quality clothes and the same quality produce, but it does not compete with the mass-market chains. On the other hand, a supermarket which sells top-quality produce and aims at the AB market (according to Ministry of Agriculture, 1971, over £27 per week), found that its sales were not affected when a supermarket which aims at the CD market opened next door (Bowbrick and Hinton, 1971). This is due to consumer loyalty to individual stores and due to the strong class image of certain stores.

The existence of strong consumer loyalty is shown in surveys conducted by the Economist Intelligence Unit (1962), Bennett (1963), Umpleby (1969) and Research Services Ltd. (1971), all of whom show that a large number of housewives buy from only one retailer, who may of course be a chain or supermarket.

If the supermarkets have a policy on margins, always charging a constant percentage margin, for instance, the purchase price and the quantity sold at retail are fixed, being determined by the retail price. It follows that the supermarkets go to their suppliers and purchase their requirements, stating both price and quantity, rather than setting the price and taking the quantity offered at this price, or setting the quantity and paying the price necessary, as the text-books would indicate. They can only do this in the short run, and even then only because their suppliers are under contract. In the long run they have to conform to market forces: if their prices were too low, contracts would not be renewed and if they were too high, customers would eventually go to other shops.

Summary. - The position in the British fruit and vegetable market at present is as follows:

Two thirds of fresh fruit and vegetables are marketed in a system that can be characterised as polyopsony-perfect competition. One third of fresh fruit and vegetables are marketed in a system that can be characterised as oligopsonistic-oligopoly.

In the short term the two markets are independent at the retail level, but are interconnected at the supply level. Oligopsonists buy under a contract system. Oligopsonists (supermarkets) stabilize prices to a greater extent than do polyopsonists (greengrocers).

Clearly, the derived average revenue to the growers will not be the same under these conditions as it would be in a market with a simple structure. Accordingly, after a brief consideration of market-margin models used for a simple market system an appropriate model will be constructed and examined.

was writing before supermarkets became important and Rashid (1968) was writing about Pakistan and Bangladesh, where supermarkets are not yet important. In a two-sector industry, such as the one described above, one can no longer assume that grower's return is retail sales less retail marketing margin. In this paper it is proposed to examine the effect market structure has on grower's return, in the absence of the policies on margins described by Parish (1967), Allen (1959) and Rashid (1968).

The model

This model has been devised to explain the main features of an extremely complex marketing system, ignoring those market channels which have little volume or which have little effect on prices. It is believed that the model is acceptably close to the British marketing system as, in practice, about two-thirds of the produce sold by supermarkets is prepacked and the rest passes through the same marketing channels, being bought from prepackers, merchants and importers rather than from the market salesmen. Produce going through minor distribution channels could amount to 15% of the market but I think this can be safely ignored. The marketing system assumed is shown in Figure 1.

It is assumed that quality is uniform and that the harvesting and marketing costs of the different growers are uniform. The prepackers are seen as procurement agents for the supermarkets and the commission salesmen as selling agents for the growers. The contract growers sell supermarkets the required quantity at the price fixed by the supermarkets; if they have any more produce available, they can sell it on the market. Supermarkets normally buy all their produce from contract growers, but they buy on the market, at market prices, if the contract growers have insufficient supplies available. The supermarkets stabilize retail prices and have a fixed percentage margin, thus setting both price and quantity. In this case there is no elasticity of demand in the normal sense. The greengrocers also charge market price plus a fixed percentage. In the short run the grower has to decide whether or not to harvest the crop, and, in doing so, he is influenced not so much by the price he will get in the different markets as by the net return in the field, after subtracting marketing and harvesting costs. In the short run, therefore, the farmers' revenue is defined as market price minus harvesting and marketing costs, so short-run costs are zero.

If the market price is not high enough to cover marketing and harvesting costs, the produce will be disposed of, perhaps by ploughing it in, - it is assumed here that there are no disposal costs. The disposal activity may be seen as a market whose demand curve is perfectly elastic above the point at which it pays to destroy produce, the point at which marginal revenue is zero. Above this point no produce will be disposed of at any price, so the average revenue curve may be seen as a vertical line at zero supply. Thus the demand curve may be seen as a straight line along the x and y axes. Growers will attempt to equate the marginal revenue in each market, in order to maximise profit, and they will do so by allocating supplies in such a way that marginal revenue is zero and elasticity of demand is unity in each market, or, if there is no surplus to

Existing models

Most models of retail margin analysis, such as those of Allen (1959, 1961), Rashid (1968), Holdren (1960) and Preston (1962) are primarily concerned with the margin between the retailers' buying price and his selling price. In the analyses which are particularly concerned with horticultural produce, those of Allen (1959, 1961), Rashid (1968) and Mac-Arthur and Rashid (1971, the basic technique is an analysis of the regression between a set of retail price statistics and a set of wholesale price statistics.

