

Intra-Urban Variations in Retail Grocery Prices

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VARIATIONS in retail grocery prices is an issue that engenders considerable interest in many sections of the community, for a variety of economic and political reasons. Since a substantial proportion of a housewife's weekly budget is spent upon foodstuffs, it is in this area that she is most sensitive to price variations, and, consequently, a strong political platform is the pledge to curb rising prices. In the short term, however, the housewife is less concerned about temporal variations in prices, and more concerned about spatial variations or the differences between one store and another. Since this interest affects the pattern of shopping trips and therefore the demand for travel facilities, variations in retail prices are also of importance to the planner whose function, in part, is to assess and cater for the future magnitude of trip patterns.

If variations in retail grocery prices can be shown to differ not only with different types of retail outlets—considered both in terms of organisation structure as well as relative size—but in different locations, then the implications are even more widespread. If, for example, supermarket chains prove to have significantly lower prices than other types of grocery stores should they be encouraged to expand their outlets into locations where prices are higher than average? Alternatively, should a greater amount be spent on travel facilities to make such areas more accessible to less expensive retail locations? The implications of retail price variations are therefore not only the concern of the customer and the retailer, but also the researcher and the planner, and affect the functioning and activity patterns of society in terms of both the present and the future.

Retail Price Variation Studies

In view of the amount of interest in, and implications of, spatial variations in retail grocery prices, it is surprising that very few empirical studies have been undertaken. Economists have primarily concentrated upon temporal variations

and have even gone so far as to implicitly assume that within-trade variations are insignificant and can therefore be ignored.^[1] Similarly most geographers have tended to ignore the effects of spatial variations in retail prices, although variations could fundamentally affect such long established theories as central place theory. Curry has even alleged that "within a city there is no systematic variation in (retail) prices".^[2] Yet two recent contributions have shown that significant systematic variations in retail grocery prices do exist, both at the intra-urban and intra-regional scales. An analysis by Campbell and Chisholm^[3] demonstrated that spatial variations in retail grocery prices in Swansea were related to the organisational structure and size of store, although it should be noted that since the total population from which the sample was drawn was not known, then the conclusions should be regarded as tentative. A more recent study in Northern Ireland by O'Farrell and Poole,^[4] found that, at the intra-regional level, Campbell and Chisholm's conclusions regarding organisational structure and size of store could not be supported. However, a significant degree of spatial variation in retail grocery prices was found to exist in Northern Ireland and the study also demonstrated that this variation tended to be inter-urban rather than intra-urban, suggesting a degree of collusion by local retailers in their pricing policies.

The considerable interest in retail grocery price variations that has been evoked within recent months in the Republic of Ireland has been reflected in a number of surveys and investigations by the National Prices Commission and various newspapers, as well as other organisations.^[5] These surveys have, in common with the studies by Campbell and Chisholm, and O'Farrell and Poole, adopted the "basket of goods" technique, whereby a number of goods are used to represent an approximation of the contents of a housewife's shopping basket and then priced at each grocery store included in the study. Substantial differences were recorded throughout the Republic by both the National Prices Commission and Irish Independent's surveys at various periods throughout the past two years; similarly differences were also recorded within Dublin city by both organisations. It should, however, be emphasised that the findings can only be regarded as tentative since the size of sample in each centre and the way in which it was chosen was often neither related to the overall population of stores in that centre, nor selected in a random manner. Similar problems exist in interpreting the results of two surveys in Britain by "Which" magazine.^[6]

The present study is an investigation into the variations in retail grocery prices in Dublin city, defined as the continuous built-up area, and in this respect has strong affinities to both the Swansea and Northern Ireland studies. In scale, the study is intra-urban, like that of Campbell and Chisholm, yet in analysis it is more akin to O'Farrell and Poole's study since it is concerned with examining significant differences in retail prices in relation to different variables, whereas the Swansea study was concerned with "explaining" price variations in terms of a number of different variables by means of correlation and regression analysis. The hypotheses of the three studies are very similar and the differences occur solely in the methods used to test the hypotheses.

