1. Overview

Retail pricing should be interwined with the rules of behaviour of consumers, so as to generate profitable basket of purchases covering, totally or partially, the needs of customers.

In this paper, we reconstruct a realistic picture of commercial offer in grocery retailers (such as supermarkets or discounters) and their effects on purchased basket of goods, depending on alternative decision-making rules of the consumer, with a special emphasis on price per kilo and price per item.

In particular, we freely distribute an Excel file with which you can make experiments to fix the prices in your commercial premise, choose your style of shopping, or simply explore the unexpected consequences of the interaction of such trivial, but real, thing like package size, weight, and budget constraints.

2. The commercial offer of grocery retailers

Nutrition is a basic human need. In most societies, there is an abundant supply of food at the disposal of consumers (having a monetary income) provided by retailers, i.e. shops, supermarkets, hypermarkets, discounter and other store and non-store distribution channels.

Some small shops are exclusively devoted to food (as in the case of greengrocers), whereas the most common situation for larger retailer is to cover all grocery categories, defined as:

* food (non sold for consumption in the store)
* drinks (alcoholic and non-alcoholic beverages)
* pet food
* cleaning products
* toiletries
* household goods.

Grocery excludes clothing, pharmaceuticals, newspapers, toys, books, etc., which are mainly durable goods, whereas grocery products tend to be non-durable and semi-durable (goods that exhaust their function after several doses of consumption).

2.1. Varieties

In each category of food (say: tuna fish, milk, biscuits), retailers offer a more or less wide choice of varieties, i.e. combinations of brand, package material, special ingredients, etc. Indeed, the dychotomies that split the categories in several sub-categories tend to be quite articulated and idiosyncratic (dependent on the specificity of the category itself).

Needless to say, these variety can be ordered in horizontal and vertical axes of product.
In the rest of the paper, however, we shall ignore the decision rules around varieties, since we already introduced an elaborated system of evaluation in this paper. Now, we concentrate on what happens to the entire purchased basket of several grocery products, by concentrating the alternatives around the size of the package.

2.2. Package size

Grocery goods tend to be purchased relatively frequently and with low involvement of psychological energies; however, we concentrate on them for a different reason: the price per kilo can be a relevant element for decisions. Books are not measured in kilos, nor toys, whereas peas, fish or canned food can be compared using the price per kilo. Weight is a common field of comparison across brands and types.

This makes relevant the possibility for retailers to offer several package sizes (in terms of the weight of contained food) per each variety of product.

The price can be linear, strictly proportional to the weight; for example, an item of 1 kg can cost exactly the double of an item of 500 grams.

But most of the times it is not: small package cost proportionally more than the larger ones. The larger the size of package, the lower the price per kilo, within the same variety \(^2\).

In the file you have, you can experiment different conditions, to capture or not this empirical regularity, which can be rationalised by packaging costs, higher profitability (in %) connected with lower absolute profits (in larger sizes), as well as by the reflection that if the opposite were true, consumers could buy the same quantity by summing up several smaller packages and save money, what destroys the sales of the bigger package \(^3\).

3.3. Retailing formats

The fundamental difference for the consumer among retail formats is the commercial offer in terms of width of categories, varieties, and size formats. As an extreme simplification, one could say:

* an hypermarket has the largest number of categories, varieties and sizes (say 500; 70; 8 respectively);

* supermarkets have a large number of grocery categories, many varieties and sizes (say 60; 30; 6 respectively);

* discounts drastically reduce the varieties and sizes but cover almost as many categories as supermarkets (say 60; 3; 5 respectively);

* normal shops reduces the choice under all dimensions (say 40; 5; 4 respectively)

* specialised shops are very deep but narrow (say 5; 50; 5 respectively).

Not all logically possible combinations are offered; some points of the theoretical space are carefully selected so as to:

* reach a target number of total items (called also SKU - Stocking Units), that might be something like 20000, 4000, 600, 400, 500 for the 5 abovementioned formats respectively;

* supply expensive varieties in small packages, what boost profitability (the percentage of profits over costs)

* supply cheaper varieties in large packages, which boost the absolute level of profits (or, better, of margins of contribution due to each sold item).

3. Consumer rules

In this another paper, we examined the careful evaluation of one durable good having specific differentiating features by a consumer using one of several alternative rules of decision. As said, we now instead concentrate on what happens to the entire purchased basket of several grocery products under different rules relating to total expenditure, total weight, number of categories covered, price per kilo, price per item, sensibility to varieties (e.g. brand).

The starting point is that the consumer think that her (or his) need can be totally or partially fulfilled with certain categories of grocery. For instance she think that she can make several meals which include, as ingredient, tuna fish. So she decides to buy tuna fish; if she plans the purchase, she might write down the "list of purchase" including it.