The significant point about these models is that they assume that wholesale price is equivalent to producers' return. There are several reasons for this: firstly the retail margin is the greater part of the marketing margin, secondly the retail margin and the wholesale margin may be added together for analytical purposes and treated as a single margin. It is also true that wholesale margins are impossible to quantify in underdeveloped countries and may not be easy to find, even in England. Allen (1959) argues: "The commission agent's charges are in two parts: one consists of the handling and market charges to cover such items as porterage, provision of containers and market tolls, and the other of his commission. Handling and marketing charges are certainly highly inflexible and do not vary with short-term changes in growers' prices. The agents' commission comprises a constant percentage deduction from the sale value of the produce plus a package charge, constant regardless of price and usually small in relation to the value of the item sold.

The agent's commission will be the largest of his total deduction (normally over two-thirds of the total) and this is generally small in comparison with the price paid to the growers. So, since commission salesmen's prices must be more or less closely followed by other dealers, wholesale margins will be relatively flexible, except at very low prices".

The implication is that, in so far as it is a constant percentage margin, the wholesale margin will not affect the elasticity of demand facing the grower.

Legally, of course, most of the produce sold in the wholesale markets remains the property of the grower until it is sold to a secondary wholesaler or a retailer, and, to this extent, such an analysis may be justified.

However, in the short run the grower has to decide whether or not to harvest the crop, and in this he is influenced not so much by the price he will get in the different markets as by the net return in the field, after subtacting marketing, transport, and harvesting costs; indeed, under several marketing systems operating in Britain, the grower does not incur these costs. In the short run therefore, the farmer's revenue can be defined as market price minus harvesting and marketing costs, so his short-run costs are zero. These costs are all highly flexible, not being influenced to any degree by the market price. It follows that an analysis of marketing and distribution margins for horticultural produce, should deal with the margin between retail price and in-field return, rather than just the retail margins.

Thus the existing models pay no attention to the effect of market structure on the grower's average revenue curve. Allen (1961), of course,

be disposed of, that marginal revenue in each market is equal.

Results

For the purpose of analysis it has been assumed that the market demand curve, and the demand curve facing each type of retailer is of the same constant elasticity. It would be possible to take empirically determined demand curves and insert them in the model, but this would mean that differences in the buying habits of supermarket customers and greengrocers, policies on margins, the ratio of fixed to proportional elements in the margin, etc. would be implicitly taken into account and it would be impossible to isolate the effect of stabilization.

The fact that the two markets, the supermarket customers and the greengrocers' customers, are effectively separated is enough to alter the shape of the average revenue curve facing the contract growers and the non-contract growers. It is not necessary that the supermarket customers respond to price changes in a different manner, that they are more quality conscious or less price conscious for instance. This can be shown by considering a market situation where the two markets are separate and where the elasticity of demand in each is unity.

In the model the following notation is used:

Q_a is the quantity sold by supermarkets,
Q_b is the quantity sold by greengrocers,
P_a is the supermarket retail price,
P_b is the greengrocers' retail price,
e is the elasticity of demand,
K_a is a constant equal to $Q_a P_a^e$,
K_b is a constant equal to $Q_b P_b^e$,
P_c is the average revenue to contract growers,
P_b' is the market price (a constant percentage of P_b),
P_a is the average price paid by supermarkets.

We assume that the demand function is of constant elasticity e so

$$Q_a = \frac{K_a}{P_a^e}$$

Similarly $Q_b \quad \dfrac{K_a}{P_a^e}$

Thus $Q_a + Q_b = X = $ total output,

so $\qquad \dfrac{K_a}{P_a^e} + \dfrac{K_b}{P_b^e} = X$

$K_a P_b^e + K_b P_a^e = X P_a^e P_b^e$

$X P_a^e P_b^e - K_a P_b^e - K_b P_a^e = 0.$

The supermarket policy is to charge consumers a price that fluctuates less than does the greengrocers' price. For example it may charge a

price that is half way between the mean price for the season and the greengrocery price so:

$$P_a = P_b - \tfrac{1}{2}(P_b - \bar{P})$$

$$P_a = \tfrac{1}{2}(P_b + \bar{P})$$

For this exposition it has been convenient to chose a price of 5 pence as $\bar{P}$. It is of course not necessary that $\bar{P}$ be the true mean – any notional mid-point or just price will do.

Thus: $\qquad P_a = \tfrac{1}{2}(P_b + 5)$

Substituting, we have

$$XP_b^e\left(\frac{5}{2} + \frac{P_b}{2}\right)^e - K_a \, P_b^e \left(\frac{5}{2} + \frac{P_h}{2}\right)^e = 0.$$

Effect on retail prices

From this the retail prices and quantities can be derived. First it is assumed that $K_a = 0$, that all produce is sold in one united market with $e = 1$; prices for this are shown in Table 2. Next it is assumed that supermarkets get one third of the trade at the mean output; this is shown in Table 3. Finally it is assumed that the market is divided equally between supermarkets and greengrocers in the manner shown in Table 4.

From these three tables and the associated graphs, figures 2 and 3, we can drawn conclusions about the effect of market separation and price stabilization.

