GROCERY PRICES IN THE EURO AREA:
FINDINGS FROM INFORMAL ESCB EXPERT GROUP SET-UP TO ANALYSE A DISAGGREGATED PRICE DATASET

This paper was prepared as part of a Eurosystem project group established to analyse a large-scale disaggregated dataset on grocery prices in the euro area. This proprietary dataset was obtained as a follow up to the 2011 Eurosystem Structural Issues Report (SIR) entitled "Structural features of the distributive trades and their impact on prices in the euro area". The main motivation for obtaining these data was to enable the analysis of a variety of issues that was previously not possible owing to data limitations. More specifically (i) analysis of Single Market issues and quantification of border effects (ii) measuring the impact of competition – both at the producer and retail level – on consumer price levels and (iii) consider potential implications for inflation measurement arising from structural changes in retail sector such as the growing importance of discounters and private label brands.

The data were obtained from Nielsen, an international market information and measurement company. The dataset is multi-dimensional with approximately 3.5 million observations each for the price, value and volume variables across a number of dimensions (13 countries; approximately 45 product categories; approximately 70 regions; approximately 10 store types on average per country; 4 brands per product category and 3 stock-keeping units - skus - per brand). The data are generally collected from barcode scanners. These cross country data are unique in a number of respects, in particular in that (a) there are data on average price levels across regions within countries, (b) there is information on both prices and volumes, and (c) there are data on aggregated private label sales and prices. The data have been cross-checked against HICP and PPP data and found to be highly congruent.

The expert group was chaired by Bob Anderton (ECB) and Aidan Meyler (ECB) acted as Secretary. We are also grateful to Stefanos Dimitrakopoulos (Warwick University) who, whilst at the ECB as a trainee, provided invaluable assistance in compiling and working with the database.

Preliminary results from the project group were initially presented at an informal Eurosystem workshop which took place in Frankfurt on 22 November 2013. Apart from the members of the expert group a small number of external participants were invited to the workshop. The following participants acted as discussants: Mario Crucini (Professor of Economics, Vanderbilt University, and Senior Fellow, Globalization and Monetary Policy Institute, Dallas Fed); Daniel S Hosken, US Federal Trade Commission (Deputy Assistant Director); Jarko Pasanen, Eurostat (Team Leader: Price Statistics, Purchasing Power Parities, Housing Statistics) and Thomas Westermann, European Central Bank (Head of Section: Prices and Costs). The refereeing process for the papers from this project was coordinated by the Secretary of the expert group (Aidan Meyler).

As the dataset is proprietary, it cannot be made available to outside researchers. Thus this paper is released in order to make the working papers and accompanying research carried out by the expert group publicly available. Additional papers from the project group will be published as they are finalised. Any queries regarding the project may be addressed to Aidan Meyler (aidan.meyler@ecb.europa.eu).

Analysing price level differences in the euro area

Competition structures and Consumer behavior

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27/10/2014

Abstract

In this paper we attempt to evaluate the impact on observed price differences of branded goods that stem from differences in: a) the producer's competition structure, b) the retail markets competition structure, c) consumer habits, d) local costs and e) other macroeconomic factors. To this effect we utilise an extensive data set on retail prices and quantities for 41 product categories of fast moving consumer goods across 58 regions in 10 euro area countries. Our results indicate that observed price differences reflect effects from diverse sources. To wit, the competition structure of the goods producers, the competition structure of retailers, consumer habits and local costs each contribute a significant and economically meaningful share to observed price differences. On balance, the feasible economic impact, suggests a similar importance of the different 'blocks' of variables, with some added importance of consumer habits. By contrast, macroeconomic factors, like regional GDP per capita and unemployment are not found to be important in explaining price within the euro area.

JEL codes: *D4, E31, F41, C23*
Keywords: *Market structure, consumer behaviour, international relative prices, law of one price.*

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[1] Bank of Greece

Non-technical summary

The law of one price (LOP) posits that "a good must sell for the same price in all locations". For the euro area, which does not have any intra-barriers to trade, it implies that price differences should – in principal – reflect transport costs. However, prices of branded consumer products exhibit large differences within the euro area, beyond what would be justified by transportation costs, indicating significant impediments to the functioning of the common market

In this paper we attempt to evaluate the effects on international and intra-national price differences that stem from differences in: a) the producer's competition structure, b) the retail markets competition structure, c) consumer habits, d) local costs and e) other macroeconomic factors. To this effect we utilise an extensive data set on retail prices and quantities for 41 product categories of fast moving consumer goods across 10 Euro area countries.