Hypotheses

The relative price level for any store was defined as the total cost of a basket of 20 commodities (Table 1). Problems occur in constructing such a basket, less

TABLE 1: *The basket of grocery goods*

<i>Commodity</i>	<i>Weight or volume</i>	<i>Brand name</i>
Butter	1 lb.	Kerrygold
Cooking Fat	$\frac{1}{2}$ lb.	Frytex
Margarine	$\frac{1}{2}$ lb.	Stork
Processed Cheese	$\frac{1}{2}$ lb.	Golden Vale Mellow
Pork Sausages (pre-packed)	$\frac{1}{2}$ lb.	Cheapest in store
Standard Eggs	$\frac{1}{2}$ doz.	Cheapest in store
Tea	$\frac{1}{4}$ lb.	Lyons Green Label
Coffee	2 oz.	Nescafe
Sugar	2 lb.	—
Cornflakes	16 oz.	Kelloggs
Orange Marmalade	1 lb.	Cheapest in store
Cream Crackers	$7\frac{1}{2}$ oz.	Bolands
Oxtail Soup	Packet to make $1\frac{1}{2}$ pints	Erin
Cream Flour	1 kilo	Odlums
Baked Beans	$15\frac{1}{2}$ oz.	Cheapest in store
Processed Peas	$15\frac{1}{2}$ oz.	Cheapest in store
Pear Halves	$15\frac{1}{2}$ oz.	Cheapest in store
Toilet Paper	Twin-pack	Babysoft
Washing-up Liquid	32 fl. oz.	Cheapest in store
Soap Powder	1 lb. $2\frac{1}{2}$ oz.	Persil

in terms of what particular commodities to include and more with respect to what individual brands to include or whether it is preferable to always choose the cheapest brand in the store. Campbell and Chisholm attempted to overcome this problem by having a basket of named brands and a basket of the cheapest alternative for the same quantity. Ultimately, they used this latter basket in their analysis, but as O'Farrell and Poole point out, this is not really comparing like with like, and the Northern Ireland study endeavoured to achieve greater standardisation by utilising only branded goods, except in the case of loose vegetables. Nevertheless, it is debatable to what extent the shopper only purchases one particular brand of a commodity or to what extent the presence of cheaper alternatives play a major role in purchasing decisions. Until an analysis of individual shopping behaviour has been undertaken such a debate cannot be resolved, although the recent growth in own brand commodities would seem to indicate that cost factors are uppermost in a substantial number of customers' minds when purchasing grocery goods.¹⁷¹ In the present study a compromise was sought to include both branded goods and the cheapest available in the store in the basket of goods.

A number of different hypotheses were established to try and account for the variations in the cost of the basket of goods and these may be broadly defined as structural and locational.

Structural

It would appear from Campbell and Chisholm's work that differences in organisational structure might significantly account for price variations, since those stores belonging to either a supermarket chain or a retail or wholesale buying group might be expected to achieve purchasing economies in their operations and pass savings onto the customer in the form of lower prices. Three major categories of organisation were identified: supermarket chains, retailers affiliated to a retail or wholesale buying group, and independent retailers. The latter two categories were each subdivided between self-service and "over-the-counter" sales outlets.

The second hypothesis is that lower prices are associated with larger stores, since these can achieve greater economies of scale than smaller stores. Store size was measured in two ways—the number of full-time and part-time persons engaged in the store,¹⁸ and the square footage of the selling area. Store size was included in both the Swansea and Northern Ireland studies, but conceptualised differently. Campbell and Chisholm utilised square footage and found this to be significantly related to price variations, whereas O'Farrell and Poole used the number of assistants and found no significant relationship with price variations. In the present study it is worth noting that a correlation coefficient of 0.797 exists between the two methods of measuring store size and although the relationship is significant at the 1 per cent level, the two variables are not totally interdependent and one may tentatively suggest that a closer similarity in findings between the Swansea and Northern Ireland studies may have occurred had they both used the same method of measuring store size.