1. Greengrocers' prices are higher and supermarket prices are lower at low levels of output that they would otherwise be. At high levels of output, supermarket prices are higher and greengrocers' prices lower than they would otherwise be. This is shown clearly in figures 2 and 3, where the curve $e = 1$ shows the prices in a united market. The curve P_b, the greengrocers' price, is less elastic than this and the curve P_a, the supermarket price, is more elastic than this with reference to total output. It must be borne in mind that all three curves represent unit elasticity of consumer demand, and the apparent difference in elasticity is due to the different market shares of the supermarkets at different levels of output.

2. The degree of price stabilization also affects the shift in the curves; the greater the stabilization, the greater the shift. For instance, if the adjustment is only 25% instead of 50%:

$$P_a = .25(5 + 3P_b)$$

and when total output is 1 000, P_b is 28. 2, P_a is 22. 4, instead of $P_b = 34. 4$, $P_a = 19. 7$.

3. The share of the market taken by each type of retailer also has its effect. Figures 4 and 5 show the effect if
(a) supermarkets sell nothing ($K_a = 0$),
(b) supermarkets have one third of the market ($K_a = \tfrac{1}{2} K_b$),
(c) supermarkets have half the market ($K_a = K_b$).
From this it is clear that the larger K_a is, in relation to K_b, (the larger the supermarket's share of the market) the greater is the shift in the

curves.

4. The effect of using a more elastic curve is shown in Figure 7 where $c = 2$ instead of $c = 1$ as in the previous models. This curve is obtained from the root of the quartic polynomial

$$-25K_b - 10KP_b + P_b^2 (25X - 4Ka - K_b) + 10XP_b^3 + XP_b^4 = 0.$$

Again the effect is to make the greengrocery price curve relatively steep.

Effect on farm price

Granted that the separation of the two markets and the price stabilization in one of them has a certain effect on the quantity sold by the supermarkets at different levels of total output, what is the effect on the average prices received by the contract and non-contract growers? Again the analysis could take into account differences that have been observed between the supermarkets' and the greengrocers' customers, the ratio of fixed to proportional elements in the margin, the fixed cost added by prepacking or the use of non-returnable cartons, for instance. However, this would make it impossible to isolate the effect of stabilization, so I will examine only those strategies that permit comparison of the effects of stabilization, ignoring those that, while more realistic, affect relative prices for other reasons.

A suitable strategy is that of taking a fixed percentage margin between total revenue to the retailer and his total cost. Half (or a third of the money received by the supermarkets goes to their suppliers and half the money received by the greengrocers goes to their suppliers. This has the advantage of being a close approximation to the truth, as far as supermarkets are concerned, half the firms aiming at a fixed percentage margin for each crop and half aiming at a fixed percentage for produce, and averaging margins of individual crops to arrive at this. Another advantage of this approach is that it leaves elasticity unchanged. Initially we shall assume that contract growers produce a constant proportion of total output. In practice this is not true: contract growers produce a relatively steady quantity, by planning harvesting and by using risk-reducing techniques like irrigation.

As a result of this assumption, supermarkets cannot get all their needs from their own contracted growers at times when supplies are short and they have two-thirds of the market. At these times prepackers must buy from the market and pay the market price. When output is high, supermarkets have only a third of the total output so the contract growers dispose of surplus produce on the market. As a first assumption, therefore, contract growers produce half of total output at each level of production.

Under these conditions the average revenue to contract growers will be given by

$$P_c' = \frac{Q_a}{4Q_c} (5 - 2P_b') + P_b' ,$$

where Q_a is the quantity sold by the supermarkets, P_b' is the market price (50% of the greengrocers' price) and Q_c is the quantity produced by the contract growers. Tables 5, 6 and 7 show the average revenue to

the contract growers (P'_c), the market price and the average price paid by the supermarkets (P'_a).

The average revenue to the contract grower is not the same as the average cost to the supermarket chain: at times when the supermarket is buying from the market, the average cost is composed of two elements, the quantity produced by contract growers times the contract price and the remainder at the market price, thus

$$AC = P'_a = \frac{1}{Q_t} (\tfrac{1}{2}(Q_a + Q_b)P'_c + \tfrac{1}{2}(Q_a - Q_b)P'_b),$$

where Q_t is total output, P'_c is contract price, and average revenue of contract growers, P'_b is market price (50% of greengrocers' price) and is also the average revenue to the non-contract growers.

At times when contract growers sell their surplus to the market, their average revenue is composed of supermarket sales at the contract price, plus market sales at the market price.

$$AR = P'_c = \frac{2}{Q_t} (P'_a Q_a + P'_b (\tfrac{1}{2}Q_t - Q_a).$$

Average revenue to the non-contract growers is P'_b and average cost to the supermarkets is P'_a.