Once in the commercial point of sale, the choice of the exact variety will determine "how well" the need will be fulfilled (e.g. with a high quality variety). The choice of the variety and the size can be done along 5 different rules:
a. Variety loyalty

The choice is **a specific variety and a specific size**. To an external observer, who had no possibility of seeing the consumer earlier, this is simply a random choice. Next time, the consumer will possibly purchase again the same, but we are interested in what does now, so the model in this file will simply extract a choice by chance. The same rule can represent the perfectly uninterested consumer that buys one out of many without any further reflection (or loyalty).

b. Kilo-price minimization

The consumer browses the categories, looks at the price per kilo (possibly written in small characters) and chooses the item and variety that minimise this crucial variable.

c. Item-price minimization

The consumer browses the categories, looks at the price of the undivisible pack (usually written in large characters) and choose the item and variety that minimise it.

d. Variety-specific kilo-price minimization

With this rule, first the consumer chooses - by brand loyalty or temporary preference - the variety, then chooses the size that minimises the price per kilo (usually the largest pack).

e. Variety-specific kilo-price minimization

As the name suggests, first the consumer choose - by brand loyalty or temporary preference - the variety, then choose the size that minimises the price per item.

These rules do not exhaust the list of actually used routines to decide what to buy. However they already produce enough divergence of results. Since we distribute the Excel file with open programming code, you can introduce as many new rules as you want. By the way, if you find out interesting and realistic rules, write to us!

4. The purchased basket of goods

As you can experiment with [this spreadsheet](mailto:), given a number of categories that the consumer has to buy to satisfy (partially or totally) her needs and a commercial offer (whose numerical structure is exemplified in the file), the different rules of purchase lead to different baskets:

1. the **variety loyal consumer pays on average much more** than the others, with a **wide variability** of basket cost and weight;

2. the **item-price minimiser pays the least**, with the additional advantage of a lighter weight to carry home;

3. the **kilo-price minimiser** pays an intermediate sum, with the **heaviest weight** to carry home.

The crucial advantage of kilo-price minimiser is that she will able to **postpone the repurchase** because she takes home a lot more than the others: the **higher number of consumption doses**, distributed over time, will give her more time before next purchase of the same things. She will enjoy the **lowest expenditure per dose of consumption** and, over a period long enough, the **lowest price per unit of time**.

To know what happens to the other consumers - and which exact basket everybody buys, please experiment with this file at the "Purchase" sheet.

Conversely, given a fixed maximum amount of money for this shopping occasion as well as a **maximum weight** of the shopping basket (lower for people coming back by foot and higher for people using a car):

* for the same budget, the **kilo-price minimizers** will exit the POS with fewer items and an heavier basket than item-price minimizers; even more importantly, they will be kept **unsatisfied** for several needs as they can afford fewer categories;

* poor people with a low maximum expenditure and low max weight will be severely rationed, with even a narrower number of categories covered, unless they use the **item-price minimization** rule; this, however, implies that they pay more per-kilo than the rich for food.

* if repurchasing is due to forthcoming breaking of house inventories of available products, then item-price minimizers will come again sooner to the POS;

* if next visit is due to unsatisfied needs and search for further categories, kilo-price minimiser will come sooner.

More in general, the time distribution of repurchase trips will play a crucial role for both monthly expenditure of households and for overall sales of POS.
5. The effects on retail profitability and sales

The number of reachable consumers, usually a function of POS dimension (in square metres and number of items) as well as of population density and transport accessibility (according to gravitational models of retail competition), is not the unique variable to determine the sales of a POS, e.g. a big-box supermarket.

What matters is also the composition of the consumers' stock in terms of their rules of decisions and disposable income.

Scanner data should be mined so as to extract the numerosity of consumers having a certain rule of behaviour, e.g. kilo-price minimization.

As a top AC Nielsen representative puts it, "If, as a profession, we are to be a catalyst for decision-making, we need to better understand the process by which consumers make decisions. This implies market researchers need to build models which allow smaller, more precise set of consumer priorities to be identified, and to utilize category-specific analyses wherein consumers will be segmented primarily on the basis of easily identifiable and understandable cognitive decision processes rather than broad attitudes or motivations."

In our paper, we accepted this challenge and demonstrated that a low-price strategy can be highly profitable, if pushes people to buy large absolute quantities, possibly with some help in transport to avoid weight rationing.

Other, more complex, commercial offers can be tested using our software, which can be fully customised to match your own market situation.

NOTES

[1] In rural areas, many peasants everywhere in the world and the extreme poor in underdeveloped countries would instead rely on self-production and self-consumption.

[2] The situation in which the larger package has a lower unit price is called "quantity price discount", the opposite is called "quantity price surcharge". In an empirical analysis of the German food market, it turns out that "about 9.6% of the brands are sold at a quantity surcharge and 84.7% at a quantity discount" out of 4421 unit-price-size comparisons.

[3] In empirical surveys, it has been demonstrated that this conditions however do occur, especially during promotions (limited time periods where certain varieties are discounted). The debate on how to explain "quantity surcharges" is wide, see for instance this 2010 paper.