Locational

The actual location of a store may affect retail prices in a number of ways. Stores that are located in close proximity to other types of retail outlet may benefit from the multi-purpose shopping trip in terms of increased sales, and this could result in lower prices compared to the more isolated store. To measure this hypothesis each store was classified as belonging to one of three categories: a planned shopping centre; adjacent to other shops; or isolated. A second locational hypothesis is that there is a significant difference in prices between those stores serving predominantly Corporation housing areas and those serving private housing areas. Although car-ownership is widespread amongst both groups, and therefore the large out-of-town supermarkets are potentially within reach of members of both groups, the mobility of the owner-occupier is generally higher, particularly with respect to housewives having the regular use of a car during the daytime, and it is therefore hypothesised that stores serving predominantly

Corporation housing areas are more expensive. Each store included in the study was therefore classified as being in either a predominantly Corporation or private housing area.

When a decision is taken to purchase goods at a particular grocery store, this is the end product of a process which is conditioned by knowledge, no matter how imperfect or inaccurate, about the level of prices at not only that particular store, but also alternative grocery stores. This process is also related to a subjective judgement of the cost in terms of time and effort required to purchase goods at what is believed to be a cheaper price in an alternative store. Such a process is extremely difficult to quantify, however as an approximation it is hypothesised that the closer a store is to another grocery outlet the lower will be its price level. The distance from each sampled store to their nearest neighbour was measured using straightline distance. Since it is recognised that different types of grocery stores may well be more in competition with their own organisational type rather than all other grocery stores, the distance to the nearest neighbour of the same organisation type was also measured.

In order to investigate whether significant differences in prices occurred between suburban and inner city locations, or between the northern and southern parts of the city, sample stores were classified as belonging to one of four zones: northern suburbs, northern inner city, southern inner city and southern suburbs. The River Liffey was taken as the boundary line between north and south Dublin, and the North and South Circular Roads were arbitrarily defined as the boundaries between the suburbs and the inner city areas. It is also proposed to use these four areas as sub-samples to investigate whether differences occur at the localised level in terms of a number of the previously mentioned hypotheses.

The Sampled Stores

A preliminary survey identified a total population of 959 grocery stores in Dublin, and these were classified according to location and organisational structure (Table 2). The structure and distribution of grocery stores has been discussed elsewhere,^[9] although it is worth noting that a significant difference (at the 1 per cent level) exists in organisational structure between the inner city and suburban areas.

To obtain an accurate indication of prices it is obviously necessary that the sampled stores should all be visited on the same day. Because of this constraint coupled with that of manpower availability, a random sample of 8.25 per cent was selected. This sample was stratified by organisational type and location, and had the additional constraint that at least one store of each organisational type in each zone was included in the study.^[10] This resulted in a certain amount of internal variation between the individual cells, notably in terms of the supermarket chains where a sample of 14.8 per cent was taken.

Since Friday is generally accepted as the major shopping day, Friday 16th March 1973 was chosen as the survey day. Of the total sample of 79 stores, some 12.5 per cent refused to co-operate, while a further 25 per cent did not sell the

TABLE 2: *Grocery Stores by Organisational Structure and Location*

	Northern City Area		Southern City Area		Dublin total by organisational structure
	Inner City	Suburbs	Inner City	Suburbs	
Supermarket chain	6	14	5	29	54
Affiliated (self-service)	9	44	9	53	115
Affiliated ("over-the-counter" sales)	2	8	2	11	23
Unaffiliated (self-service)	14	53	6	61	134
Unaffiliated ("over-the-counter" sales)	108	136	135	254	633
<i>Dublin total by location</i>	139	255	157	408	959

full range of 20 commodities. This latter problem has been previously noted in both Campbell and Chisholm and O'Farrell and Poole's studies. In the former instance the missing prices were filled in from a "guide" to retail prices^[11], while in the latter case the original basket of 19 goods was reduced to 14 and a constraint imposed that the sampled store sell at least 13 of these 14 commodities. In those cases where one of the goods was not on sale, the average price for that commodity in that centre was substituted. Both of these methods inevitably introduce a degree of bias, and it may well be that the limited number of commodities used in the Northern Ireland study resulted in the rejection of many of the non-locational hypotheses. In the present study it was therefore decided to include in the analysis only those stores that sold all 20 commodities on the day of the survey, and this resulted in a total valid sample of 50 stores; a 5.24 per cent sample of all Dublin grocery stores. A chi-square test was used to examine whether there was a significant difference in terms of either location or organisational structure between those stores included in the study and those that were excluded. Since no significant difference resulted at the 2 per cent level it was concluded that the stores included in the study were an acceptable approximation to the total sample of stores.