Our results indicate that observed price differences reflect effects from diverse sources. To wit, the competition structure of the goods' producers and retailers, consumer habits and local costs each contribute a significant and economically meaningful share to the observed price differences. Consumer habits though appear to have a somewhat higher impact. By contrast, macroeconomic factors, like regional GDP per capita and unemployment differences are not found to be important in explaining price differences within the euro area.

The policy implications are similarly diverse if the goal is to reduce observed price differences in the euro area. Namely, reducing product market regulation and increasing competition is important, but is also only one step in the process. Of equal importance is the structure of the retail market. With regard to the prices consumers face it would seem that there are gains to be had if retailers a) are located in close proximity to each other – say two hypermarkets side by side which b) co-operate in terms of buying from producers.

As to consumer habits, while some differences may be culturally inclined preferences, e.g. not all are inclined to consume pasta like the Italian regions, gain for consumers are to emerge if they become aware of the fact that their 'shopping attitudes' affect prices.

1 Introduction

The law of one price (LOP) posits that "a good must sell for the same price in all locations". For the euro area, which does not have any intra-barriers to trade, it implies that price differences should – in principal – reflect transport costs. In the case of local production price differences may reflect differences in marginal costs between locations, but in essence these differences in local marginal costs should be less or equal the transport costs.

Even so, deviations from the LOP have been found to be significant in magnitude and persistent over time.[2] There are several theoretical underpinnings as to why this may be the case, ranging from the magnitude of shipping costs, Dumas (1992), imperfect competition – pricing to market effects –, Krugman (1987) and productivity differences between trade and non-traded goods, Balassa (1964) and Samuelson (1964). Indeed recent work shows that, for tradable products, pricing-to-market factors are more important than non-traded inputs with regard to prices.[3] For the euro area in particular, the empirical evidence suggests that while price dispersion has decreased over time, it remains significant.[4]

Trade however, rarely takes place in perfectly competitive markets.[5] Even in common currency areas such as the euro area, products are seldom identical and consumers may have different preferences.[6] Prices may thus differ by location over and above distance related costs. For a set of differentiated products – whether in a monopolistic or oligopolistic competition setting – the price that a producer can extract in a specific location depends on a variety of reasons which are generally described as 'market power' and are expressed as the gross mark-up over marginal cost. The mark up each firm can ascribe to its products may depend on a number of factors such as: the number of competitors it faces in each location, product quality, consumer preferences, branding and package size. In addition, for many goods, there is an intermediate step between the producer and the final consumer, which affects prices, namely the retail store. Thus, observed price differences between two locations may also depend on the retailers mark up, their competition structure and monopsony power versus the producer.

In this paper we attempt to evaluate the effects on international and intranational price differences of branded goods that stem from differences in: a) the producer's

[2] See for example: Isard (1977), Haskel and Wolf (2001) Lach(2002) and Crucini et al. (2005)
[3] See Alessandria and Kaboski (2011). .
[4] See Goldberg and Verboven (2004) and Engel and Rogers (2004).
[5] For example, a common practice for multinational producers which have multiple production facilities is to apply territorial supply constraints.
[6] See for example Broda and Weinstein (2008) and Ghosh and Wolf (1994),

competition structure, b) the retail markets competition structure, c) consumer habits, d) local costs and e) other macroeconomic factors. To this effect we utilise an extensive data set on retail prices and quantities for 41 product categories of fast moving consumer goods across 10 Euro area countries. We find that producer market shares, retail market concentration, local costs and consumer habits explain a significant part of branded product price differences across countries. As to economic importance it seems that each block of factors has a similar effect in terms of de facto magnitude on price differences with consumer habits appearing to have a somewhat higher impact. Interestingly, several macroeconomic factors, like income levels and unemployment are less important.

The remainder of the paper is structured as follows. Section 2 provides a description of the data. In Section 3 we present and discuss our model while Section 4 presents the results. Section 5 presents robustness checks, while Section 6 concludes.

2 The Data

The analysis reported in this paper is based on a large and highly disaggregated dataset of retail prices and quantities from A.C. Nielsen market research (Nielsen). While based on scanner data, the dataset obtained contains total quantities and sales for various breakdowns.[7] In this respect the relevant units of comparison are unit prices and equivalised quantities (i.e. it is the price per diaper and number of diapers sold in thousands). In addition, data is available on the number of packs sold.

