Consumers and sellers heterogeneity, search costs and spatial price dispersion in retail food markets

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Abstract— **Price dispersion, i.e. a homogeneous product sold at different prices by different sellers, is among the most replicated findings in empirical economics. The paper assesses the extent and determinants of spatial price dispersion for 14 perfectly homogeneous food products in more than 400 retailers in a market characterized by the persistence of a large number of relatively small traditional food stores, side by side with large supermarkets. The extent of observed price dispersion is quite high, suggesting that, despite their large number, monopolistic competition prevails among sellers as a result of the heterogeneity of services offered. When prices in an urban area (where the spatial concentration of sellers is much higher and consumer search costs significantly lower) have been compared with those in smaller towns and rural areas, differences in search costs and the potentially higher degree of competition did not yield lower prices; quite the contrary, they were, on average, higher for 11 of the 14 products considered. Supermarkets proved to be often, but not always, less expensive than traditional retailers, although average savings associated to food shopping at supermarkets were extremely low. Finally, the results of the study suggest that sellers behave differently in their pricing decision strategies; these differences emerge both at the firm level and, for supermarkets, within the same chain. The fact that products considered were homogeneous, purchases frequently repeated, the number of sellers large, and search costs relatively low, did not suffice to keep price dispersion low. Based on the results presented in the paper, it is clear that more important in explaining price dispersion is the contemporaneous heterogeneity of retailers (in terms of services rendered) and consumers (in terms of their propensity to search and shopping preferences), which makes it possible for a monopolistic competition structure of the market to emerge and for small traditional food retail stores to remain in business.**

Keywords— **Price dispersion, retail pricing, food markets.**

JEL classification— **L81; D8; D4; Q13.**

I. INTRODUCTION

The existence of price dispersion, even for homogeneous products, is among the most replicated findings in empirical economics. After Stigler's (1961) seminal paper, a rich literature flourished, both theoretical and empirical, analyzing the causes and consequences of such "ubiquitous" price dispersion.[1]

The paper aims to contribute to the empirical literature by assessing the extent and determinants of spatial price dispersion for 14 perfectly homogeneous food products. We found only two studies addressing price dispersion for food products in Europe (Lloyd et al., 2009; Griffith et al., 2009). In addition, to the best of our knowledge, our study is the only one conducted in a market characterized by the strong persistence of traditional food retailers (i.e. small shops specializing in selling one specific category of food products only, such as bread, fresh fruit and vegetables, fish, meat, etc).

In addition to measuring the extent of price dispersion, the paper attempts to answer several questions related to its determinants which emerge from the alternative theoretical models proposed in the literature. These questions include: How relevant are promotional sales in explaining spatial price dispersion? How important is seller heterogeneity in explaining price dispersion, e.g. are consumer prices higher in traditional food retailers than in supermarkets? Is price dispersion greater in supermarkets than in traditional small stores? Is price dispersion within each supermarket chain smaller than across all supermarkets? Are prices and price dispersion higher in smaller towns and rural communities, where search costs can be assumed to be

[1] Baye, Morgan and Scholten (2006) provide a survey of the theoretical and empirical literature on price dispersion.

higher, than in urban settings? Do low/high price setters remain so over time?

We believe the results of our study may be relevant for more general frameworks characterized by perfectly homogeneous, well known products, involving frequently repeated purchases, with relatively low unit prices, sold by a large number of heterogeneous stores and bought by a large number of heterogeneous consumers.

The paper is organized as follows: the next section briefly recalls the main theories which have been proposed to explain price dispersion; section three provides an overview of relevant empirical contributions assessing the extent and determinants of price dispersion; section four presents the results of our study and section five concludes by discussing their implications and relevance.

II. WHY PRICE DISPERSION?

There is no unique explanation of why price dispersion arises. Many studies agree that a good portion of observed price dispersion stems from the existence of information (search) costs. In his seminal paper Stigler (1961) considers price dispersion as a measure of ignorance in the market: nobody can possibly know all the prices quoted by different sellers at any given time, and any agent who wishes to ascertain the lowest price must do a search that involves a cost. In his model consumers search strategy consists in canvassing a fixed sample of n firms and then buying at the minimum asking price. The optimal amount of search n* is determined a priori and corresponds to the number of firms which makes the cost of search equal to its expected marginal return; it varies among individuals mostly because of differences in search costs. The persistence of price dispersion has been explained in different ways: first of all, the fact that knowledge becomes obsolete as supply and demand, and therefore the distribution of asking prices, change over time; buyers and sellers change and new agents enter the market with no prior information on prices; finally, the circumstance that, as the market grows, there is a strong tendency towards monopoly in the provision of information. Rothschild (1973) criticizes Stigler's model as a "partial-partial equilibrium theory" (p. 1288), in the sense that he considers only one side of the market, the consumers, acting in an optimizing fashion, while firms do not make an optimal use of the information they possess, because in Stigler, although price setters know how buyers search, they do not make use of this information in their decision making.

Notwithstanding the fact that Stigler denies that all price dispersion is attributable to heterogeneity, the literature expanding on his theory mostly focuses on models with varying search and production costs as factors generating the dispersion. Representative examples include Burdett and Judd (1983), Carlson and McAfee (1983), Salop (1977), Salop and Stiglitz (1977), and Stahl (1989). Carlson and McAfee (1983) develop an equilibrium price dispersion model where a finite number of firms differ in their cost functions and consumers have different search costs. The predictions of the model are that the variance of prices rises as the number of firms increases, as the marginal cost curve becomes flatter, or when the cumulative density distribution of consumer search costs shifts downward. Salop and Stiglitz (1977) consider a market with both "low information cost" consumers, who are supposed to have full information regarding the distribution of offered prices, and "high information cost" consumers, who know nothing about it. The former always purchase from a low-priced store, while the latter purchase at a randomly chosen store. Stores are identical and behave as monopolistically competitive price setters. It is shown that in equilibrium every store earns zero profits, for prices must equal average costs, and high-priced stores sell a smaller quantity than lower-priced ones. Low-priced stores sell at the competitive price (minimum average cost), while the other stores sell at a higher price and only to uninformed consumers. Stahl (1989) focuses on the case where there are two types of consumers about whom stores have no individual information: a proportion μ of consumers, named "shoppers", derive enjoyment from shopping and are assumed to be costless searchers; the remaining proportion $1 - \mu$ of consumers have an identical positive search cost c. N identical stores with constant marginal costs compete in the market of a homogeneous good. A two-stage model is considered, where in the first stage each store fixes the price and in the second stage consumers adopt an optimal sequential strategy with perfect recall. When $\mu = 1$ and $\mu = 0$ the marginal cost price (Betrand result) and monopolistic price (Diamond result), respectively, occur. As μ goes from 0 to 1 and the search cost goes from c to 0 there is a Nash equilibrium price distribution that smoothly moves from "monopoly pricing" to "marginal cost pricing". Moreover, in this model, as in Carlson and McAfee

(1983), entry does not lead to a competitive outcome, the reason here being that, as the number of stores increases, the probability of any one of them being the lowest-priced store decreases, thus reducing the incentive for lowering the price. In terms of welfare analysis, as pricing becomes more monopolistic, "shoppers" are better off while consumers with a positive search cost are worse off. The overall effect depends on the size of μ and it may be the case that total welfare decreases when the number of stores rises.

When consumers are heterogeneous in their search behaviors and exhibit different efficiencies in gathering information, a further reason for price dispersion arises, that is firms behaving as discriminating monopolists. In this case price dispersion acts as a device for splitting the market in two, with more efficient information gatherers, on one side, and less efficient ones on the other. Thus, monopolists can charge the latter, who are supposed to have a more price inelastic demand function, a higher price (Salop 1977).

The literature on price dispersion contemplates four different typologies of consumer search strategies: Stigler (1961), Burdett and Judd (1983), Mac Minn (1980), Wilde and Schwartz (1979), among others, consider a "fixed sample size" consumer search, while Diamond (1971), Carlson and McAfee (1983), Reinganum (1979) and Stahl (1989), to quote some, assume "sequential" consumer search; Burdett and Judd (1983) consider also a noisy sequential search; finally, Rosenthal (1980), Varian (1980) and Baye and Morgan (2001) propose models with "information clearinghouse". In a fixed sample size search consumers decide the number of prices to observe prior to starting their search, so the problem is to determine how many price quotations it is efficient to collect. In a sequential search consumers observe a price quotation and then decide whether to ask for another price quotation or make the purchase at the lowest price observed up to then. In a noisy sequential search consumers pay a cost to obtain an unknown number of price quotations, as happens when consumers purchase a newspaper in which they know they will surely find one price of the good they want to buy, but it is possible that the newspaper contains more than one firm's price quotation. After collecting the price(s) provided in the newspaper the consumer either purchases at the lowest price observed, or decides to keep searching and buys another newspaper. An information clearinghouse search technique consists in observing an extensive list of prices charged by different firms in the market by means of specialized newspapers or on-line websites.

Stigler's fixed sample size rule has been criticized as unrealistic, because it implies that the information consumers accumulate during the search does not affect their decision to canvass all the sample chosen ex ante (Rothshild, 1973). As a consequence, several authors point out that a more appropriate assumption regarding consumer search strategy is a sequential one. Morgan and Manning (1985), Burdett and Judd (1983) and Wilde and Schwartz (1983) show, however, that both types of search can be optimal: the key advantage of a fixed sample search is to collect the price for the number of firms decided a priori at the same time, hence gathering the information quickly; on the contrary, a sequential search would be more efficient when the acceptable price could be found early in the search, allowing consumers to economize on information search costs (otherwise it could take a significant amount of time waiting for each new price quotation before deciding whether or not to search further, with the consequent increase in search costs).

In line with Stigler's insight, other contributions consider price dispersion as endogenously generated. Indeed, Varian (1980) presents a model in which price dispersion is due to the randomization behavior adopted by identical firms and shows how consumer information asymmetries, initially considered as exogenous, can be made endogenous. He distinguishes between "spatial" price dispersion - e.g. different stores contemporaneously offering identical items at different prices - and "temporal" price dispersion - e.g. stores varying their selling price for a given commodity over time, for example by means of promotional sales. He argues that the former may exist only if the latter occurs. In fact, with temporal price dispersion consumers are unable to learn from experience which stores systematically charge low prices, and spatial price dispersion would be unlikely to persist if consumers could learn from experience which firms charge the lowest prices. In the Salop and Stiglitz (1982) model all individuals are ex ante identical, and imperfect and costly information, due to the functioning of the market, is at the center of the analysis. By chance, some consumers happen to shop at low-price stores, while others shop at high-priced stores; they randomly select a store in period 1, so whether they pay a good price or not depends only on the luck of the draw. It is assumed that consumers

have the possibility of starting a new search at period 2. Consumer demand one unit of the good each period, but may either purchase just one unit in period 1, facing an additional transaction cost in re-entering the market in period 2; or they may decide to purchase two units in period 1 and store the unit in excess of the immediate consumption for the next period, incurring a storage cost. The decision to buy-and-store or shop again stems from the comparison of these two options. High-price stores earn higher profits per sale, but low price stores realize a higher volume of sales. Equilibrium price dispersion entails equal profits for the two types of stores, i.e. the larger volume of sales of low-price stores exactly compensates for the larger profit per sale of high-price stores. Burdett and Judd (1983) show that price dispersion may exist independent from any form of *ex ante* agent heterogeneity. Considering identical and fully rational consumers and firms, they show that for equilibrium price dispersion an *ex post* heterogeneity in consumer information is crucial, that is a divergence in the amount of information each consumer holds after searching. They demonstrate that a dispersed price equilibrium can exist both with noisy and non sequential searches.

Finally, there are alternative theoretical approaches to price dispersion which do not consider consumer search costs as the main determinant, but rather stress the importance of heterogeneity in consumers and/or firms instead in generating price dispersion. Frequently cited factors other than search costs include: price discrimination in the presence of consumers who do not engage in searches, regardless of cost; heterogeneity of retailers in terms of the quantity and quality of services offered, e.g. opening hours, cleanliness, number of references to choose from, location and/or parking convenience, credit cards being accepted, store layout to reduce shopping time, delays at check-out; trust/reputation; degree of competition; promotional sales; and bounded rationality of consumers and/or firms.

III. PRICE DISPERSION IN EMPIRICAL ANALYSES

Empirical evidence of spatial price dispersion has been found in virtually all markets which have been investigated, including automobiles (Dahlby and West, 1986), air travel (Borenstein and Rose, 1994), services (Pratt, Wise and Zeckhauser, 1979), gasoline and products sold in gas station stores (Adams, 1997), books and CDs (Brynjolfsson and Smith, 2000; Clay *et al,* 1999; Clay, Krishnan and Wolff, 2001), scanners and digital cameras (Baylis and Perloff, 2002), and prescription drugs (Sorensen, 2000).

Dahlby and West (1986) find that price dispersion in automobile insurance in Alberta increases with competition and could be explained by the cost of consumer search. Borenstein and Rose (1994) analyze air fares charged in 1986 by the 11 major U.S. airlines for coach seating to passengers traveling domestically on the same routes. The expected absolute difference in fares between two passengers on the same route was 36 percent of the average ticket price for that route. Fare dispersion turned out to be smaller across carriers relative to dispersion across customers of the same carrier. Considering thirty-nine products and services, for which, on average, twelve price quotations in the Boston area were collected, Pratt, Wise and Zeckhauser (1979) gathered evidence of notable price dispersion. Adams (1997) finds that price dispersion for gasoline was significantly lower than that for 22 items sold by convenience stores located on the same premises. Because search costs for consumers of gasoline are lower than those for in-store items (prices for gasoline are prominently displayed and easily visible), he concludes that the observed differences in price dispersion support the hypothesis that different search and information costs for consumers explain a sizable portion of price dispersion for homogeneous goods. Brynjolfsson and Smith (2000) consider book and CD prices offered by Internet and conventional retailers; they find Internet retailer price ranges of 33 percent for books and 25 percent for CDs (for some books and CD the range is as much as 47 percent), with price dispersion among Internet retailers being smaller than that among conventional ones. Clay *et al.* (1999) find substantial price dispersion across 13 online bookstores, with the average difference between the minimum and maximum price for paperback bestsellers being 73 percent. Clay, Krishnan and Wolff (2001) find a similar result when analyzing 32 online bookstores. Baylis and Perloff (2002) found significant price dispersion in offers by 49 Internet retailers for a digital camera and a scanner; the price range was 42 percent of the average price for the camera and 29 percent for the scanner. Their study shows that, contrary to expectations, retailers charging high prices provided fewer services; this is consistent with differences in firm pricing strategies explained by targeting consumers with high or low search costs.