The fact that supermarkets buy in the market when they are short of supplies and that they sell in the market when prices are low, must have the effect of increasing the fluctuations in price observed by non-contract growers. The effect cannot be determined in terms of market demand, as market demand is a derived demand, depending on the structure of the market, the degree of stabilization and the margins of the different types of retailer.

Table 8 shows the prices, under the assumption that the 50% margin of the supermarkets is the margin between the average revenue and the average cost of all their purchases.

5. The market price has been established already. It is the greengrocers' price less 50%, and the greengrocers' price has been identified from the demand elasticity and the degree of stabilization. The shift in the market curve from the situation where all produce is sold in one market is shown by the curves in Figure 8.

6. The average price paid by supermarkets, P'_a has also been determined. Under the assumptions made, the average revenue of contract growers is always below the average cost to the supermarket except at mean output where they are equal, because supermarkets average the price paid to contract growers with the high market prices when supply is short, and because contract growers sell their surplus at a lower market price when supply is high. The effect on price is rather greater when supplies are short. This result is sensitive to alterations in the assumptions on contract and purchasing policy.

7. It should be noted that different policies on margins taken by supermarkets will not affect the market price: the margin could be lower at lower prices to give contract growers a steadier unit price for instance.

8. The average revenue curve of contract farmers is considerably more

elastic than the average revenue curve of the non-contract farmers (a direct comparison is possible in Figure 6, as the market is equally divided between the two). This effect is enhanced if a point is reached where the average revenue in the market is zero, and average revenue from contracts remains positive (see 10 below).

9. The elasticity of the average revenue curve of the contract growers is much greater when only a small proportion of total output comes from contract growers. This is best seen in Figure 9 which gives the average revenue curves for 50% produced by contract growers and for 33%. These are plotted against output of contract growers, so the elasticities are comparable. The supermarket purchases from the market at all levels of output, when 33% is produced by the contract grower, and the contract price can be well below P_a' at low levels of output and slightly higher at high levels of output. When 66% is produced by the contract growers, they sell on the market at all levels of output and the average revenue curve lies between P_a' and P_b'. This result is largely due to the assumption that contract growers produce a constant proportion of total output.

Disposal of surpluses

The model used so far has not been capable of dealing with surpluses, as the constant elasticity curves never reach zero price. If, however, we accept that there are times when it does not pay the grower to harvest, when the price on the market, after subtracting marketing costs, is zero or negative, we must have a market demand curve which cuts the zero line.

10. When the amount sold on the market is above this point, the market price will be zero and it will not pay growers to harvest beyond this point. Non-contract growers, who sell all their produce on the market, will have zero Total Revenue beyond this point.

Contract growers will still be selling the bulk of their output at the contract price. This follows from the assumption that the supermarkets stabilise prices more than greengrocers, an assumption that was justified on theoretical grounds and empirical evidence. The conclusion is given more direct support by Bowbrick (1969), who reports that prepackers can always get a fair price (at least enough to cover their variable costs) even when prices are very low, and that they often make most of their profit at these prices. Retailers, too, agreed in the survey reported by Bowbrick and Hinton (1971) that this was so. In the 1970/71 sprout season, when prices were very low, often too low to justify picking, supermarkets continued to pay prepackers a price which, though below normal prices, gave the prepacker a much higher return than he could have got in the market.

11. It follows that prepackers will have a positive total revenue even at outputs where it does not pay to harvest vegetables for the market and that they will have a positive, though declining, average revenue as output increases beyond this point.

Summary. -- The results of price stabilization in a two-sector industry are:

1. Greengrocers' prices are higher and supermarket prices are lower

at low levels of output than would otherwise be. At high levels of output supermarket prices are higher and greengrocers' prices lower than they would otherwise be.

2. The greater the degree of stabilization, the more pronounced the effect.

3. The larger the supermarkets' share of the market, the more pronounced is the shift in the curves.

4. Similar effects are observed with demand functions of different elasticity.

5. The market price is determined by the greengrocers' retail price and the greengrocers' margin.

6. The average revenue of contract growers is always below the average cost to the supermarket, unless the supermarket buys all the contract growers' production and none of the non-contract growers' production, in which case the two are the same.

7. The different policies on margins taken by supermarkets will not affect the market price.

8. The average revenue curve of the contract farmers is more elastic than the average revenue curve of the non-contract growers.

9. The elasticity of the average revenue curve of the contract growers is greater when only a small proportion of total output comes from contract growers.

10. If output should increase beyond the point at which produce is destroyed, the non-contract growers have zero total income.

11. If output should increase beyond the point at which produce is destroyed, the contract growers will have a positive, though declining, average revenue.

Discussion

Theoretical implications. - It has been shown that the market structure can be an important factor in determining the elasticity of demand facing growers and it has been shown that it is not necessary to assume different policies on margins or different margins to explain the different demand curves facing contract and non-contract growers.

It is clear, too, that models like those of Parish (1967), Allen (1959) and Rashid (1968) must be modified substantially before being applied to the present British horticultural situation. The effect of market structure on the demand faced by growers could be greater than the effect of policies on margins, price levelling and averaging.