The full dataset is multidimensional, contains approximately 4.5 million observations and covers 45 product categories in total.[8] Each product category contains information on 4 branded products and private label data. Most often, it refers to two "Pan European" brands and two other brands (local) with a large market share in each

[7] Regarding the data collection: the majority of the data provided by Nielsen originate from Electronic Point of Sale (EPoS) bar code scanners. In a small number of instances these are complemented by shop audits. The data for hard discounters in France and Belgium are collected using cash slips. In Germany, a number of hard discounters (e.g. Aldi, Lidl and Norma) are 'non-cooperating' so the data are collected by means of Nielsen's Homescan Panel. A Homescan panel operates by having consumers scan the barcodes on their purchases. The data is then sent via USB or the internet to the market research company.

[8] (1) 100% fruit juice; (2) all-purpose cleaners (apc); (3) automatic dishwasher detergent; (4) baby food; (5) beer; (6) bouillon; (7) butter; (8) carbonated soft drinks; (9) cat food; (10) cereals ready to eat; (11) chewing gum; (12) chocolate; (13) cigarettes; (14) coffee_ground; (15) coffee_instant; (16) condoms; (17) deodorant; (18) diapers; (19) dog food; (20) fabric softener; (21) fish frozen; (22) ice cream; (23) jam strawberry; (24) laundry detergent; (25) margarine; (26) milk refrigerated; (27) milk uht; (28) olive oil; (29) panty liners; (30) paper towels; (31) pasta/spaghetti; (32) peas frozen; (33) peas tinned; (34) rice; (35) shampoo; (36) shaving prep; (37) sugar; (38) toilet tissue; (39) toothpaste; (40) tuna tinned; (41) vodka; (42) water sparkling; (43) water still; (44) soups wet; (45) whiskey.

country. Moreover, for each branded product there are also data on the three most popular pack sizes (or stock-keeping units "SKUs").[9]

Even though there are 'missing brands' in each market, the data available (four brands and private label) have a mean and median coverage of 75% and 78% respectively. The high coverage on average by just 4 brands and private label data, is a strong indication that most product categories in our dataset can be characterised as oligopolistic markets (as opposed to monopolistic competition which is favoured in theoretical models of competition).

The dataset covers 13 euro area countries which are further disaggregated into approximately 70 regions. The number of regions per country varies from a minimum of four (Ireland and Estonia) to a maximum of nine (Germany).[10] While these regions are defined by the Nielsen affiliates and do not correspond to an official regional classification it has been possible to match them with official NUTS2 and NUTS3 classifications so that we can obtain Nielsen regional macro data from Eurostat's regional database.[11]

Data have been converted from four-weekly frequency to monthly calendar covering the period September 2008 to December 2011.

In this empirical investigation we analyse differences in unit prices of branded products using brand-level aggregated unit prices. We avoid using SKU data as they are: 1) more susceptible to measurement errors and 2) have lower coverage.[12] Moreover, specific SKUs may have low volume weights in the brands total sales. In this respect, producers, when setting their prices, may be more interested in the average price of all their SKUs i.e. the brand total, than at each specific SKU.[13] Thus, brand level unit prices may reflect the average price in a more proper manner across locations. Data on private label products are used as control variables. The brand-level data are analysed on a regional level in order to add a within-country dimension to the investigation.

[9] Consider a brand like Pampers. The pack sizes or SKUs of pampers are large. One SKU is pampers "New Baby size 1": normal pack with 25 nappies, another is economy pack (64 nappies), yet another is jumbo pack with 74 nappies. As the pack sizes and varieties change with the baby's age, the number of SKUs becomes very large indeed.

[10] There is also a breakdown by outlet type (hypermarket, supermarket, superette, petrol station etc.) for country – brand level disaggregation, but not for location.

[11] See Appendix I, for a list of the Nielsen regions and their NUTS correspondence.

[12] Measurement errors have a much smaller impact on the brand level unit prices. As regards the coverage, the 'most popular' SKUs refer to a specific time-period. On several occasions the particular SKU does not exist for some months prior to their introduction, or the volumes are so small that large measurement errors may occur.

[13] See for example Dutta S. et al (2002) "Pricing as a strategic capability", MIT Sloan management review.

2.1 Cleaning the Data

A closer investigation leads us to drop Slovenia, Slovakia and Estonia from the sample as their prices tend to exhibit catching-up effects due to their recent accession.