They (and others) also find that firms do not take turns in undercutting each other, i.e. the high-priced firms remain high-priced and low-priced firms remain low-priced over long periods. Sorensen (2000) focuses on the retail market for prescription drugs and finds that prices for equivalent prescriptions differ substantially across pharmacies within the same small town, with the highest price being, on average, 50 percent higher than the lowest one. Differences in service characteristics turn out to be relatively unhelpful in explaining price differences. Moreover, pharmacies price rankings differ from one drug to another, with price dispersion significantly lower for prescriptions used for drugs used to treat chronic conditions, which are purchased repeatedly.

Research has systematically found that significant price dispersion exists even in on-line markets, where search costs can be assumed to be very low (Baye and Morgan 2001; Baye, Morgan and Scholten, 2003; Nermuth *et al.,* 2009; Clay *et al.*, 1999; Clay, Krishnan and Wolff, 2001; Brynjolfsson and Smith, 2000; Baylis and Perloff, 2002).

Several studies addressed the extent and determinants of price dispersion with specific reference to food products. Ambrose (1979) analyzed prices for 54 grocery products in 6 small independent stores, 4 large independent stores and in 4 stores belonging to a chain, located in inner city, suburban and rural areas in Nebraska. He found prices to be higher in small independent stores and in stores located in rural areas. Lloyd et al. (2009) use a very detailed data base of weekly observed prices of over 1,700 grocery products sold in the seven largest retail chains in the UK to address the role of promotional sales in price variability over time. They conclude that the influence of promotional sales on price variation across the chains is modest, explaining at most 29 percent of price variability. Significant price dispersion across the seven chains they focus on emerges from the study; even after excluding discount sales, the average difference in the prices of products carrying the same bar code is about 25 percent. Griffith et al. (2009) use information on purchases of food products by 25,000 families in Great Britain over the 2006 calendar year to analyze four dimensions of their buying behaviors aimed at containing their spending: purchasing products on sale, generic brands, and in bulk, and choosing where to buy. They show that potential and actual savings from these four sources are significant. In Israel Lach (2002) found price dispersion for four products (three of them food: frozen chicken, coffee and flour) to be significant and to prevail even after controlling for unobserved product heterogeneity. Temporal price dispersion within stores was significant; most stores were observed to have the lowest and the highest price over the length (48 months) of the sample period. Stores moving up and down the cross sectional price distribution implies that consumers cannot learn about stores that consistently post lower prices; this is a condition for price dispersion to persist. Pesendorfer (2002) analyzes prices of two market leader ketch-ups in 21 supermarkets in Springfield, Missouri over a two year period. Prices of Heinz and Hunt's 32 ounce bottles both show substantial price dispersion on a given day, with the lowest price being about 30 percent below the average one. Sexton, Zhang and Chalfant (2003) address retailer behavior in procurement and sale by 20 grocery chains in six U.S. metropolitan markets focusing on fresh produce (iceberg lettuce, fresh tomatoes and bagged salads). They conclude that retailers do exert oligopoly power in setting prices to consumers, but not to the full extent available to them as a result of geographical dispersion, brand differentiation and inelastic consumer demands; in addition, no evidence emerged of price setting by retailers. Hosken and Reiffen (2004) consider monthly prices of 20 food products in 30 U.S. metropolitan areas for up to 5 years. They conclude that grocery products typically have a "regular" price and stay at that price at least 50% of the time, most of the deviations from the regular price are downward and promotional sales account for 20 to 50 percent of observed annual price variability. Devine and Marion (1979) conducted an experiment by providing for five weeks through daily newspapers consumers in the Ottawa-Hull area with information on prices for sixty-five food products in twenty-six local stores. When compared with price developments in a control area, the provision of consumers with low cost information on prices induced a decline of the level and dispersion of an aggregate price index across stores as well as within chains.

Contrary to expectations, price dispersion is not to be observed across retailers only, but within stores as well. Quantity surcharges, i.e. the per unit price of a brand's larger package being higher (rather than lower) than the per unit price of the same brand's smaller package, occurs more frequently than one would expect. Sprott, Manning and Miyazaki (2003) cite research which found quantity surcharges in 16 to

34 percent of grocery supermarket brand products available in more than one package size.

IV. RESULTS

The analysis is based on the results of a survey of retail prices for 14 food items in 437 stores located in towns and cities of different demographic sizes in Calabria, a region in Southern Italy. The list of the 14 food items is given in table 1; they are all processed products, univocally identified by their brand, packaging and volume/size. The survey was conducted between April 8 and 11, 2010.

The sample covers 10% of the 4,350 food retail stores operating in Calabria in 2001, at the time of the most recent Italian Census of Manufacture and Services; because of the historical trend towards a rapid reduction of food retail stores, it is reasonable to assume that the survey coverage of the population of active retail stores in 2010 is significantly larger than 10%. 57% of the stores in the sample are supermarkets (including very large ones, sometimes referred to as "hypermarkets"), the remaining 43% are traditional retail stores. Small traditional retailers (specialized food shops in which the seller handles the items) are 26% of the stores in the sample, while 17% are "superettes" (relatively small shops in which buyers have the freedom to pick most of the items from the shelves). Supermarkets are over-represented in the sample with respect to their consistency in the 2001 Census (5.1%), and traditional retail stores under-represented.

In total, 4,149 prices are used in the analysis; the number varies between 193 (MILKTDM) and 386 (NUTELLA), as not all products were sold in every retail store (Table 2).

A. How much price dispersion?

Based on the specific characteristics of the products - perfectly homogeneous, well known to consumers and frequently purchased - and markets - relatively low search costs, because of the high number of sellers - considered in this study, theory explaining price variability by assigning a key role to search costs and product heterogeneity would lead us to expect a relatively low level of spatial price dispersion. However, empirical research conducted in contexts very different from the one analyzed here has found food products characterized by a significant degree of price dispersion.

The results of our survey for the entire sample are presented in table 2 and figures 1-3. The ratio between the maximum and minimum prices for the 14 products ranges between 1.45 (MILKGRA) and 2.96 (SPAGBAR) and exceeds 2 for 7 out of the 14 products (table 2; figure1). The significantly lower price dispersion for MILKGRA is due to the fact that during the week of the survey the manufacturer distributed it with a "suggested" promotional retail price clearly displayed on the label; in fact, the "suggested" sale price was the observed retail price in 294 stores out of the 353 selling that specific brand of milk.

The coefficient of variation - which provides a measure of variability which is independent of the magnitude of the price and, as a result, is directly comparable across products – varies between 4.8% (MILKGRA) and 23.5% (YOG); it exceeds 10% in 11 cases (table 2; figure 2).

From the results of our survey we conclude that the extent of the observed spatial price dispersion is fairly large. Our results appear to be of the same order of magnitude as those reported for a range of different food products in Baye, Morgan and Scholten (2006; table 1, pp. 325-330), Degeratu, Rangaswamy and Wu (2000), Lach (2002) and Pesendorfer (2002).

Price dispersion and its variability around the trend both tend to decline as the average price of the food item increases (figure 3); this is likely the result of two interlinked reasons: as the average price increases, the same coefficient of variation yields wider absolute differences in prices, which become more easily detectable by consumers and, most important, more significant in terms of their effect on consumers expenditure, increasing their willingness to search. In other words, seller pricing decisions appear to assume consumers are more concerned with absolute differences in prices than percentage ones.[2]

Not only does price dispersion differ across products, but the shape of price distribution appears dissimilar as well (figure 4). Four types of distributions emerge. The first one is associated to one product only, MILKGRA, which, for the reasons discussed above, shows much less price dispersion than all other products, with a very marked concentration of observed prices around the

[2] A moderate negative relation between the coefficient of variation and the price of the products and services they considered has been found by Pratt, Wise and Zeckhauser (1979) and Lach (2002).

"suggested" sale price, and few prices above it. The second type of price dispersion is associated to a clearly negative-asymmetric frequency distribution of prices, with the mode interval lying on the right of the one containing the average; this type of spatial price dispersion involves 9 of the 14 products. This result is consistent with the findings by Hosken and Reiffen (2004), Griffith et al. (2009), Li, Sexton and Xia (2006) and Pesendorfer (2002); they analyzed temporal price dispersion in different countries for different food products and all conclude that their prices typically show a "regular" price, which can be observed for a relatively long period of time, with most of the deviations being downward from this price and occurring for relatively short periods. The third type of distribution is associated to three products (NUTELLA, WATERLEV and SPAGVOI) and shows a relatively symmetric distribution of prices around the average. Finally, the price distribution of YOG appears different from all the others, with a large number of prices falling in the modal interval and an even larger number of prices falling in intervals on its right; 111 retailers out of 285 sell YOG at the same price (0.99€), possibly revealing a temporary low price retail strategy by the manufacturer.

If instead of analyzing the dispersion of the price of each product, the dispersion of the cost of the basket of all products analyzed is considered, dispersion drops significantly, signalling that retail stores strategically price the products they sell differently, choosing to price some of them below, and others above the average. This is consistent with a strategy aimed at making it difficult for consumers to identify which stores are selling at prices above average (because they would then decide to shop elsewhere) and, at the same time, setting a large number of prices at or above average (in order to guarantee the expected returns). There are only 15 retail sores in the sample selling all 14 items. If the analysis is extended to the sub-samples of retail stores selling the same basket of 13, 12, 11 and 10 products, choosing in all instances the set of products which maximizes the number of retail stores selling them, the ratios between the maximum and minimum cost of the basket vary between 1.15 and 1.21, while coefficients of variation remain for all 5 baskets below 5% (table 3).

B. How relevant are promotional sales in explaining spatial price dispersion?

One of the factors which can explain price dispersion are promotional sales, which retailers, most often supermarkets, use to attract new customers and/or retain current ones. Lloyd et al. (2009) analyzed average prices in 7 main food retail chains in the UK over three years to conclude that sales have a significant but relatively modest role, smaller than that played by the retailer, in explaining price dispersion; overall sales explain 13% of price variability, with percentages for individual food product aggregates varying between 2% and 29%. In Hosken and Reiffen (2004) sales account for a larger percentage (20% to 50%) of annual price variations.

12 out of the 14 products considered in our survey were at the time of the survey on promotional sale in at least one of the stores; in fact, the number of stores offering the products considered as a promotional sale varies between 0 (MILKTDM and SPAGVOI) and 294 (MILKGRA). If we exclude MILKGRA, in 49 of the 437 retail stores at least one of the remaining 13 products was offered on a promotional sale; in 18 of them there were at least two on special offer. The largest number of stores offering the product "on sale" is observed for MILKPARM (24) and YOG (22). Surprisingly enough, only in 5 cases was the lowest of the prices advertised as a special promotional sale the minimum observed price for that product; most of the times (in 7 cases out of 12) there were few retail stores selling the same item at a price below the minimum observed "on sale" price without highlighting that price as being a special offer. This seems to suggest a bounded rationality framework for the behaviour of at least some of the firms. If MILKGRA is excluded from the analysis, a positive linkage exists between the stores offering the product as a promotional sale as a percentage of the total number of stores selling that product, and the coefficient of variation of the price of the same product (figure 5). On the contrary, if MILKGRA is included, clear evidence emerges for a linkage in the opposite direction. We thus conclude that promotional sales, if driven by a market-wide promotion by the producer have a lowering effect on price dispersion, while the contrary is true if they are the result of decisions taken at the retail level.

C. Are consumer prices higher in supermarkets than in traditional food retailers?

A specific characteristic of the market which is the focus of this study is the significant persistence of a large number of traditional, relatively small, food retailers. Because of their higher acquisition prices and, likely, operational costs with respect to those of supermarkets, traditional retail stores are expected to show higher retail prices. Ambrose (1979) found grocery prices to be, on average, lower in chain stores than in independent ones, and in large independent stores lower than in small ones. Our survey confirms this expectation: shopping at supermarkets is often, though not always, cheaper than in traditional stores (table 4; figures 6 and 7).

The highest price is observed in a traditional store for 6 out of the 14 products and in a supermarket for 2 products (the maximum price is the same in the two groups of stores for the remaining 6 products). Supermarkets show the lowest observed price for 8 of the 14 products; for three products this is the case for traditional stores, while in the remaining three the minimum price in the two groups of stores is the same. The average price is lower in supermarkets for 11 products, but two products were cheaper in traditional retail stores.

The statistical significance of the difference between average prices in supermarkets and traditional retail stores has been tested by estimating by OLS for each product k (k = 1, 2,… 14) a very simple equation:

$$P^k_i = \delta^k_0 + \delta^k_1 D^k_i + \varepsilon_i$$

where P^k_i is the price of the k-th product in the i-th store, D^k_i is a dummy variable which equals 1 if the store is a traditional retailer, 0 if it is a supermarket, δ^k_0 and δ^k_1 are the parameters to be estimated, and ε_i is the error term (results are shown in table 5). Obviously, the estimated values of δ^k_0 and δ^k_1 are nothing but the average price of the k-th product in supermarkets, and the difference between the average prices in traditional retail stores and in supermarkets, respectively. The tests show that for 7 out of the 14 products the average price in the supermarkets was statistically significantly lower than that in traditional retail stores (in 5 cases at the 99% confidence level, in the remaining 2 cases at the 95% level), while the contrary never happens, since in the other 7 cases the two average prices are not statistically different.

Table 6 allows us to compare the cost of baskets of products, instead of considering them one by one. Traditional retail stores, being much smaller in size, tend to carry a lower number of references than supermarkets; in fact, no traditional retail store carries all 14 food items, only two sell the full set but MILKTDM, and the basket of 10 products (that obtained by excluding MILKTDM, BABYFPLA, SPAGVOI and COFFEELAV) is sold by 10 stores only. Nevertheless, the information in table 6 provides useful indications, complementing those which emerged when products were considered individually. The lowest cost of each basket always occurs in a supermarket, but the same is also true for the highest cost. Beside the 13 products basket, which is sold by two traditional retail stores only, the average cost of the baskets considered is always lower in supermarkets, although the average savings are relatively small (between 1.7% and 2.5% of total expenditure).