The model has implications beyond the British horticultural industry. There are other industries where a similar market structure is obvious; for instance, the bulk of world copper output is sold on contract at a steady price, while the rest is sold on the London Metal Exchange at a violently fluctuating price. The basic market structure of the model is one where different degrees of retail-price stabilization are associated with different marketing systems and this may be a lot commoner than seems apparent at first sight. For instance, nobody would be surprised to hear that town and country retailers had different pricing policies and different marketing systems, or that retailers in different regions had different pricing policies and different marketing systems.

Any analysis of margins which, like that of Rashid (1968) and Allen (1959), is based on a comparison of one set of wholesale prices with another set of retail prices could be seriously biased by the choice of the wrong statistical series. It is essential for this purpose that one compares the market price with the greengrocers' retail price, the average cost of supermarket purchases with the retail price of supermarkets. If the market price is compared with the supermarket price, a false conclusion will be drawn. MacArthur and Rashid (1971) have discussed the great practical difficulties in getting suitable data for examination and they make it clear that such a false comparison is not unlikely: "There could be a very simple explanation to the divergence between expected and observed margin-fixing tendencies, both between developed and developing countries and within them, namely that the price series that are available for statistical investigation may not be representative. Obviously, not all types of produce have been covered by the data, which has been put together on what has had to be 'catch-as-catch-can' basis".

Practical importance. – The factors which have led to this market structure in Britain have been the increasing market share of the supermarkets and the growth of direct buying. These trends will continue for the next ten years at least, so the effects of the market structure will be more pronounced. The two types of retailer will become more independent of one another with the fall in numbers of greengrocers and the increase in out-of-town shopping and shopping by car. Thus the effects of a market structure discussed in this paper will become very much more important in the future.

Horticultural production fluctuates violently because of variations in the weather, disease and un-coordinated planting policies. Ceteris Paribus, one might expect that the growers with the more elastic average revenue curves, the contract growers, would be better off than the growers with the less elastic average revenue curves. However, contract growers produce a relatively steady quantity by planning weekly output targets with supermarkets, and planting for a continuous supply, and they use risk-reducing techniques like irrigation. This has two implications: firstly, fluctuations in the supply are less in the case of contract growers than in the case of non-contract growers and secondly, the total fluctations will fall as the proportion grown under contract increases.

The full implications of the changed market structure caused by the growth of the supermarkets, cannot usefully be discussed without an analysis of the changed marketing margins caused by the special requirements of the supermarkets. This will be discussed in a forthcoming publication.

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Table 1 – The main competitors of large supermarket chains, variety-
store chains and greengrocery chains, in %.

Type of firm	Main competitors					
	Chain stores	Super-markets	Green-grocers	Local markets	No competition	Total
Grocers	12. 5	29. 2	26. 6	15. 0	16. 7	100
Variety stores	50. 0	25. 0	–	–	25. 0	100
Greengrocers	9. 7	26. 4	51. 4	12. 5	–	100

Source: Bowbrick and Hinton (1971)

Table 2 – Prices in a uniform market, with unit elasticity of demand
$(K = PQ)$

Total output (0000)	Price
1	25. 00
2	12. 00
3	8. 33
4	6. 25
5	5. 00
6	4. 16
7	3. 57
8	3. 12
9	2. 78
10	2. 50

Table 3 -- Sales and prices in separate markets, when supermarkets
have one third of sales at mean output.

Total output (0000)	Supermarket		Greengrocers	
	Sales (0000)	Prices	Sales (0000)	Prices
1	470	17. 54	530	30. 9
2	855	9. 75	1150	14. 5
3	1175	7. 06	1825	9. 12
4	1440	5. 75	2560	6. 51
5	1666	5. 00	3333	5. 00
6	1840	4. 50	4160	4. 00
7	2000	4. 16	5000	3. 33
8	2120	3. 91	5880	2. 83
9	2230	3. 73	6770	2. 46
10	2330	3. 58	7663	2. 17

Table 4 - Sales and prices in separate markets, when supermarkets
have one half of sales at mean output.

Total output	Supermarket		Greengrocers	
	Sales (0000)	Prices	Sales (0000)	Prices
1	635	19. 70	365	34. 30
2	1205	10. 37	795	15. 73
3	1704	7. 33	1296	9. 65
4	2136	5. 85	1864	6. 70
5	2500	5. 00	2500	5. 00
6	2810	4. 46	3190	3. 92
7	3055	4. 08	3945	3. 16
8	3265	3. 82	4735	2. 64
9	3450	3. 62	5550	2. 25
10	3600	3. 48	6400	1. 95

Table 5 – Supermarket purchase price, market prices and average
revenue to contract growers, when supermarkets sell half
total output at mean output.