One important issue when comparing unit price values is of course that products are measured in similar units. In some instances, this is not possible. Thus, the product categories of bouillon and chewing gum are dropped as the relevant units vary greatly across countries. For example, chewing gum units can be strips, pieces, packs or kilos, depending on the country, making thus cross-country comparisons challenging. Chocolate is also dropped as the reporting is often done is country specific sub-categories.[14] In the same vein, some sub-product categories of dog- , cat- and baby food as well as 100% juice are dropped. We also drop the product category of cigarettes as it contains a large share of missing data and the locational reporting differs substantially compared to other product categories. We also drop locations where branded products have very low coverage, defined as less than 10% of the sales value for the market leader in that location as branded goods may not be representative for that market.[15] Finally as the starting and ending point of our data contain a large share of missing values, we drop the first four and last three time periods, restricting thus our sample to the period January 2009 to October 2011.

Having cleaned the data we remain with a total of approximately a quarter of a million observations for branded products and about 63 thousand observation for private label products. The data refer to 41 product groups, with 44 unit equivalents in 58 locations. The countries covered are Austria, Belgium, Germany, Spain, France, Greece, Ireland, Italy, Netherlands and Portugal.

2.2 Describing the Data

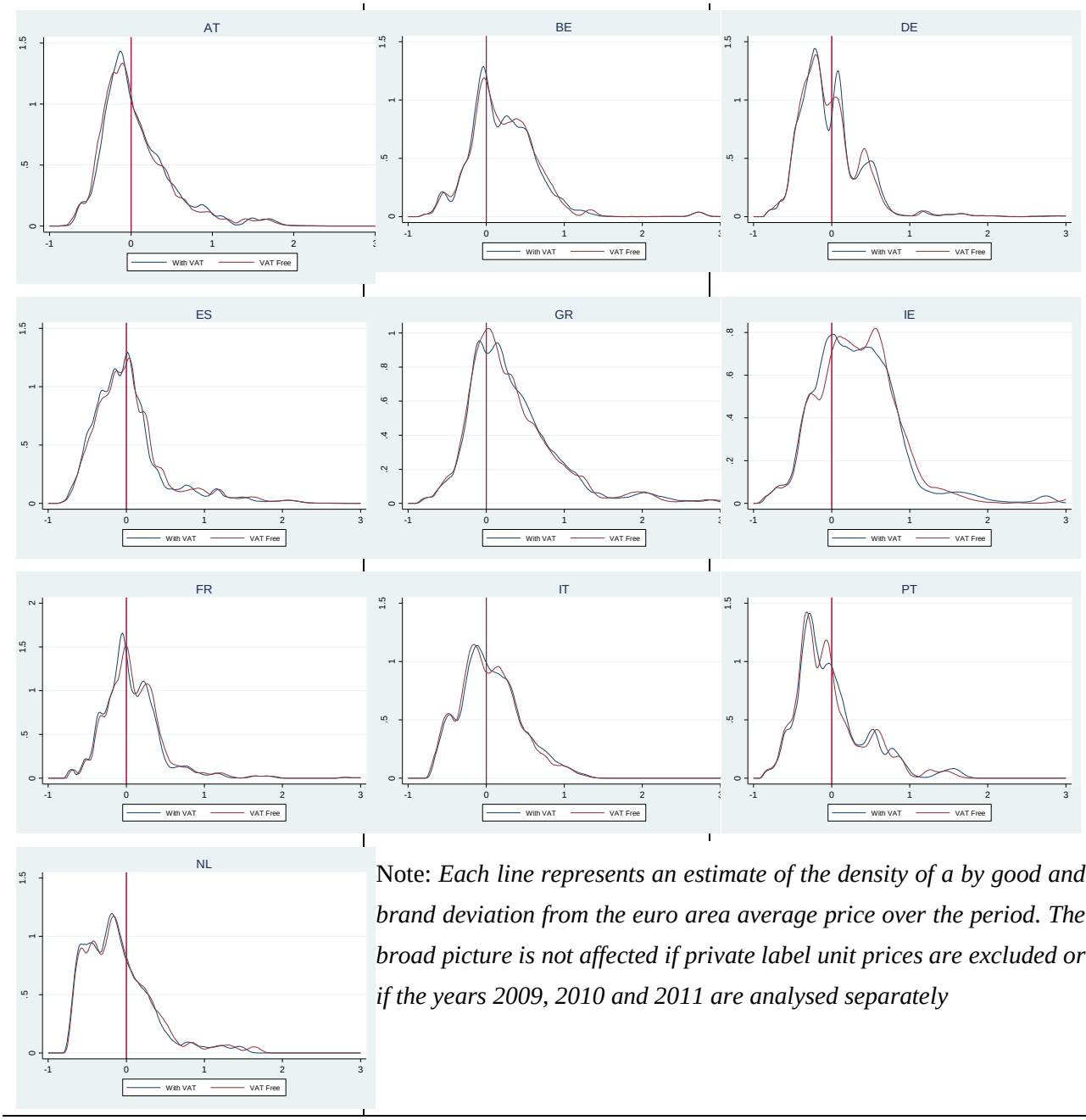
The data show the price dispersion of branded products across countries is significantly larger than within country price dispersion. Specifically, price dispersion defined as the standard deviation over the mean is 27%, across countries which can be contrasted with an average within country dispersion of 2.9% in our sample.