One interesting issue involves pricing decision behaviours by stores belonging to the same chain. Most consumers, especially among those devoting relatively little effort to their food shopping, tend to believe supermarkets belonging to the same chain offer identical, or very similar, prices. Theory, however, suggests the contrary, as this would imply that retail stores belonging to certain chains could be identified a priori as being cheaper than those belonging to certain other chains. To address this point table 7 provides information on price dispersion in supermarkets belonging to the 11 chains which in our sample have at least 6 stores; this means considering 159 supermarkets out of the 249 covered by the survey. When average prices in each of the chains are compared with average prices across all supermarkets in the sample one finds out that no chain shows a lower (or a higher) than average price for all 14 items. The number of products offered at a higher than average price varies among the 11 chains between 4 and 12. 58% of the average prices for the 14 products in the 11 chains are above the average calculated for each product across all supermarkets. However, the number of products sold at above or below average prices in a certain chain, alone, does not provide enough information to assess the advantage of shopping in that specific chain. Figure 8 gives the ratio between the average total cost of the basket of the 14 products in each chain of stores and the average cost of the same basket calculated for all supermarkets in the sample, and the number of products sold in the

same chain at above average prices. A positive link between the two variables emerge. Nevertheless, it seems to us that this relationship cannot be taken as a general rule. In fact, one of the chains with the largest number of items (11 out of 14) sold at a price above the average shows an average expenditure for the 14 products which is 2% below the average expenditure calculated across all supermarkets (SISA), and the largest expected savings (6%) occur in a chain where 7 of the 14 products are sold at an above average price (STANDA) (table 7). This suggests (a) that different chains use different strategies in their pricing decisions, and (b) that at least some of those pricing a relatively large number of food items above average have other food items priced well below average, or, to put it differently, that chains offering (truly advantageous) promotional sales are, at the same time, often selling many other items at not-so-advantageous prices. This is consistent with the conclusions reached in Griffith et al. (2009, pp. 111-112), who found Tesco to be the supermarket chain where consumers saved the most, but, at the same time, 79 out of the 189 product groups considered were sold at above average prices.

D. Is price dispersion larger within supermarkets than in traditional food retailers?

Supermarkets being engaged in more sophisticated pricing strategies than traditional retail stores, one would expect to find higher price dispersion among the former. However, this does not seem to be the case; in fact, on the contrary, the coefficients of variation of prices are higher in traditional retail stores for 10 of the 14 products and lower for three (in one case, BEERPERO, the two groups of stores show the same value of the coefficient) (table 4; figure 7). Furthermore, wider price dispersion is not systematically associated to products for which stores show higher average retail prices; in fact, this is the case only for 7 products, while in 6 cases the group of stores showing the highest coefficient of variation is the one with the lowest average price (table 4).

The opposite result emerges when the coefficients of variations for the cost of the baskets considered in table 6 are compared. The higher dispersion of the cost of the baskets observed in supermarkets is not in contradiction with the lower dispersion observed in the same group of stores for individual prices, as it may be the result of more careful pricing. However, the small number of traditional retail stores selling the four baskets considered in the analysis suggests caution in comparing differences in the variability between the two groups.

In general, price dispersion for individual products in supermarkets and traditional food retailers appears relatively close and not far from that observed for the entire sample. What remains to be seen is whether the determinants of price dispersions are the same in supermarkets and traditional food retailers, or if the similar price dispersion observed is the result of different factors/behaviours in the two groups of stores.

Finally, it would be reasonable to expect price dispersion within stores belonging to the same chain to be smaller than that observed across all supermarkets. The results of our survey suggest that this is not necessarily the case. In fact, for 34% of the prices of the 14 products sold in the 11 supermarket chains with at least 6 stores in our sample, the coefficient of variation calculated for the stores belonging to the same chain (table 7) is larger than that calculated considering all supermarkets (table 4).

E. Are prices and price dispersion higher in smaller and rural communities than in urban settings?

In an urban setting, because of the greater density of stores, consumer search costs are definitely lower. Hence, one can expect both lower prices and lower price dispersion. Ambrose (1979) compared grocery prices in retail stores located in inner city, suburban and rural areas. His results show higher prices in retail stores located in rural areas, followed by those in suburban and inner city areas, respectively. In table 8 prices and price dispersion in the stores located in the urban area of the Cosenza-Rende conglomeration are compared with those in the rest of the sample, where most stores are located in smaller towns and rural areas of the region. 118 (27%) of the 437 retail stores in the sample fall in the urban area; the share of supermarkets in the two groups is practically the same (58% for the urban area, 56% in the rest of the sample).

Average prices in the urban area are not systematically lower than those in smaller towns and rural areas. On the contrary, in fact, for 11 of the 14 products the average price is higher in the urban area, and statistically significantly so at least at the 95%

confidence level in three cases (table 9). [3] For only one of the three products for which the average price in the urban area is lower than in the rest of the region is the difference statistically significant (at the 99% confidence level). At average prices, the basket of the 14 products in the food retail stores located in the urban area is 1.6% more expensive than in the rest of the region (it costs €30.61 vs. €30.14).

However, on the contrary, price dispersion measured by the coefficients of variation is lower in the urban area for 9 of the 14 food products considered (table 8). Observed differences in price dispersion in the urban areas *vis a vis* smaller towns and rural areas are, in some cases, quite marked.

These results suggest that, while the greater density of sellers in the urban area definitely does not translate into increased price competition among retailers and lower consumer prices, it does yield lower price dispersion. This means that differences in search costs across markets may have a limited impact on the level of prices, while sellers in the presence of lower search costs seem to be more careful in limiting price dispersion, which consumers may now detect more easily.

F. Do low/high price setters remain so over time?

Theory suggests that retailers are expected to vary over time the prices of the different goods they sell in opposite directions. In fact, as discussed above, temporal price dispersion is a necessary condition for spatial price dispersion, otherwise consumers would be able to identify from experience stores selling a given product at a lower price and no one would buy it from stores offering it a higher price (Varian, 1980). Lach (2002) found evidence of most stores in his sample falling over a 48 months period in both the lower and the upper quartiles of the price distribution of the three food products considered.

In order to assess if this is also true in our case, and if so to what extent, prices surveyed in 2010 were compared with prices in 2009 for the 178 retailers in our sample (out of 437) which were involved in an identical survey conducted between April 2 and 5, 2009. In Figure 9, for each of the 14 food products, normalized prices in 2010 are plotted against normalized prices in the same store the previous year (the number of stores varies from product to product, because only stores which carried the product in both years are considered); if temporal price dispersion did not exist, in each graph all stores would lie on the 45° line crossing the origin.

Observed over time pricing strategies do not show a negative relation between prices in 2009 and 2010, with stores who offered a given product at an above (below) average price in 2009 more likely to offer the same product at a below (above) average price one year later. On the contrary, in 13 out of the 14 instances, retailers who offered the product at an above (below) average price in 2009 were more likely to do so again one year later (although a significant number of stores - those falling in the second and fourth quadrants of the graphs - did the opposite); this behavior is particularly evident for five of the products, while the relation is less marked for the other eight.

In principle this result could be consistent with retailers consistently offering, over time, certain products at above average prices and others at below average price, without revealing an equally stable overall pricing profile, i.e. their prices consistently being, overall, either low or high. To check if this is actually the case we considered the same-store expenditure in 2009 and 2010 for a given basket of products. Even limiting the number of products to 10, only 23 of the 178 stores involved in the two surveys sold those products at the time of both surveys (figure 10). Even with all the precaution suggested by the small number of stores, the indication which emerges is that those stores which charged, overall, relatively higher prices in 2009 were doing the same one year later.

This result is consistent with those of Baylis and Perloff (2002) regarding non food products.

A possible explanation is firm heterogeneity - in terms of the services they provide, such as number of references offered, opening hours, number of references, proximity, parking convenience and reputation - and consumer heterogeneity – in terms of their shopping preferences.

V. CONCLUSIONS

The aim of this paper has been to contribute to the empirical literature on price dispersion by assessing its extent and determinants for a group of perfectly

[3] The approach taken to assess the statistical significance of the difference between the two average prices is analogous to that used for the difference between average prices in supermarkets and traditional retail stores (table 5).

homogeneous food products. As far as we know, this is the first attempt to address the price dispersion issue in a retail market characterized by a marked heterogeneity of sellers as a result of the persistence of a large number of relatively small traditional food retailers, side by side with large supermarkets.

Some of the results reached confirm in this specific market setting those obtained elsewhere, while others, in our opinion, may offer original insights to the empirical literature on price dispersion.

Although (i) the products considered are perfectly homogeneous and (ii) frequently purchased, (iii) the number of sellers high, and (iv) search costs relatively low, the observed price dispersion is quite high. Its magnitude has been found to be of the same order detected for food products by several others studies in very different environments, suggesting that the greater heterogeneity of firms (because of the persistence of a large number of traditional food retail stores) does not lead to increased price dispersion.

The extent of price dispersion observed suggests that monopolistic competition prevails among sellers as a result of their heterogeneity in terms of services rendered. This is consistent with Carlson and MacAfee (1983). Further evidence of heterogeneity of firms' characteristics which can be detected and appreciated by consumers (i.e. different from heterogeneity in operational and procurement costs, which is another factor which has been suggested to explain price dispersion) is provided by the circumstance that, in our study, many retailers selling at relatively high (low) prices in 2010 were doing the same one year earlier.

High price dispersion in the presence of low search costs and frequently repeated purchases signal that these factors are counteracted in consumer decisions about searching by the relatively low prices of the commodities considered (which reduce the expected marginal benefits from search efforts). Sellers pricing behaviors suggest that consumers are more sensitive to absolute price differences than percentage ones, i.e. they are more interested in detecting a 10% price difference which translates in savings of 2€ than a 50% price difference involving saving 50 cents.

Promotional sales are found (here and elsewhere) to contribute in a significant way to price dispersion. Based on the results of our survey, however, we have been able to conclude that this does not have to be always the case. In fact, if the promotional sale is market-wide run by the manufacturer it reduces, rather than increases, price dispersion, while the contrary is true if the sale is the result of decisions taken by retailers.

When prices in an urban area (where the spatial concentration of sellers is much higher and, hence, consumer search costs significantly lower) have been compared with those in smaller towns and rural areas differences in search costs proved to have a significant albeit limited positive effect on price dispersion. The potentially higher degree of competition deriving from the lower search costs and high density of sellers did not yield lower prices – on the contrary, on average, they where higher for 11 of the 14 products considered - confirming the hypothesis that food retail is an imperfectly competitive market.

Supermarkets proved to be often, but not always, less expensive than traditional retailers. Yet, average savings associated to food shopping at supermarkets were extremely low. This helps explain the persistence of traditional retail stores: consumers keep shopping at them because they are often not significantly more expensive than supermarkets. In addition, if factors other than prices are considered, traditional retail stores provide fewer of the services many consumers ask for, and often of a lower quality, but they may provide other services which are not strong points for supermarkets, such as a convenient location and the social pleasure from shopping deriving from a more personal interaction. On the other hand, the economic squeeze traditional retailers face (between the constraint to contain prices, and their higher operational and acquisition costs) is proven by their rapid steady decline.

Finally, the results of our study suggest that there is no one-rule-fits-them-all for firm strategic behaviors, as different groups of sellers behave differently in their pricing decisions. While explaining these differences and their motivations is beyond the scope of this study, our results show that such differences exist both between one store and another and between different supermarket chains.

In conclusion, our study confirms that significant price dispersion occurs even where, according to some of the theories proposed to explain it, it should be low. The products considered being homogeneous, purchases frequently repeated, the number of sellers high, and search costs relatively low did not suffice to keep price dispersion low. Based on the results presented in this study, what turned out to be more important in explaining price dispersion is the contemporaneous occurrence of retailer heterogeneity (in terms of services rendered), and consumer

heterogeneity (in terms of propensity to search and preferences regarding how to shop, i.e. "supermarket lovers" vs. "social shoppers"), which makes it possible for a monopolistic competition structure of the market to emerge and for a large number of traditional food retail stores to remain in business.

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REFERENCES

Adams A. F. III (1977), "Search Costs and Price Dispersion in a Localized, Homogeneous Product Market: Some Empirical Evidence", *Review of Industrial Organization*, (12), 5-6 , pp. 801-808.

Ambrose D. M. (1979), "Retail Grocery Pricing: Inner City, Suburban, and Rural Comparisons", *Journal of Business*, (52), 1, pp. 95-102.

Baye M. R., Morgan J. (2001), "Information Gatekeepers on the Internet and the Competitiveness of Homogeneous Product Markets", *The American Economic Review*, (91), 3, pp. 454-474.

Baye M. R., Morgan J. and Scholten P. (2003), "The Value of Information in an Online Consumer Electronics Market", *Journal of Public Policy and Marketing*, (22), 2, pp. 17-25.

Baye M. R. and Morgan J. (2001), "Information Gatekeepers on the Internet and the Competitiveness of Homogeneous Product Markets", *The American Economic Review*, (91), 3, pp. 454-474.

Baye M. R., Morgan J. and Scholten P. (2006), "Information, Search, and Price Dispersion", in T. Henderschott (ed), *Economics and Information Systems (Volume I)*, Amsterdam, Elsevier, pp. 323-373.

Baylis K. and Perloff J. M. (2002), "Price Dispersion on the Internet: Good Firms and Bad Firms", *Review of Industrial Organization*, (21), 3, pp. 305-324.

Borenstein S. and Rose N. L. (1994), "Competition and Price Dispersion in the U.S. Airline Industry", *Journal of Political Economy*, (102), 4, pp. 653-683.

Brynjolfsson E. and Smith M. D. (2000), "Frictionless Commerce? A Comparison of Internet and Conventional Retailers", *Management Science*, (46), 4, pp. 563-585.

Burdett K. and Judd K. (1983), "Equilibrium Price Dispersion", *Econometrica*, (51), 4, pp. 955-969.