Total output (0000)	Supermarket purchase price P'_a	Market price P'_b	Super-market quantity Q_a	Output by contract growers Q_c	Contract growers AR P'_c	Price in uniform market
1	9.85	17.15	635	500	7.85	12.50
2	5.18	7.86	1205	1000	4.63	6.25
3	3.66	4.83	1704	1500	3.51	4.17
4	2.93	3.35	2136	2000	2.90	3.13
5	2.50	2.50	2500	2500	2.50	2.50
6	2.23	1.96	2810	3000	2.21	2.08
7	2.04	1.58	3055	3500	1.98	1.78
8	1.91	1.32	3265	4000	1.80	1.56
9	1.81	1.12	3450	4500	1.65	1.39
10	1.74	0.98	3600	5000	1.53	1.25

Table 6 – Supermarket purchase prices, market prices and average
revenue to contract growers, when contract growers produce
one third of output.

Total output (0000)	Supermarket purchase price P'_a	Market price P'_b	Super-market quantity Q_a	Output by contract growers Q_c	Contract growers AR P'_c	Price in uniform market
1	9.85	17.75	635	333	3.3	12.50
2	5.18	7.86	1205	666	3.0	6.25
3	3.66	4.83	1704	1000	2.8	4.17
4	2.93	3.35	2136	1333	2.7	3.13
5	2.50	2.50	2500	1666	2.5	2.50
6	2.23	1.96	2810	2000	2.3	2.08
7	2.04	1.58	3055	2333	2.2	1.78
8	1.91	1.32	3265	2666	2.0	1.56
9	1.81	1.12	3450	3000	1.9	1.39
10	1.74	0.98	3600	3333	1.8	1.25

Table 7 - Supermarket purchase prices, market prices and average
revenue to contract growers, when contract growers produce
two thirds of output.

Total output (0000)	Supermarket purchase price P'_a	Market price P'_b	Super-market quantity Q_a	Output by contract growers Q_c	Contract growers AR P'_c
1	9.85	17.15	635	666	10.19
2	5.18	7.86	1205	1300	6.11
3	3.66	4.83	1704	2000	3.83
4	2.93	3.35	2163	2666	3.01
5	2.50	2.50	2500	3333	2.50
6	2.23	1.96	2810	4000	2.15
7	2.04	1.58	3055	4666	1.88
8	1.91	1.32	3265	5333	1.68
9	1.81	1.12	3450	6000	1.52
10	1.74	0.98	3600	6666	1.39

Table 8 - Supermarket purchase prices, market prices and average
revenue to contract growers, when contract growers do not
produce a constant proportion of total output.

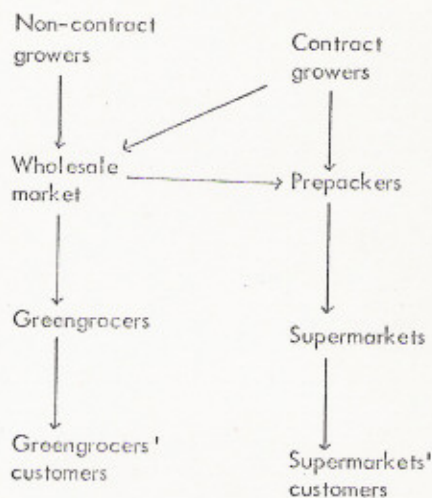| Total output (0000)	Supermarket purchase price P'_a	Market price P'_b	Super-market quantity Q_a	Output by contract growers Q_c	Contract growers AR P'_c	Price in uniform market
1	9.85	17.15	635	1000	12.51	12.50
2	5.18	7.68	1205	1333	5.44	6.25
3	3.66	4.83	1704	1666	3.63	4.17
4	2.93	3.35	2136	2000	2.90	3.13
5	2.50	2.50	2500	2500	2.50	2.50
6	2.23	1.96	2810	3000	2.21	2.08
7	2.04	1.58	3055	3333	2.00	1.78
8	1.91	1.32	3265	3666	1.85	1.56
9	1.81	1.12	3450	4000	1.72	1.39
10	1.74	0.98	3600	4333	1.61	1.25

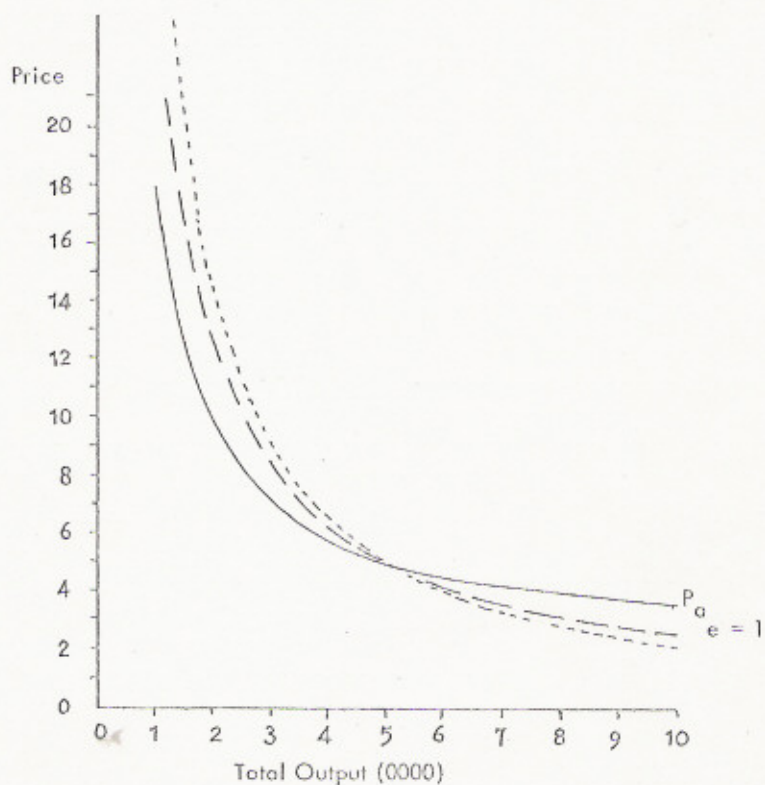Figure 1 – Model of the British vegetable market.