Variations in Retail Grocery Prices

The results of the survey showed that the average cost of the basket of goods was £2.55, however this masks the fact that there was a difference of 0.58p between the cheapest basket of goods (£2.22) and the most expensive (£2.80). On average the southside stores were a little cheaper than northside stores, the average costs being £2.54 and £2.57 respectively, although application of a difference-of-means test^[12] showed that this difference could be by no means regarded as significant. Similarly, the difference in average prices between the inner city (£2.57) and suburban stores (£2.55) was also not significant. In terms

of zonal variations within the city, the cheapest shopping area was the southern suburbs, where the basket of goods cost on average £2.51, while the most expensive area was the southern inner city zone where the goods on average cost 0.10p more. The differences on the northside were less noticeable, the average price in the suburbs being £2.59 and £2.52 in the inner city area. In terms of organisational structure, the supermarket chains were the cheapest grocery stores, the basket of goods costing on average £2.35, and the independent "over-the-counter" retailers were the most expensive (£2.63). Independent retailers with supermarket layouts charged 0.05p less than independent "over-the-counter" retailers, and the basket of goods cost on average £2.52 in stores affiliated to a retail or wholesale buying group. In this respect these preliminary findings are in agreement with Campbell and Chisholm's study, which also found that supermarket chains had the cheapest basket of goods.

Hypothesis Testing

Most of the hypotheses were tested using the Mann-Whitney U test,^[13] taking 5 per cent as an acceptable level of significance. Initially the spatial variation in prices was examined between the northern parts and the southern parts of the city. No significant difference in prices existed between the northside and the southside, nor between the northern and southern inner city areas. The southern suburbs however prove significantly cheaper than the northern suburbs at the 1 per cent level, and a significant difference in prices between the inner city area and the suburbs was recorded for the whole of Dublin at the 5 per cent level.

Structural Hypotheses

Table 3 records the significant differences in prices between different types of organisational structure throughout the city. As might be expected from the average prices, supermarket chains are significantly cheaper than any other type of retail outlet. The only other significant difference is that affiliated retailers are cheaper than independent "over-the-counter" retailers.

TABLE 3: *Retail Variations by Organisational Structure*

	2	3	4
1. Supermarket chain	**	**	**
2. Affiliated retailer		n.s.	*
3. Independent retailer (self-service)			n.s.
4. Independent retailer ("over-the-counter")			n.s.

**Significant at the 1 per cent level.

* Significant at the 5 per cent level.

n.s. Not significant at the 5 per cent level.

The differences in retail prices by organisational structure were also tested both between and within different areas of the city. Independent retailers in the southern suburbs were significantly cheaper than those in the northern suburbs, and supermarkets were cheaper than other types of stores in both the northern and southern suburbs. Other differences were found not to be significant at the 5 per cent level, although this may be due, particularly in the inner city areas, to the small number of cases in each organisational structure cell. It would appear therefore that price variations are related to organisational structure, but spatial variations by different types of organisational structure are limited.

In order to test the effects of store size it was necessary to group both the square footage data and also the number of assistants employed in the various stores. Three categories were chosen in each case, and for store size measured in square feet these were: under 500 square feet; between 500 and 1,000 square feet and over 1,000 square feet. The largest group of stores were significantly cheaper (at the 1 per cent level) than the smallest stores throughout the city, and cheaper than the middle-order (500 to 1,000 square feet) stores on the southside. A comparison of similar sized stores on the northside and southside revealed that significant differences occurred for both the smallest and middle-order stores. The smallest stores were cheaper on the southside, whilst the middle-order stores were cheaper on the northside. These conclusions are not only borne out, but amplified when price variations are considered against store size measured as the number of assistants employed. Stores were classified as having less than 4 assistants; 4 to 8 assistants, or over 8, and throughout the city the largest stores were found to be cheaper than either of the two smaller groups of stores (significant at the 1 per cent level). As might be expected the middle-order group was cheaper than the smallest stores, although the level of significance was only 5 per cent. When the data was disaggregated spatially the difference between the largest stores and the two smaller groups were also significant between groups of stores on the northside, the southside, the suburbs and the inner city areas. A significant difference in price between the middle-order and smallest store groupings only occurred on the southside.