Carlson J. A. and McAfee R. P. (1983), "Discrete Equilibrium Price Dispersion", *Journal of Political Economy*, (91), 3, pp. 480-493.

Clay K., R. Krishnan, E. Wolff and D. Fernandes (1999), "Retail Strategies on the Web: Price and Non-price Competition in the Online Book Industry", mimeo.

Clay K., R. Krishnan and E. Wolff (2001), "Prices and price dispersion on the web: evidence from the online book industry", *The Journal of Industrial Economics*, (49), 4, pp. 521-539.

Dahlby B. and D. S. West (1986), "Price Dispersion in an Automobile Insurance Market", *Journal of Political Economy*, (94), 2, pp. 418-438.

Degeratu A. M., A. Rangaswamy and J. Wu (2000), "Consumer choice behaviour in online and traditional supermarkets: The effects of brand name, price, and other search attributes", *International Journal of Research in Marketing*, (17), pp. 55-78.

Devine D.G. and B. W. Marion (1979), "The Influence of Consumer price Information on Retail Pricing and Consumer Behavior", *American Journal of Agricultural Economics,* (61), 2, pp. 228-237.

Diamond P. (1971), "A Model of Price Adjustment", *Journal of Economic Theory*, (3), pp. 156-168.

Griffith R., E. Leibtag, A. Leicester and A. Nevo (2009), "Consumer Shopping Behavior: How Much Do Consumers Save?", *Journal of Economic Perspectives*, (23), 2, Spring, pp. 99-120.

Hosken D. and D. Reiffen (2004), "Patterns of retail price variation", *RAND Journal of Economics*, (35), 1, pp. 128-146.

Lach S. (2002), "Existence and persistence of price dispersion: an empirical analysis", *The Review of Economics and Statistics*, (84), 3, pp. 433-444.

Li L., R. J. Sexton and T. Xia (2006), "Food Retailers' Pricing and Marketing Strategies, with Implications for Producers", *Agricultural and Resource Economics Review*, (35), 2, October, pp. 221-238.

Lloyd T. A., C.W. Morgan, S. McCorriston and E. Zgovu (2009), "Do Sales Matter? An Exploration of Price Discounting in UK Food Retailing", Paper prepared for presentation at the IAAE Conference, Beijing, August 16-22, mimeo.

MacMinn R. D. (1980), "Search and Market Equilibrium", *Journal of Political Economy*, (88), 2, pp. 308-327.

Morgan O. and R. Manning (1985), "Optimal Search", *Econometrica*, (53), 4, pp. 923-944.

Narasimhan C. (1988), "Competitive Promotional Strategies", *Journal of Business*, (61), 4, pp. 427-449.

Pesendorfer M. (2002), "Retail Sales: A Study of Pricing Behavior in Supermarkets", *Journal of Business*, (75), 1, pp. 33-66.

Pratt J. W., D. A. Wise and R. Zeckhauser (1979), "Price differences in almost competitive markets", *The Quarterly Journal of Economics*, (93), 2, pp. 189-211.

Reinganum J. (1979), "A Simple Model of Equilibrium Price", *Journal of Political Economy*, (87), 4, pp. 851-858.

Rosenthal R. W. (1980), "A Model in which an Increase in the Number of Sellers Leads to a Higher Price", *Econometrica*, (48), 6, pp. 1575-79.

Rothschild M. (1973), "Models of Market Organization with Imperfect Information", *Journal of Political Economy*, (81), November/December, pp. 1283-1308.

Salop S. (1977), "The Noisy Monopolist: Imperfect Information, Price Dispersion and Price Discrimination", *Review of Economic Studies*, (44), 3, pp. 393-406.

Salop S. and J. E. Stiglitz (1977), "Bargains and Rip-offs: A Model of Monopolistically Competitive Price Dispersion", *Review of Economic Studies*, (44), October, pp.493-510.

Salop S. and J. E. Stiglitz (1982), "The Theory of Sales: A Simple Model of Equilibrium Price Dispersion with Identical Agents", *The American Economic Review*, (72), 5, pp. 1121-1130.

Sexton R., Z. Mingxia and Chalfant J. (2003), *Grocery Retailer Behavior in the Procurement and Sale of Perishable Fresh Produce Commodities*, ERS/USDA, Contractors and Cooperators Report No. 2, September.

Shilony Y. (1977), "Mixed Pricing in Oligopoly", *Journal of Economic Theory*, (14), 2, pp. 373-388.

Sorensen A. T. (2000), "Equilibrium Price Dispersion in Retail Markets for Prescription Drugs", *Journal of Political Economy*, (108), 4, pp. 833-850.

Sprott D. E., K. C. Manning and A. D. Miyazaki (2003), "Grocery Price Setting and Quantity Surcharges", *Journal of Marketing*, (67), July, pp. 34-46.

Stahl D. O. II (1989), "Oligopolistic Pricing with Sequential Consumer Search", *The American Economic Review*, (79), 4, pp. 700-712.

Stigler G. (1961), "The Economics of Information", *Journal of Political Economy*, (69), 3, pp. 213-225.

Varian H. R. (1980), "A Model of Sales", *The American Economic Review*, (70), 4, pp. 651-659.

Wilde L.L. and A. Schwartz (1979), "Equilibrium Comparison Shopping", *Review of Economic Studies*, (46), 3, pp. 543-553.

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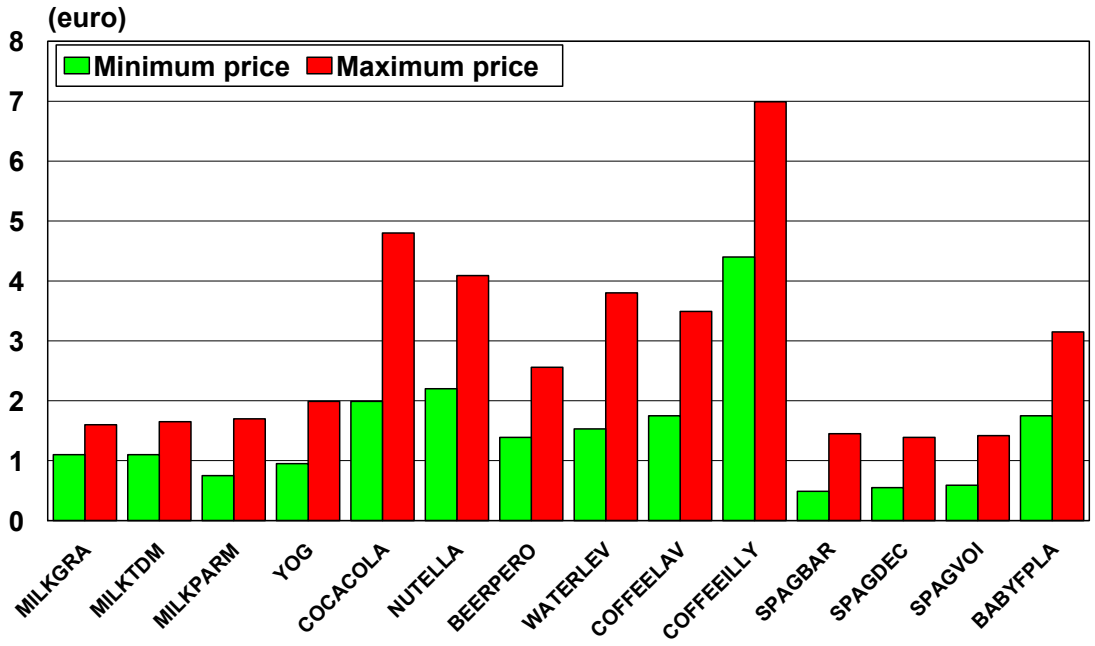

Fig. 1 Price dispersion: minimum and maximum prices.

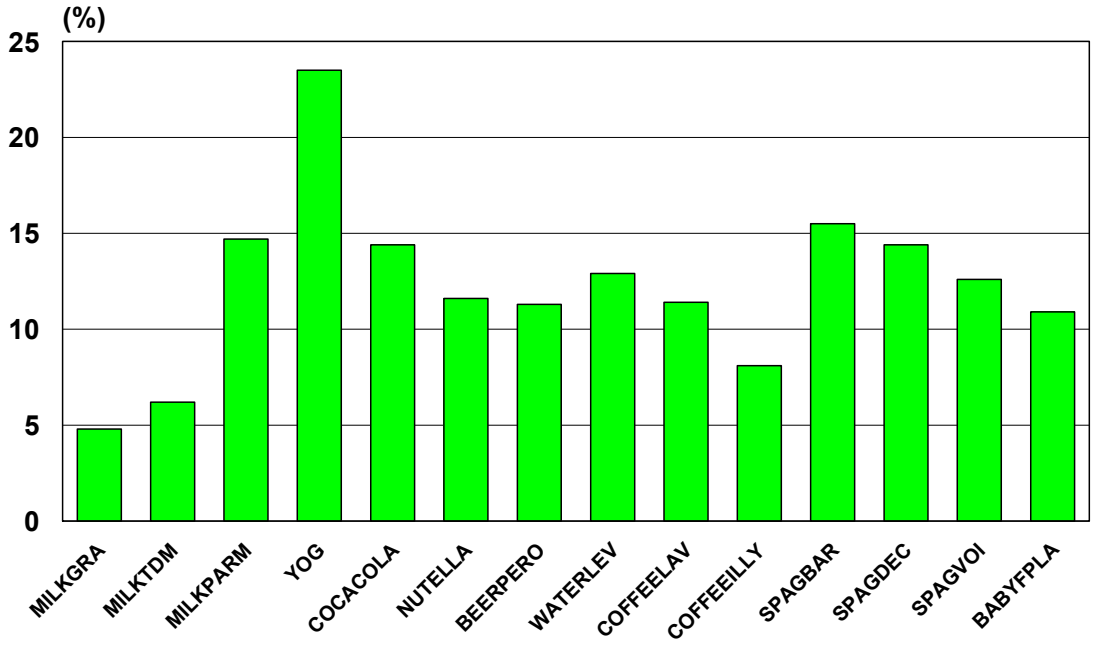

Fig. 2 Price dispersion: coefficients of variation (σ/μ x 100)

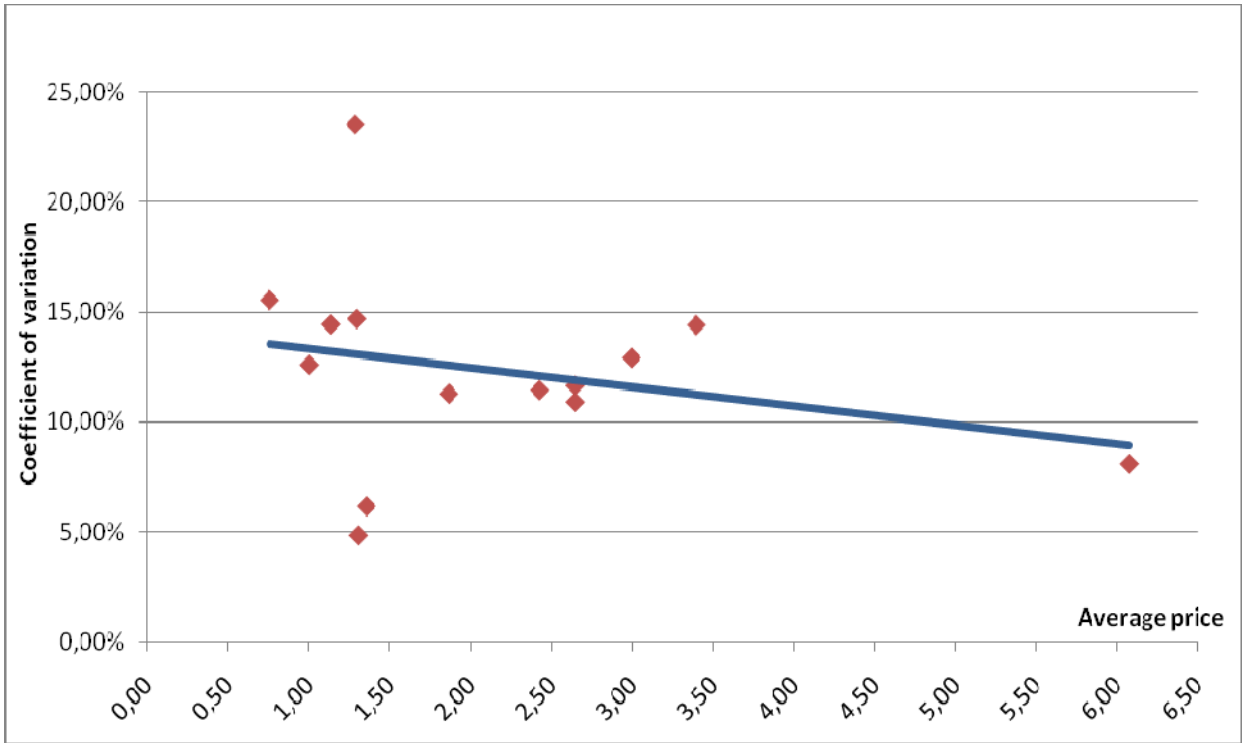

Fig. 3 Average prices and coefficients of variation for the 14 products.