Figure 2 – Retail prices at different levels of output, supermarkets and greengrocers having equal shares of the market (see Table 4).
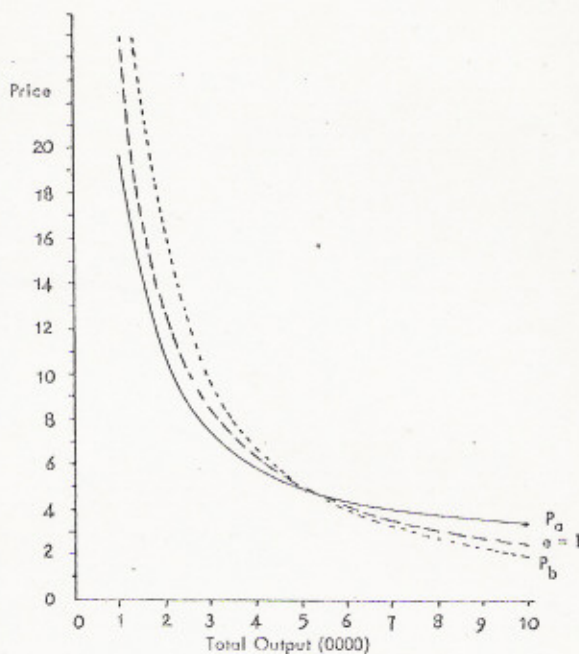
Figure 3 - Retail prices at different levels of output, supermarkets
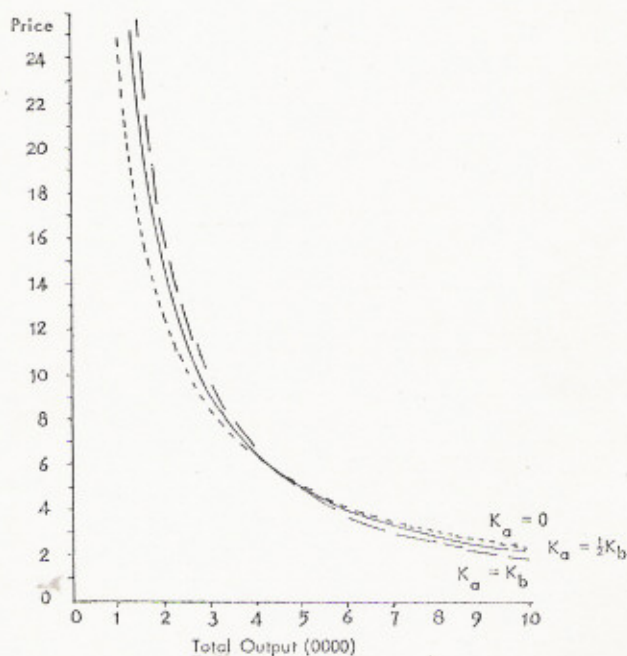having one third of the market at the mean price
(see Table 3).

Figure 4 - Greengrocers' retail prices at different levels of total
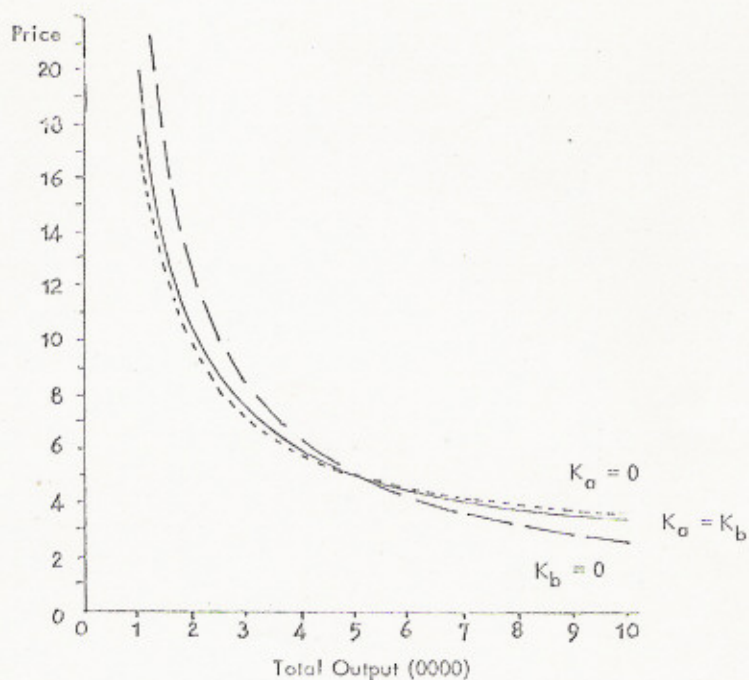output, under the assumptions $K_a = 0$, $K_a = \frac{1}{2}K_b$, $K_a = K_b$
(see Tables 2, 3).