Locational Hypotheses

In order to test whether there was a significant difference in the retail prices of stores located in different types of centres the Kruskal-Wallis one-way analysis of variance test was used.⁽¹⁴⁾ The hypothesis that stores in planned centres were cheaper than any other stores, while those stores adjacent to other shops were cheaper than isolated grocery stores was significant at the 1 per cent level. In part this is probably a reflection of the fact that supermarket chains are the predominant type of grocery store located in planned shopping centres, nevertheless it must not be overlooked that all types of grocery organisations locate in both isolated and adjacent locations. It would appear that the high costs associated with planned shopping centres are not passed on to the customer, and also that a monopolistic position in an isolated type of location leads to an increase in prices.

Few of the other locational hypotheses proved to be significant. No difference occurred in retail prices between private and Corporation housing areas, using the Mann-Whitney U test. For the two nearest neighbour hypotheses the distances were grouped as under 0.2 of a mile; 0.2 to 0.6 of a mile, and over 0.6, however the only significant difference in prices (at the 5 per cent level) was that for the city as a whole, stores where the nearest neighbour of either the same or different organisational type was less than 0.2 of a mile away were cheaper than stores where the nearest neighbour was between 0.2 and 0.6 of a mile away. To test the hypothesis that stores closer to the city centre were significantly cheaper, the distances of the sample stores from the city centre were grouped into three categories: under two miles; two to four miles, and over four miles, however the hypothesis was not substantiated for the city as a whole, nor for either the northside or the southside. This may well be due to the fact that "convenience" shopping for day-to-day items is much more localised in a large city like Dublin, and the role of the centre city is not that of a dominant node for "convenience" goods.

Conclusions

Although limitations imposed by time mean that a relatively small sample of Dublin grocery stores have been included in the study, it is, nevertheless, important to note that a number of important conclusions may be drawn from the analysis. One of the most significant factors related to retail grocery price variations is that of organisational structure, and since this is linked closely with store size, then expected differences in retail prices charged by small and large stores are also substantiated. As in the case of Campbell and Chisholm's study those hypotheses related to the structure rather than the location of grocery stores appear to be more significant. Little hypothesised difference in price occurred with differences in the distance to the nearest competitor, or with differences in distance from the city centre—this latter finding contrasting with the findings of Campbell and Chisholm. This divergence between the two intra-urban studies can almost certainly be explained by the fact that in Swansea the larger supermarket chains have concentrated in the city centre, while in Dublin they form the nucleus for suburban nodes. Such a conclusion would appear to be substantiated by the fact that the partial correlation coefficient in the Swansea study between price variation and distance from the city centre, after the influence of organisational structure and store size had been held constant, was only 0.196, whereas the product moment correlation coefficient between price and distance was 0.422.

Prices in the southern suburbs are significantly cheaper than those on the northside, and the suburbs as a whole proved to be cheaper than the inner city area, although this again may be taken as a reflection of the spatial distribution of different types of grocery outlets in the city. The large stores of the supermarket chains are obviously the cheapest places to purchase groceries, however the fact that they represent less than 7 per cent of the total number of retail outlets means that for many people the cheaper prices are offset by the greater journey times

required for the shopping trip. Furthermore, there are many factors which cannot be quantified including, amongst others, a strong local affinity with the corner shop which provides a meeting place in long established communities such as the inner city areas, and the provision of good service and personal attention.

Considerable research is urgently required in this field for the benefit of consumer and retailer, theoretician and planner. Are the conclusions presented above valid when the temporal dimension is considered? Would a larger sample size confirm or rescind a number of the hypotheses that were found not to be significant in this present study, and would such a larger sample size clarify the various hypotheses at the zonal level within the city? It is intended to continue and expand this present study to investigate some of these and allied problems in the near future.

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