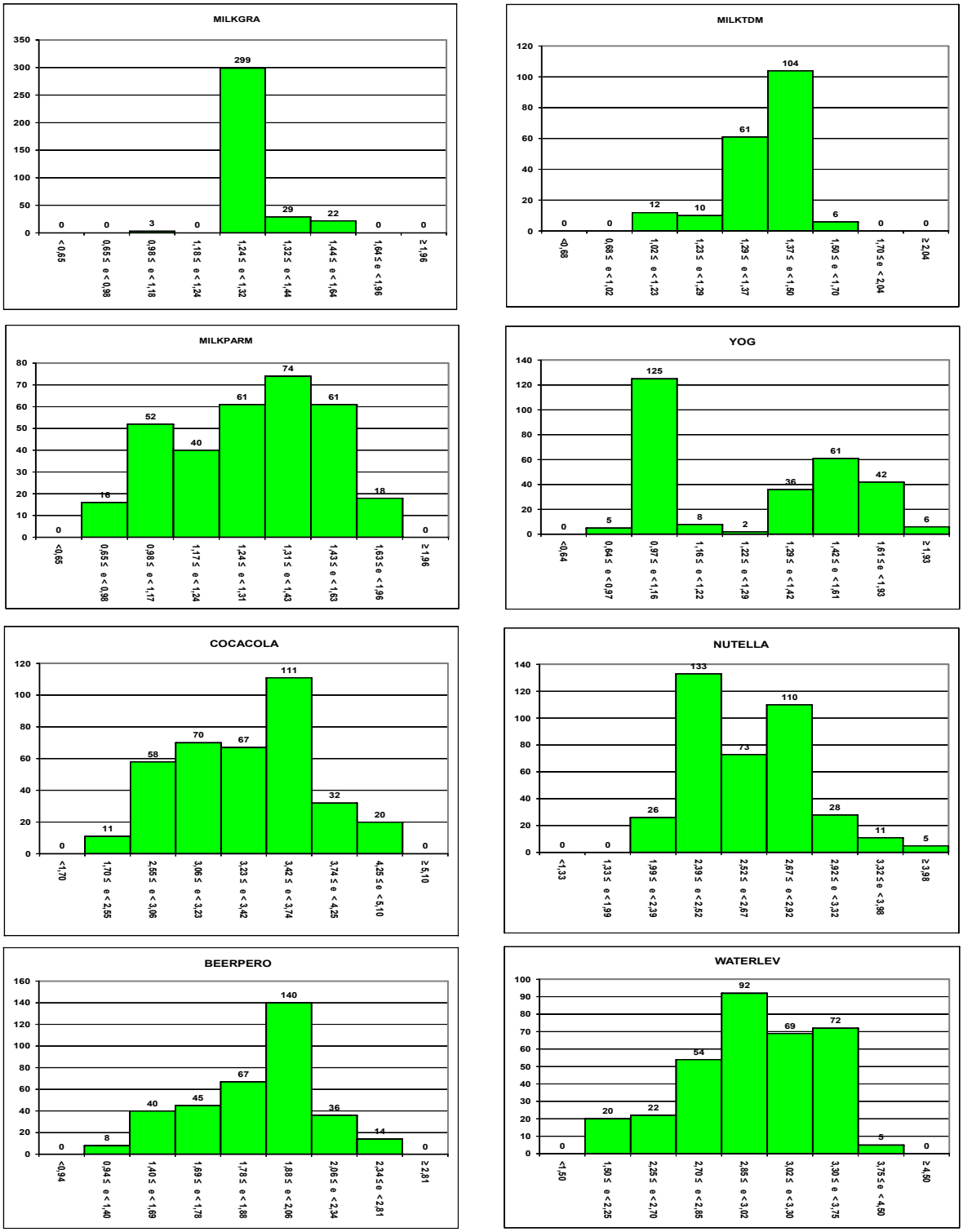

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Figure 4 Price frequency distribution for the 14 food products*

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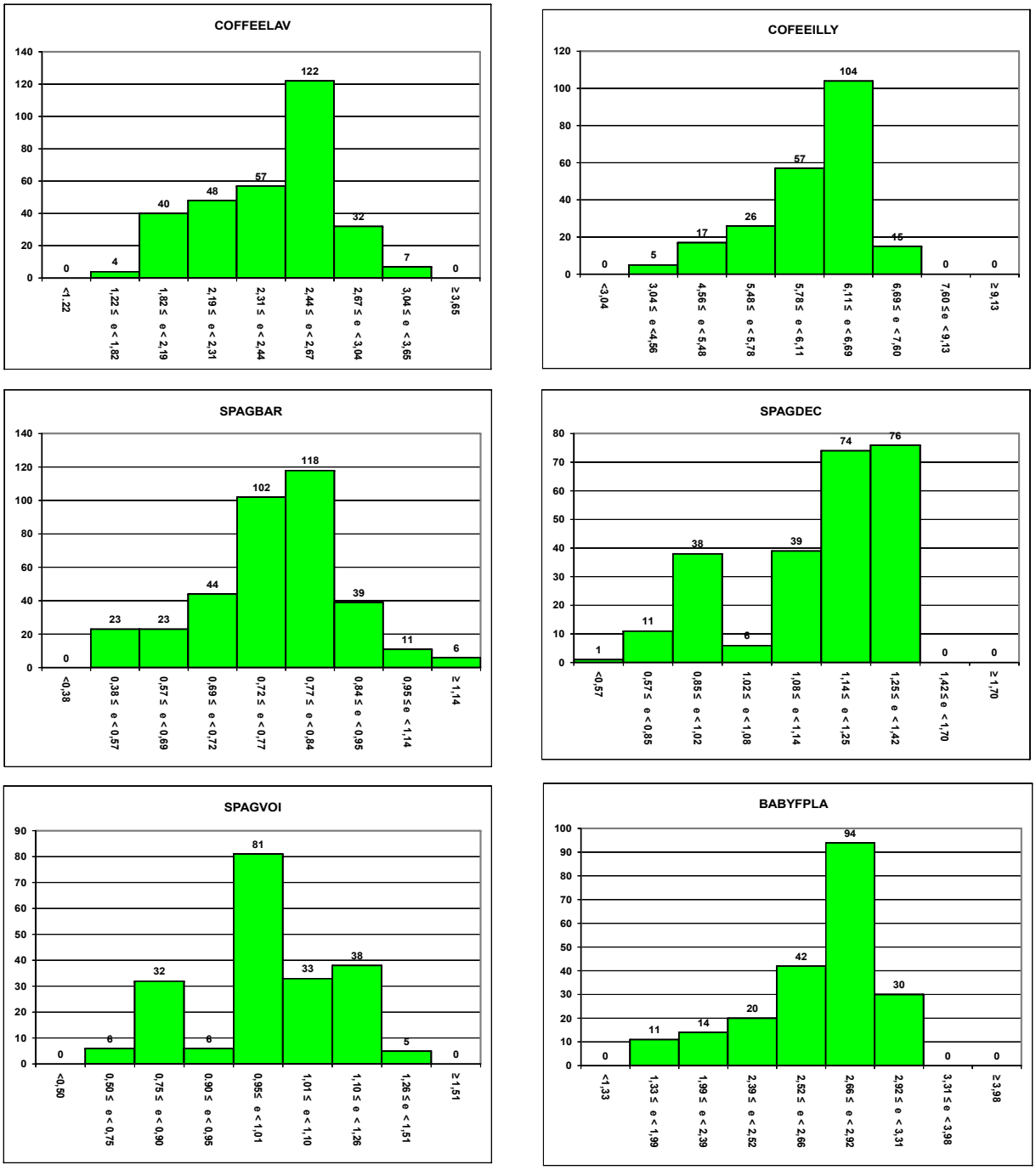

Figure 4 Price frequency distribution for the 14 food products*

*: the extreme values of the intervals used to generate the frequency distributions are defined by using the same per cent differences from the average price for all products.

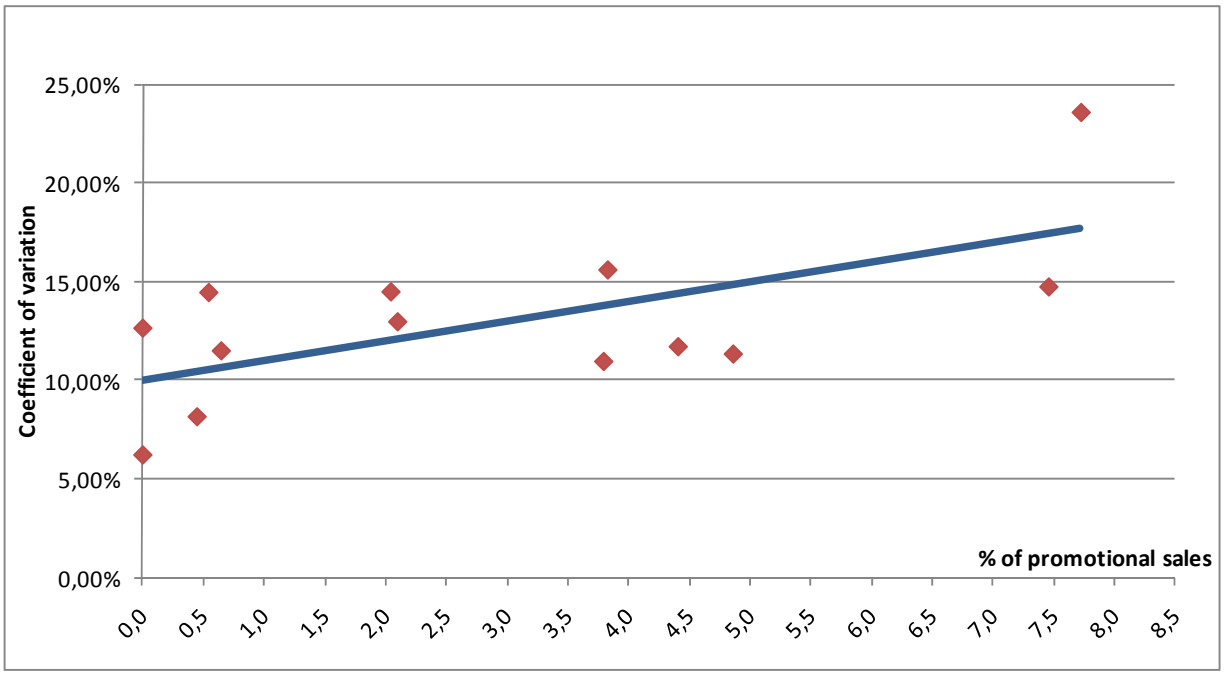

Fig. 5 Percentage of stores selling the product as a promotional sale and price coefficient of variation for 13 food products (excluding MILKGRA*)

*: The percentage of stores offering MILKGRA at the promotional sale price is 83% and the price coefficient of variation is 4.8% .

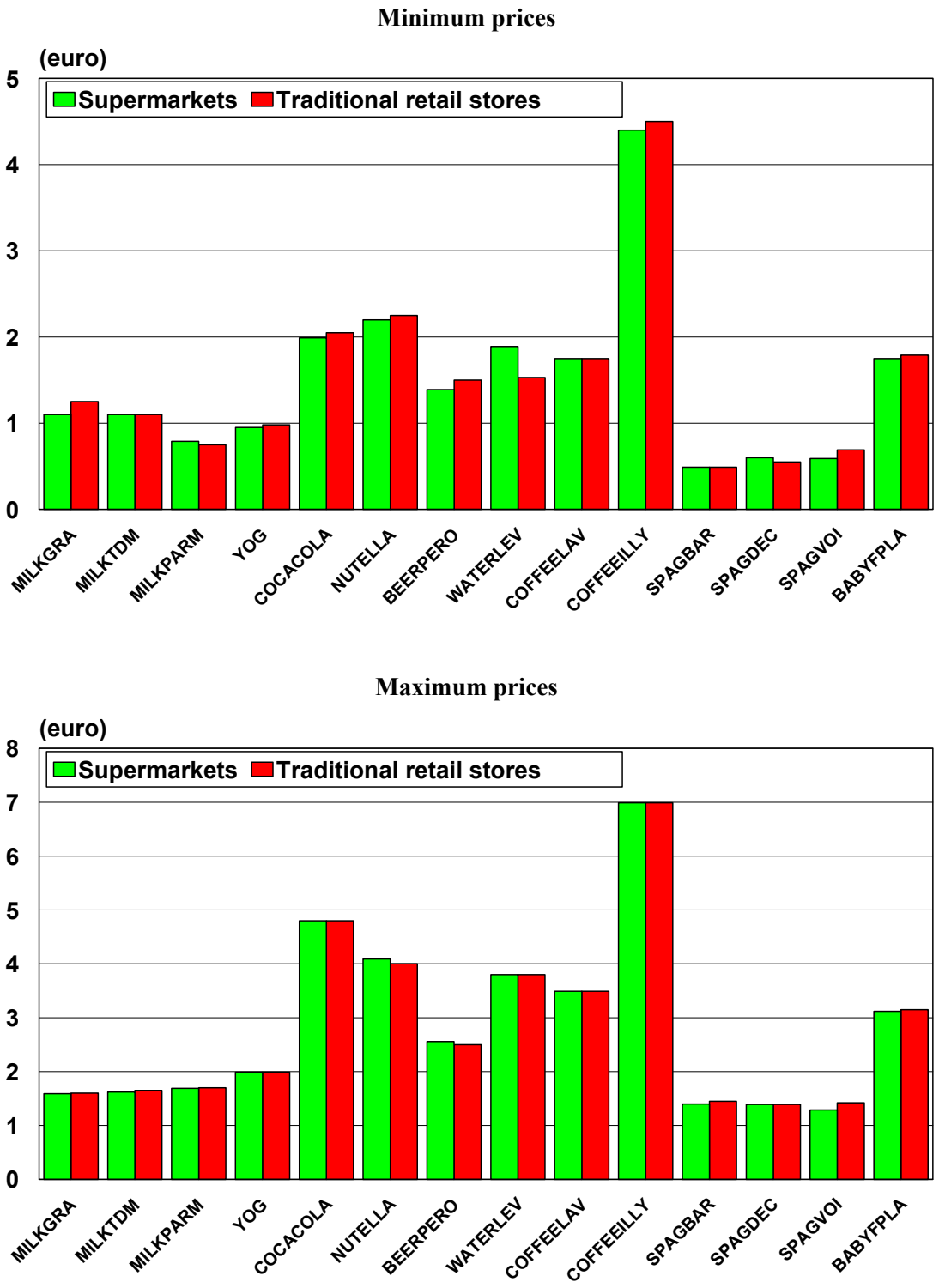

Fig. 6 Price dispersion in supermarkets vs. traditional retail stores: minimum and maximum prices.