Figure 5 – Supermarket retail prices at different levels of total output put under the assumptions $K_a = \frac{1}{2}K_b$, $K_a = K_b$, $K_b = 0$ (see Tables 2, 3).
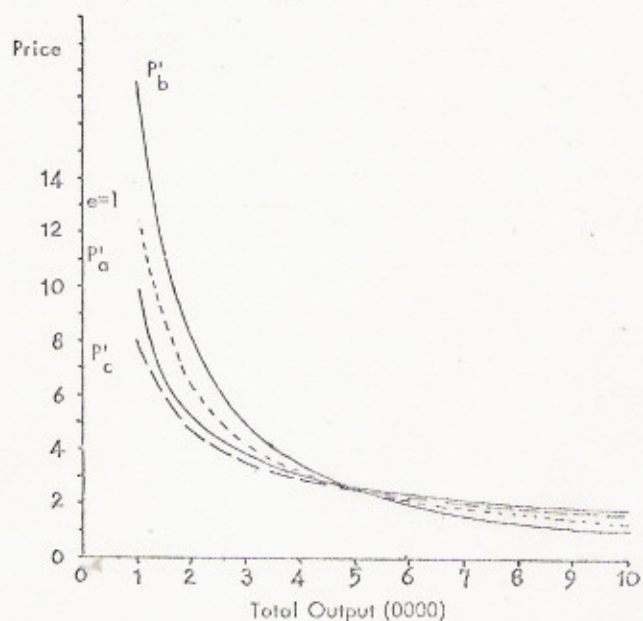
Figure 6 – Average revenue of contract growers, the market price and the average price paid by supermarkets (see Table 5).
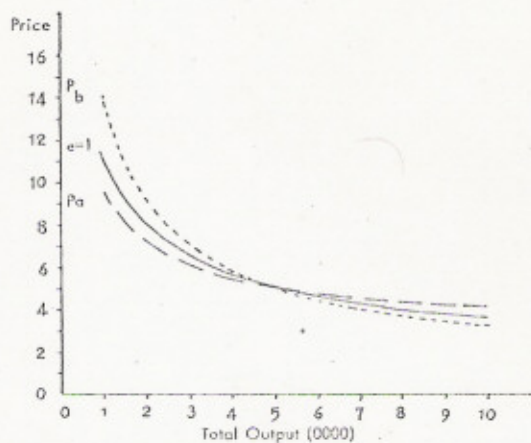
Figure 7 - Effect of market separation when elasticity of demand is relatively elastic (e-2).
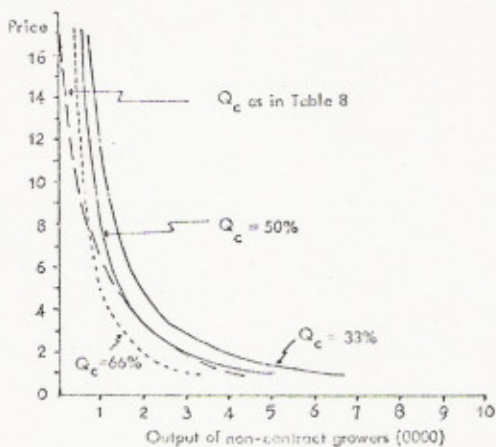

Figure 8 - Price received by non-contract growers at different levels of output, with supermarkets taking different proportions of total sales at the mean output (see Tables 5, 6, 7 and 8).
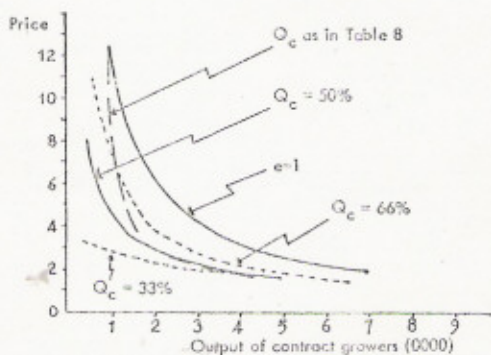

Figure 9 - Price received by contract growers, with supermarkets taking different proportions of total sales at the mean output (see Table 8).