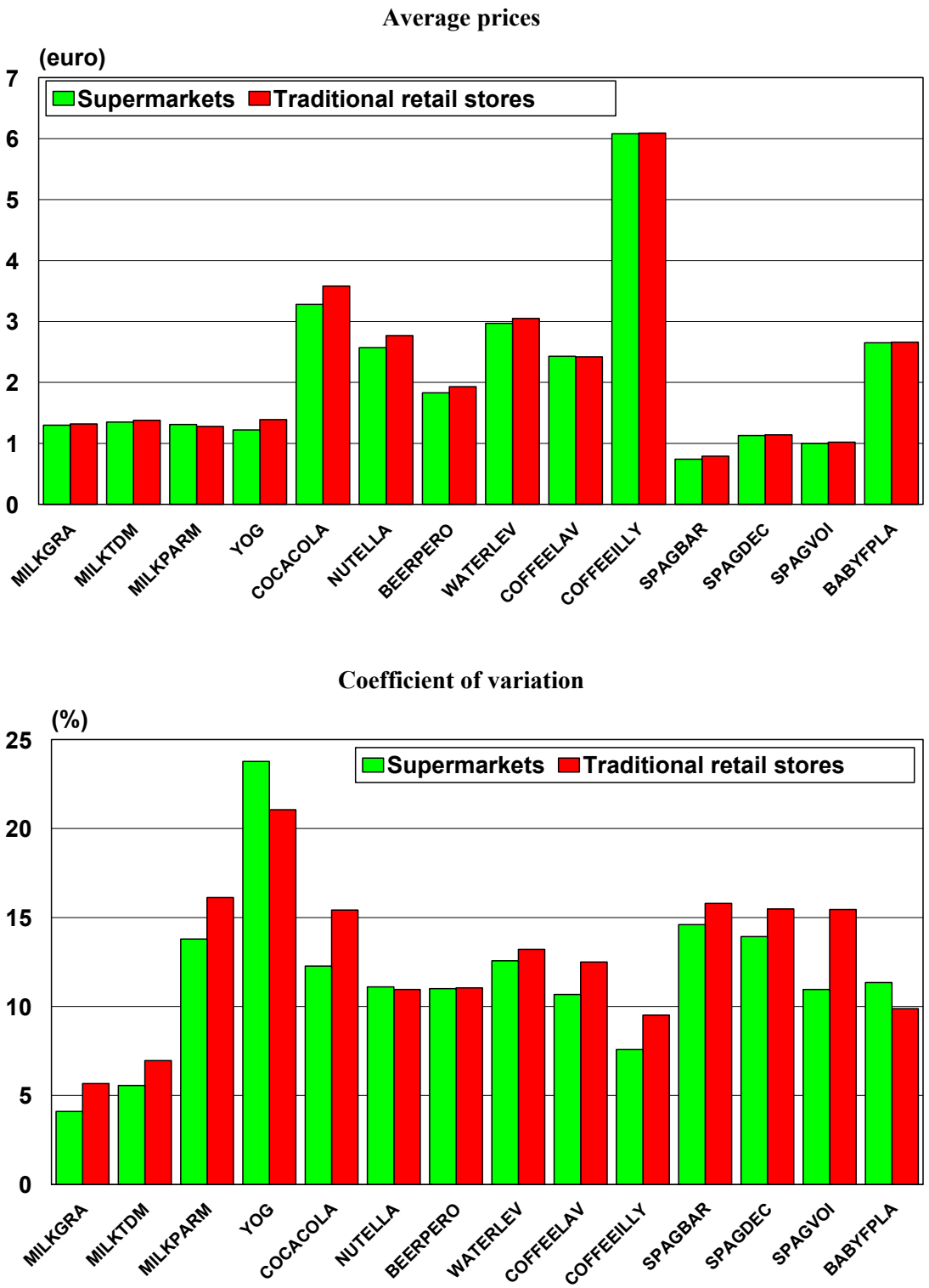

Fig. 7 Price dispersion in supermarkets vs. traditional retail stores: average prices and coefficients of variation.

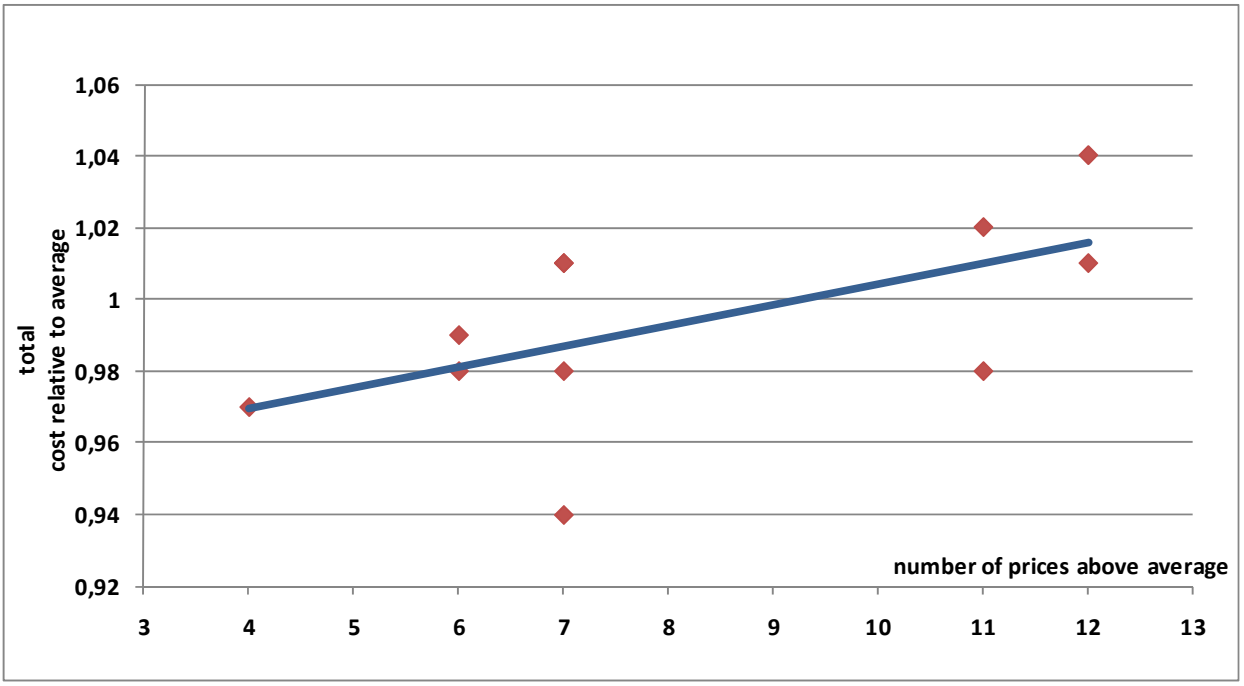

Fig. 8 Number of average prices above the average calculated across all supermarkets in the sample and ratio between the average cost of the 14 products and that calculated across all supermarkets in the sample, by supermarket chain.

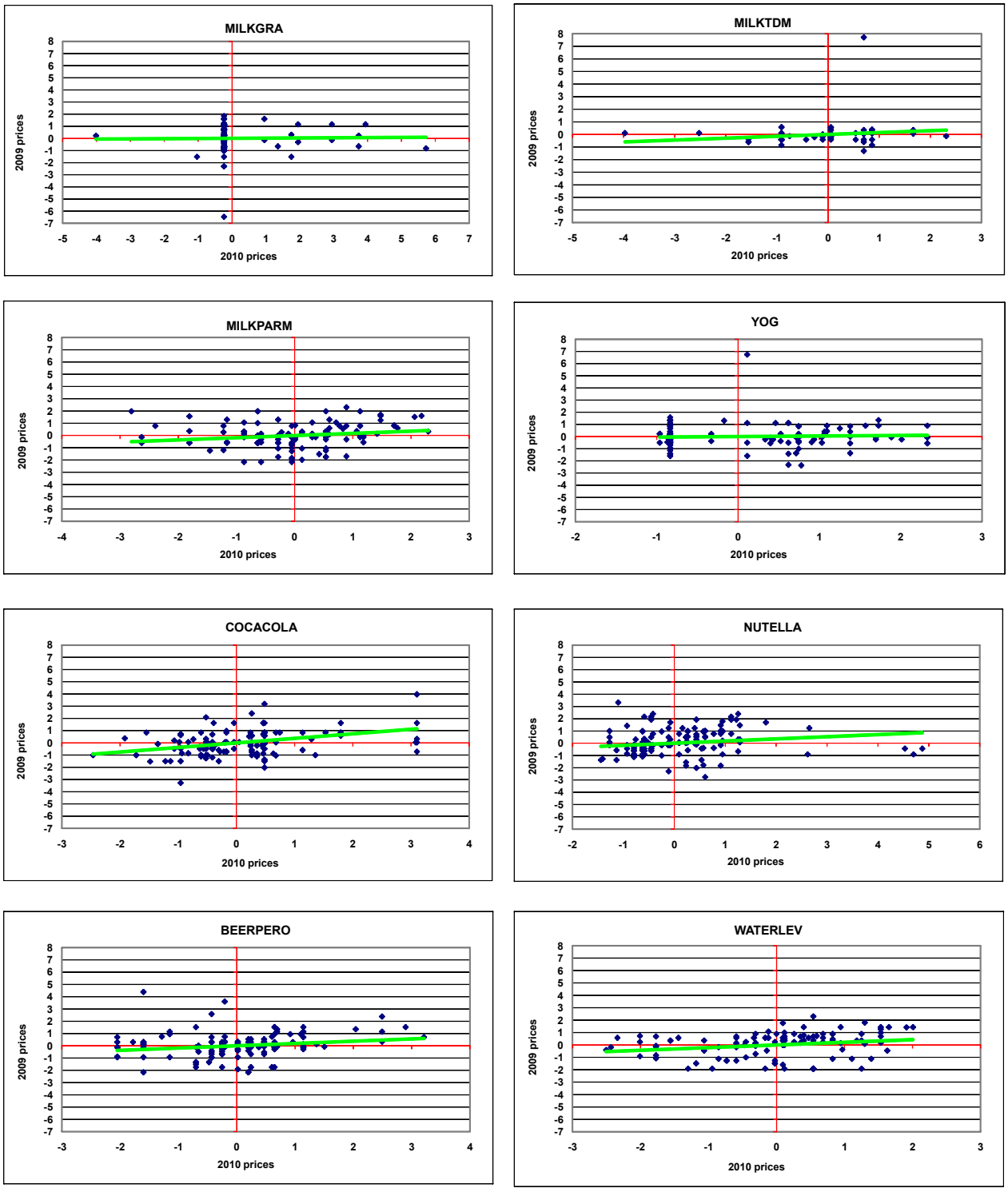

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Figure 9 Same store normalized prices in 2009 and 2010 for the 14 food products

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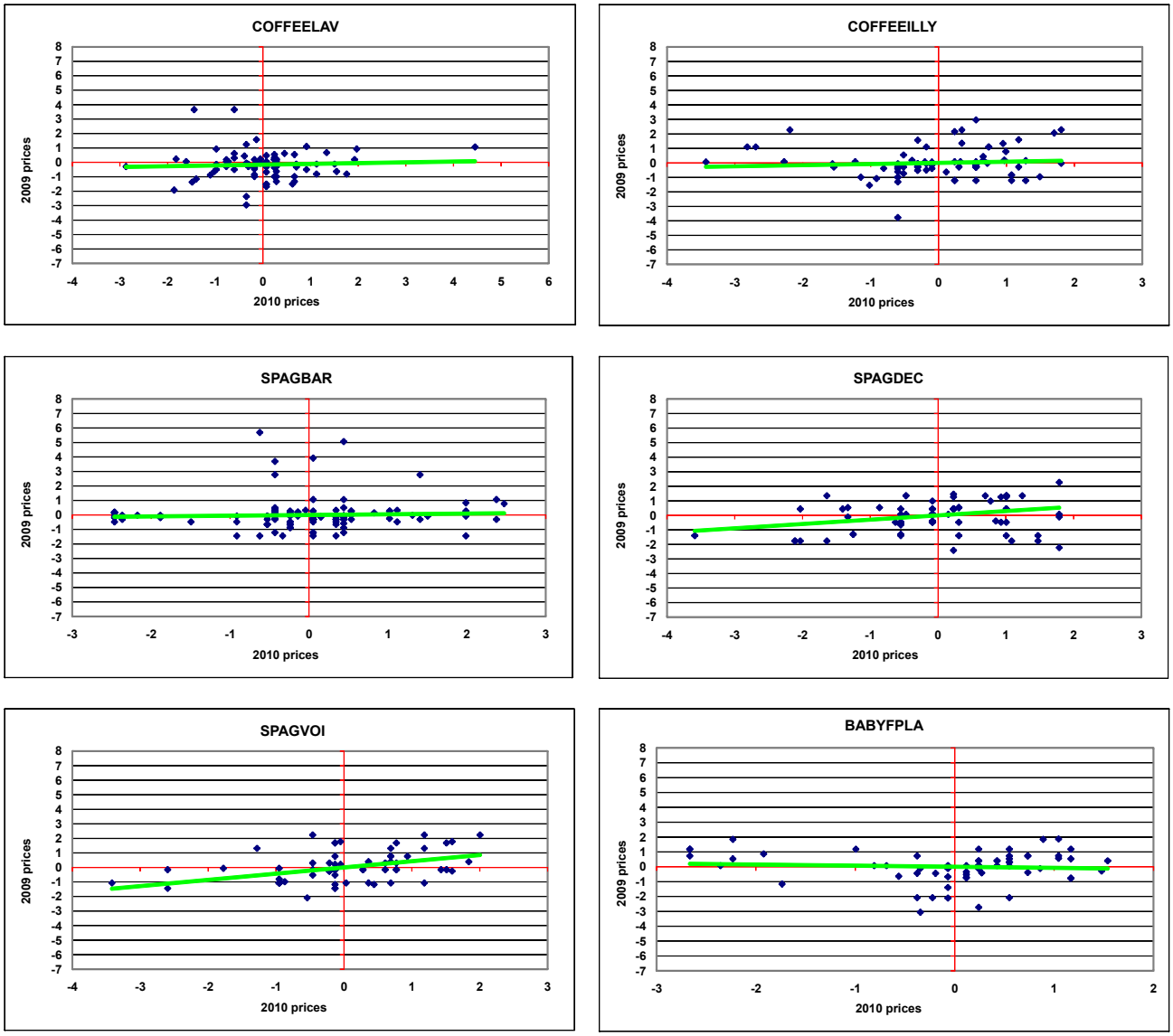

Figure 9 Same store normalized prices in 2009 and 2010 for the 14 food products

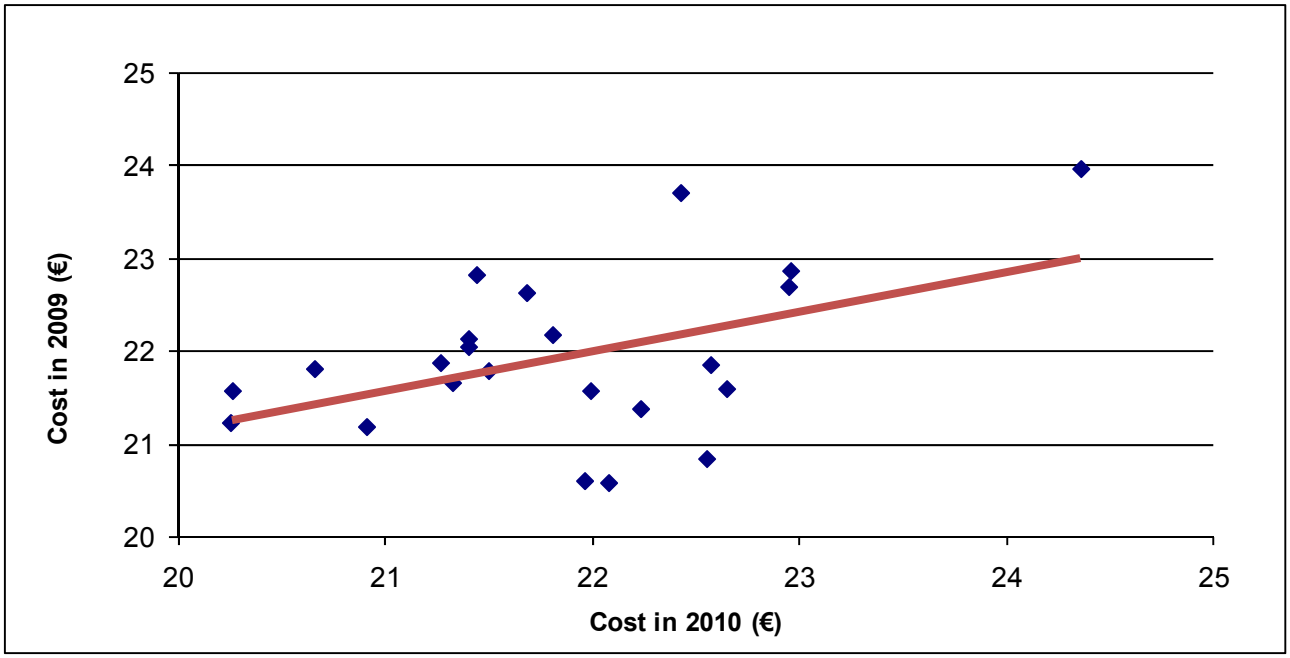

Figure 10 Same store cost of 10-product basket in 2009 and 2010 (23 stores)
(all products but MILKTDM, BABYFPLA, SPAGVOI and COFFEELAV)

Table 1 Food products considered in the survey

	Label	Description
1	MILKGRA	*Granarolo-Centrali del latte di Calabria* , Milk, whole, pastourized, "*Alta qualità* ", plastic (PET) bottle, 1 lt
2	MILKTDM	*Torre di Mezzo* , Milk, whole, pastourized, glass bottle, 0.75 lt
3	MILKPARM	*Parmalat* , Milk, whole, UHT, "*Bontà e gusto* ", plastic (PET) bottle, 1 lt
4	YOG	*Danone* , Yogurt, skimmed, with fruit, "*Vita snella* ", package of two, 125 gr each
5	COCACOLA	*Coca cola* , six can pack, 330 cc each
6	NUTELLA	*Ferrero* , "*Nutella* " spread, glass container, 400 gr
7	BEERPERO	*Peroni* , beer, "*Birra Peroni* ", three bottle pack, 330 cc each
8	WATERLEV	*Levissima* , mineral water, 6 plastic bottle pack, 1.5 lt each
9	COFFEELAV	*Lavazza* , coffee, "*Espresso - Crema e gusto* ", 250 gr
10	COFFEEILLY	*Illy* , coffee, "*Espresso* ", metal container, 250 gr
11	SPAGBAR	*Barilla* , spaghetti, "*n. 5* ", 500 gr
12	SPAGDEC	*De Cecco* , spaghetti, "*n. 12* ", 500 gr
13	SPAGVOI	*Voiello* , spaghetti, "*n. 104* ", 500 gr
14	BABYFPLA	*Plasmon* , baby food, "*Omogeneizzato Le selezioni* ", "*Nasello con patate* ", package of two, 80 gr each

Table 2 Price dispersion (prices in €)

MILKGRA	MILKTDM	MILKPARM	YOG	COCACOLA	NUTELLA	BEERPERO	WATERLEV	COFEELAV	COFFEEILLY	SPAGBAR	SPAGDEC	SPAGVOI	BABYFPLA
Number of prices surveyed for each product													
353	193	322	285	369	386	350	334	310	224	366	245	201	211
Minimum price													
1,10	1,10	0,75	0,95	1,99	2,20	1,39	1,53	1,75	4,40	0,49	0,55	0,59	1,75
Maximum price													
1,60	1,65	1,70	1,99	4,80	4,09	2,56	3,80	3,49	6,99	1,45	1,39	1,42	3,15
Pmax / Pmin													
1,45	1,50	2,27	2,09	2,41	1,86	1,84	2,48	1,99	1,59	2,96	2,53	2,41	1,80
Minimum "on sale" price													
1,29	NA	0,75	0,95	2,93	2,21	1,39	1,92	1,89	5,45	0,49	0,69	NA	1,75
Average price (μ)													
1,31	1,36	1,30	1,29	3,40	2,65	1,87	3,00	2,43	6,08	0,76	1,14	1,00	2,65
Standard deviation (б)													
0,06	0,08	0,19	0,30	0,49	0,31	0,21	0,39	0,28	0,49	0,12	0,16	0,13	0,29
Coefficient of variation (%) (б/μ x 100)													
4,8%	6,2%	14,7%	23,5%	14,4%	11,6%	11,3%	12,9%	11,4%	8,1%	15,5%	14,4%	12,6%	10,9%

Table 3 Cost dispersion of selected product baskets (costs in €)

all 14 products	13 products: all products but MILKTDM	12 products: all products but MILKTDM and BABYFPLA	11 products: all products but MILKTDM, BABYFPLA and SPAGVOI	10 products: all products but MILKTDM, BABYFPLA, SPAGVOI and COFFEELAV
Number of retail stores selling the specific basket				
15	**29**	**40**	**60**	**82**
Minimum cost				
27,64	**26,23**	**23,73**	**22,47**	**20,19**
Maximum cost				
31,89	**30,50**	**27,75**	**27,02**	**24,43**
Cmax / Cmin				
1,15	**1,16**	**1,17**	**1,20**	**1,21**
Average cost (μ)				
29,51	**28,01**	**25,67**	**24,63**	**22,09**
Standard deviation (б)				
1,08	**1,02**	**1,06**	**1,10**	**1,06**
Coefficient of variation (%) (б/μ x 100)				
3,6%	**3,6%**	**4,1%**	**4,5%**	**4,8%**

Table 4 Price dispersion in supermarkets and in traditional retail stores (prices in €)

MILKGRA	MILKTDM	MILKPARM	YOG	COCACOLA	NUTELLA	BEERPERO	WATERLEV	COFEELAV	COFFEEILLY	SPAGBAR	SPAGDEC	SPAGVOI	BABYFPLA
Supermarkets													
Number of prices surveyed for each product													
217	124	205	179	222	224	205	199	179	168	218	167	139	146
Minimum price													
1,10	1,10	0,79	0,95	1,99	2,20	1,39	1,89	1,75	4,40	0,49	0,60	0,59	1,75
Maximum price													
1,59	1,62	1,69	1,99	4,80	4,09	2,56	3,80	3,49	6,99	1,40	1,39	1,29	3,12
Pmax / Pmin													
1,45	1,47	2,14	2,09	2,41	1,86	1,84	2,01	1,99	1,59	2,86	2,32	2,19	1,78
Average price (μ)													
1,30	1,35	1,31	1,22	3,28	2,57	1,83	2,97	2,43	6,08	0,74	1,13	1,00	2,65
Standard deviation (б)													
0,05	0,08	0,18	0,29	0,40	0,29	0,20	0,37	0,26	0,46	0,11	0,16	0,11	0,30
Coefficient of variation (%) (б/μ x 100)													
4,1%	5,6%	13,8%	23,8%	12,3%	11,1%	11,0%	12,6%	10,67%	7,6%	14,6%	13,9%	11,0%	11,3%
Traditional retail stores													
Number of prices surveyed for each product													
136	69	117	106	147	162	145	135	131	56	148	78	62	65
Minimum price													
1,25	1,10	0,75	0,98	2,05	2,25	1,50	1,53	1,75	4,50	0,49	0,55	0,69	1,79
Maximum price													
1,60	1,65	1,70	1,99	4,80	4,00	2,50	3,80	3,49	6,99	1,45	1,39	1,42	3,15
Pmax / Pmin													
1,28	1,50	2,27	2,03	2,34	1,78	1,67	2,48	1,99	1,55	2,96	2,53	2,06	1,76
Average price (μ)													
1,32	1,38	1,28	1,39	3,58	2,77	1,92	3,05	2,42	6,08	0,79	1,14	1,02	2,66
Standard deviation (б)													
0,07	0,10	0,21	0,29	0,55	0,30	0,21	0,40	0,30	0,58	0,13	0,18	0,16	0,26
Coefficient of variation (%) (б/μ x 100)													
5,7%	7,0%	16,1%	21,1%	15,4%	10,9%	11,0%	13,2%	12,5%	9,5%	15,8%	15,5%	15,4%	9,9%

Table 5 Testing average price differences between supermarkets and traditional retail stores.

Observations: 353	price MILKGRA	Coefficient	Stand. Error	t	Confidence interval (95%)	
R^2 = 0.0190	δ_0	**1,3030**	0,00425	306,85	1,29469	1,31139
	δ_1(traditional retail stores)	**0,0178**	0,00684	2,61	0,00439	0,03130
Observations: 193	**price MILKTDM**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0186	δ_0	**1,3536**	0,00747	181,14	1,33889	1,36837
	δ_1(traditional retail stores)	0,0238	0,01250	1,90	-0,00089	0,04841
Observations: 322	**price MILKPARM**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0059	δ_0	**1,3147**	0,01334	98,56	1,28844	1,34093
	δ_1(traditional retail stores)	-0,0306	0,02213	-1,38	-0,07412	0,01296
Observations: 285	**price YOG**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0733	δ_0	**1,2241**	0,02182	56,10	1,18118	1,26708
	δ_1(traditional retail stores)	**0,1693**	0,03578	4,73	0,09884	0,23969
Observations: 369	**price COCACOLA**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0882	δ_0	**3,2817**	0,03140	104,53	3,21993	3,34341
	δ_1(traditional retail stores)	**0,2963**	0,04974	5,96	0,19848	0,39411
Observations: 386	**price NUTELLA**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.1035	δ_0	**2,5694**	0,01957	131,30	2,53090	2,60785
	δ_1(traditional retail stores)	**0,2011**	0,03021	6,66	0,14173	0,26051
Observations: 350	**price BEERPERO**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0455	δ_0	**1,8344**	0,01441	127,26	1,80609	1,86279
	δ_1(traditional retail stores)	**0,0912**	0,02240	4,07	0,04717	0,13526
Observations: 334	**price WATERLEV**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0117	δ_0	**2,9660**	0,02732	108,57	2,91229	3,01977
	δ_1(traditional retail stores)	**0,0852**	0,04297	1,98	0,00070	0,16975
Observations: 310	**price COFFEELAV**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0002	δ_0	**2,4332**	0,02083	116,80	2,39219	2,47418
	δ_1(traditional retail stores)	-0,0082	0,03205	-0,26	-0,07128	0,05483
Observations: 224	**price COFFEEILLY**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0000	δ_0	**6,0829**	0,03804	159,92	6,00790	6,15782
	δ_1(traditional retail stores)	0,0021	0,07608	0,03	-0,14778	0,15207
Observations: 366	**price SPAGBAR**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0522	δ_0	**0,7394**	0,00781	94,66	0,72400	0,75472
	δ_1(traditional retail stores)	**0,0550**	0,01228	4,48	0,03081	0,07912
Observations: 245	**price SPAGDEC**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0005	δ_0	**1,1338**	0,01270	89,29	1,10882	1,15885
	δ_1(traditional retail stores)	0,0077	0,02250	0,34	-0,03662	0,05204
Observations: 201	**price SPAGVOI**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0081	δ_0	**0,9968**	0,01070	93,16	0,97566	1,01786
	δ_1(traditional retail stores)	0,0245	0,01927	1,27	-0,01346	0,06252
Observations: 211	**price BABYFPLA**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0002	δ_0	**2,6477**	0,02394	110,59	2,60047	2,69487
	δ_1(traditional retail stores)	0,0085	0,04313	0,20	-0,07655	0,09352

Table 6 Cost dispersion of selected product baskets in supermarkets and traditional retail stores (costs in €)

all 14 products	13 products: all products but MILKTDM	12 products: all products but MILKTDM and BABYFPLA	11 products: all products but MILKTDM, BABYFPLA and SPAGVOI	10 products: all products but MILKTDM, BABYFPLA, SPAGVOI and COFFEELAV
Supermarkets				
Number of retail stores selling the specific basket				
15	27	34	51	72
Minimum cost				
27,64	26,23	23,73	22,47	20,19
Maximum cost				
31,89	30,50	27,75	27,02	24,43
Cmax / Cmin				
1,15	1,16	1,17	1,20	1,21
Average cost (μ)				
29,51	28,02	25,60	24,54	22,03
Standard deviation (б)				
1,08	1,05	1,09	1,13	1,09
Coefficient of variation (%) (б/μ x 100)				
3,6%	3,7%	4,3%	4,6%	4,9%
Traditional retail stores				
Number of retail stores selling the specific basket				
0	2	6	9	10
Minimum cost				
…	27,48	24,93	24,03	21,68
Maximum cost				
…	28,25	27,00	26,28	23,67
Cmax / Cmin				
…	1,03	1,08	1,09	1,09
Average cost (μ)				
…	27,87	26,03	25,13	22,59
Standard deviation (б)				
…	0,54	0,85	0,79	0,71
Coefficient of variation (%) (б/μ x 100)				
…	1,9%	3,3%	3,1%	3,1%

Table 7 Price dispersion in supermarkets by chain (only those with at least 6 stores in the sample are considered) (prices in €)

MILKGRA	MILKTDM	MILKPARM	YOG	COCACOLA	NUTELLA	BEERPERO	WATERLEV	COFEELAV	COFFEEILLY	SPAGBAR	SPAGDEC	SPAGVOI	BABYFPLA
DESPAR (31 stores)													
Average price (μ)													
1,30	1,30	1,35	1,17	3,31	2,57	1,62	2,84	2,31	5,86	0,75	1,12	0,95	2,64
Standard deviation (б)													
0,05	0,05	0,11	0,29	0,44	0,39	0,20	0,35	0,23	0,41	0,08	0,10	0,07	0,28
Coefficient of variation (%) (б/μ x 100)													
4,2%	3,8%	7,9%	25,1%	13,3%	15,0%	12,6%	12,3%	10,0%	6,9%	10,2%	9,2%	7,4%	10,4%
CONAD (28 stores)													
Average price (μ)													
1,30	1,32	1,18	1,11	3,15	2,47	1,88	3,09	2,61	6,18	0,80	1,16	0,99	2,80
Standard deviation (б)													
0,04	0,05	0,13	0,20	0,14	0,09	0,11	0,33	0,47	0,31	0,18	0,18	0,05	0,09
Coefficient of variation (%) (б/μ x 100)													
3,1%	3,9%	11,0%	18,5%	4,6%	3,7%	6,0%	10,5%	18,1%	5,0%	22,3%	15,4%	4,9%	3,4%
GS (17 stores)													
Average price (μ)													
1,30	1,38	1,30	1,03	3,27	2,43	2,00	2,93	2,39	6,43	0,75	1,18	1,03	2,17
Standard deviation (б)													
0,05	0,02	0,17	0,13	0,33	0,09	0,09	0,33	0,21	0,19	0,05	0,13	0,08	0,49
Coefficient of variation (%) (б/μ x 100)													
4,0%	1,3%	12,7%	12,5%	10,0%	3,6%	4,4%	11,2%	8,6%	2,9%	6,0%	10,9%	7,3%	22,5%
SIDIS (17 stores)													
Average price (μ)													
1,32	1,38	1,30	1,15	3,18	2,51	1,85	2,82	2,61	5,83	0,60	1,18	1,05	2,60
Standard deviation (б)													
0,08	0,02	0,15	0,31	0,39	0,26	0,23	0,37	0,38	0,35	0,25	0,12	0,13	0,32
Coefficient of variation (%) (б/μ x 100)													
6,1%	1,6%	11,7%	26,7%	12,4%	10,2%	12,3%	13,2%	14,6%	6,0%	40,9%	10,4%	12,7%	12,3%
CRAI (15 stores)													
Average price (μ)													
1,31	1,33	1,16	1,31	3,33	2,65	1,90	3,19	2,50	6,11	0,78	1,19	1,10	2,65
Standard deviation (б)													
0,04	0,11	0,20	0,33	0,28	0,19	0,16	0,26	0,25	0,52	0,11	0,08	0,11	0,19
Coefficient of variation (%) (б/μ x 100)													
3,0%	8,2%	17,5%	25,0%	8,4%	7,0%	8,2%	8,1%	10,0%	8,6%	13,7%	6,9%	10,4%	7,2%
SISA (12 stores)													
Average price (μ)													
1,31	na	1,46	1,39	3,30	2,54	1,90	3,23	2,51	6,08	0,76	1,18	1,01	2,75
Standard deviation (б)													
0,05	na	0,09	0,38	0,15	0,19	0,16	0,22	0,13	0,70	0,08	0,17	0,06	0,19
Coefficient of variation (%) (б/μ x 100)													
3,9%	na	6,1%	27,4%	4,6%	7,6%	8,3%	6,7%	5,0%	11,6%	10,1%	14,4%	6,1%	7,0%

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A&O (9 stores)													
Average price (μ)													
1,29	1,40	1,39	1,29	3,38	2,70	1,88	3,00	2,42	6,14	0,76	1,17	1,04	2,44
Standard deviation (б)													
0,00	0,01	0,28	0,27	0,12	0,17	0,07	0,10	0,15	0,47	0,03	0,03	0,07	0,34
Coefficient of variation (%) (б/μ x 100)													
0,0%	0,4%	20,2%	21,0%	3,5%	6,5%	3,7%	3,5%	6,2%	7,7%	4,4%	2,4%	6,8%	13,9%
SIGMA (9 stores)													
Average price (μ)													
1,29	1,40	1,39	1,38	3,63	2,78	1,89	3,16	2,47	6,19	0,79	1,02	1,01	2,72
Standard deviation (б)													
0,00	…	0,12	0,19	0,48	0,55	0,29	0,32	0,15	0,80	0,14	0,30	0,18	0,21
Coefficient of variation (%) (б/μ x 100)													
0,0%	…	8,7%	13,5%	13,3%	19,7%	15,6%	10,1%	5,9%	13,0%	17,9%	29,7%	17,5%	7,8%
DOK (8 stores)													
Average price (μ)													
1,29	1,39	1,40	1,20	3,50	2,62	1,92	3,07	2,43	6,05	0,73	1,07	0,95	2,63
Standard deviation (б)													
0,00	0,01	0,24	0,22	0,48	0,10	0,23	0,11	0,19	0,67	0,10	0,22	0,21	0,12
Coefficient of variation (%) (б/μ x 100)													
0,0%	1,1%	17,0%	18,3%	13,7%	3,6%	12,2%	3,4%	7,9%	11,1%	14,2%	20,7%	22,3%	4,7%
PAM (7 stores)													
Average price (μ)													
1,29	1,35	1,20	1,16	3,55	2,65	1,89	2,69	2,52	6,45	0,77	na	0,98	2,71
Standard deviation (б)													
0,00	0,01	0,28	0,29	0,04	0,05	0,00	0,33	0,05	0,06	0,02	na	0,15	0,38
Coefficient of variation (%) (б/μ x 100)													
0,0%	0,4%	23,2%	25,2%	1,2%	2,0%	0,0%	12,3%	2,0%	1,0%	2,9%	na	15,0%	14,1%
STANDA (6 stores)													
Average price (μ)													
1,31	1,49	1,39	1,16	2,86	2,59	1,82	2,66	2,43	5,42	0,75	1,02	1,03	2,32
Standard deviation (б)													
0,04	…	0,19	0,23	0,47	0,15	0,23	0,27	0,04	0,61	0,22	0,11	0,19	0,46
Coefficient of variation (%) (б/μ x 100)													
3,4%	…	14,0%	19,9%	16,5%	5,7%	12,5%	10,0%	1,5%	11,2%	29,6%	10,4%	18,5%	19,7%
Total (159 stores above)													
Average price (μ)													
1,30	1,34	1,31	1,19	3,29	2,56	1,84	2,98	2,46	6,07	0,75	1,15	1,00	2,64
Standard deviation (б)													
0,05	0,06	0,18	0,28	0,35	0,26	0,21	0,34	0,29	0,49	0,14	0,15	0,10	0,29
Coefficient of variation (%) (б/μ x 100)													
3,6%	4,6%	13,8%	23,7%	10,7%	10,3%	11,5%	11,4%	11,9%	8,0%	19,1%	13,1%	10,3%	11,1%
Total (249 stores, all supermarkets in the sample)													
Average price (μ)													
1,30	1,35	1,31	1,22	3,28	2,57	1,83	2,97	2,43	6,08	0,74	1,13	1,00	2,65
Standard deviation (б)													
0,05	0,08	0,18	0,29	0,40	0,29	0,20	0,37	0,26	0,46	0,11	0,16	0,11	0,30
Coefficient of variation (%) (б/μ x 100)													
4,1%	5,6%	13,8%	23,8%	12,3%	11,1%	11,0%	12,6%	10,67%	7,6%	14,6%	13,9%	11,0%	11,3%

Table 8 Price dispersion in the urban area (Cosenza-Rende) and in the rest of the sample (smaller towns and rural areas) (prices in €)

MILKGRA	MILKTDM	MILKPARM	YOG	COCACOLA	NUTELLA	BEERPERO	WATERLEV	COFEELAV	COFFEEILLY	SPAGBAR	SPAGDEC	SPAGVOI	BABYFPLA
Urban area (Cosenza-Rende)													
Number of prices surveyed for each product													
103	62	86	72	97	97	87	91	76	61	85	49	41	47
Minimum price													
1,10	1,11	0,75	0,95	2,50	2,20	1,48	2,10	1,95	4,49	0,49	0,70	0,59	1,75
Maximum price													
1,49	1,45	1,69	1,99	4,80	4,05	2,49	3,60	3,49	6,90	1,00	1,36	1,35	3,15
Pmax / Pmin													
1,35	1,31	2,25	2,09	1,92	1,84	1,68	1,71	1,79	1,54	2,04	1,94	2,29	1,80
Average price (μ)													
1,30	1,35	1,32	1,25	3,50	2,66	1,92	3,02	2,46	6,17	0,77	1,18	1,02	2,69
Standard deviation (б)													
0,039	0,058	0,199	0,305	0,487	0,315	0,213	0,328	0,235	0,392	0,075	0,134	0,135	0,341
Coefficient of variation (%) (б/μ x 100)													
2,97%	4,26%	15,14%	24,36%	13,92%	11,83%	11,10%	10,85%	9,57%	6,35%	9,74%	11,35%	13,25%	12,67%
Rest of the sample													
Number of prices surveyed for each product													
250	131	236	213	272	289	263	243	234	163	281	196	160	164
Minimum price													
1,10	1,10	0,79	0,95	1,99	2,20	1,39	1,53	1,75	4,40	0,49	0,55	0,69	1,75
Maximum price													
1,60	1,65	1,70	1,99	4,80	4,09	2,56	3,80	3,49	6,99	1,45	1,39	1,42	3,12
Pmax / Pmin													
1,45	1,50	2,15	2,09	2,41	1,86	1,84	2,48	1,99	1,59	2,96	2,53	2,06	1,78
Average price (μ)													
1,32	1,37	1,30	1,30	3,36	2,65	1,86	2,99	2,42	6,05	0,76	1,13	1,00	2,64
Standard deviation (б)													
0,070	0,094	0,189	0,302	0,486	0,307	0,208	0,407	0,291	0,521	0,128	0,169	0,124	0,272
Coefficient of variation (%) (б/μ x 100)													
5,32%	6,85%	14,51%	23,23%	14,45%	11,59%	11,20%	13,61%	11,99%	8,62%	16,94%	15,02%	12,42%	10,30%

Table 9 Testing average price differences between urban area (Cosenza-Rende) and rest of the sample (smaller towns and rural areas)

Observations: 353	price MILKGRA	Coefficient	Stand. Error	t	Confidence interval (95%)	
R^2 = 0.0198	δ_0	**1,3156**	0,00396	332,22	1,3078	1,3234
	δ_1 (urban area)	**-0,0195**	0,00732	-2,66	-0,0340	-0,0050
Observations: 193	**price MILKTDM**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0041	δ_0	**1,3658**	0,00732	186,58	1,3513	1,3803
	δ_1 (urban area)	-0,0114	0,01292	-0,88	-0,0369	0,0141
Observations: 322	**price MILKPARM**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0013	δ_0	**1,2994**	0,01246	104,29	1,2748	1,3240
	δ_1 (urban area)	0,0158	0,02411	0,66	-0,0318	0,0634
Observations: 285	**price YOG**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0047	δ_0	**1,2991**	0,02073	62,67	1,2582	1,3400
	δ_1 (urban area)	**-0,0476**	0,04124	-1,15	-0,1290	0,0338
Observations: 369	**price COCACOLA**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0142	δ_0	**3,3650**	0,02949	114,11	3,3068	3,4232
	δ_1 (urban area)	**0,1322**	0,05752	2,30	0,0186	0,2458
Observations: 386	**price NUTELLA**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0003	δ_0	**2,6509**	0,01819	145,73	2,6150	2,6868
	δ_1 (urban area)	**0,0113**	0,03629	0,31	-0,0604	0,0830
Observations: 350	**price BEERPERO**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0190	δ_0	**1,8555**	0,01290	143,84	1,8300	1,8810
	δ_1 (urban area)	**0,0672**	0,02588	2,60	0,0161	0,1183
Observations: 334	**price WATERLEV**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0013	δ_0	**2,9921**	0,02485	120,41	2,9430	3,0412
	δ_1 (urban area)	**0,0309**	0,04761	0,65	-0,0631	0,1249
Observations: 310	**price COFFEELAV**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0025	δ_0	**2,4228**	0,01812	133,71	2,3870	2,4586
	δ_1 (urban area)	0,0325	0,03671	0,89	-0,0400	0,1050
Observations: 224	**price COFFEEILLY**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0129	δ_0	**6,0493**	0,03837	157,66	5,9735	6,1251
	δ_1 (urban area)	0,1253	0,07352	1,70	-0,0199	0,2705
Observations: 366	**price SPAGBAR**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0025	δ_0	**0,7584**	0,00706	107,42	0,7445	0,7723
	δ_1 (urban area)	**0,0139**	0,01464	0,95	-0,0150	0,0428
Observations: 245	**price SPAGDEC**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0169	δ_0	**1,1257**	0,01163	96,79	1,1027	1,1487
	δ_1 (urban area)	0,0531	0,02599	2,04	0,0018	0,1044
Observations: 201	**price SPAGVOI**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0020	δ_0	**1,0015**	0,01000	100,15	0,9818	1,0213
	δ_1 (urban area)	0,0139	0,02215	0,63	-0,0298	0,0576
Observations: 211	**price BABYFPLA**	**Coefficient**	**Stand. Error**	**t**	**Confidence interval (95%)**	
R^2 = 0.0055	δ_0	**2,6388**	0,02253	117,12	2,5943	2,6833
	δ_1 (urban area)	0,0514	0,04773	1,08	-0,0429	0,1457