[14] For example it can be reported as chocolate, chocolate bars and chocolate bites in one country, while in another it is reported in the categories of: chocolate gift, chocolate pralines etc.

[15] Market leaders refer to brands with the highest quantity share for a product in a location.

In order to obtain a better view of the deviations from the LOP on a country basis we plot the kernel density of the unit price deviations (with and without VAT) in Figure 1. Specifically, each region and brand is compared to the euro area average unit price for that product category.[16] In the distribution, a value of -0.5 (0.5) implies that an observation is 50 per cent below (above) the euro area average.[17]

Figure 1: Empirical distributions of LOP deviations



Note: *Each line represents an estimate of the density of a by good and brand deviation from the euro area average price over the period. The broad picture is not affected if private label unit prices are excluded or if the years 2009, 2010 and 2011 are analysed separately*

[16] Take for example diapers: We compute an un-weighted euro area average price based on all observed (regional) prices in the sample. We then compare each unit price (over time across brands and across regions) in a country with the euro area average price.

[17] For presentational purposes we truncate the graphs above at 3.

The figure shows that Germany, Spain and the Netherlands have a significant mass below zero, while Ireland, Greece and Belgium have a significant mass above. The non-standard shapes of the distributions – diverging from smooth normal distribution graphs – are due to a) the fewness of the number of products analysed, compared to the universe of consumer of goods (i.e. our sample is confined to goods sold in super markets and does not cover for instance durable goods) and b) the country-specific clustering of prices for each product which is shown anon.

Even so, differences in prices may reflect differences in quality. That is, average price differences across countries may be due to the inclusion of premium or lower-quality brands.

In order to address potential effects stemming from quality differences we also analyse unit value prices of market leaders. Market leaders tend to, by definition, have a broad consumption base and to be characterised by good quality. They offer, in the consumers' eyes a reasonable 'value for money' – within each country. Indeed for many product categories, the market leaders tend to be the same producers offering the same base products – for example Barilla in the product category of dry pasta. In this respect, quality differences are minimized.[18] Moreover, in order to view the full range of price dispersion, within the single market, among products with similar quality (within each product category) we compare the time averaged minimum and maximum unit value prices of market leaders across euro area countries.

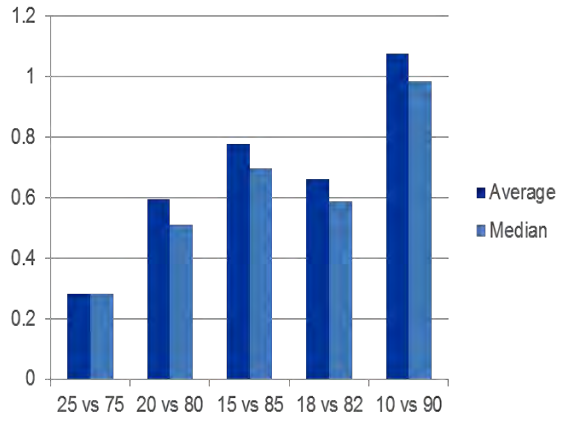
This min-max comparison between price leaders confirms that locations in Greece and Ireland are among the most expensive as they together earn the top position in slightly more than half the product categories (see Table 1). Germany and Spain are again among the cheapest ones as they together occupy the cheapest position in half of the product categories. The most important information though is the sheer difference in prices, indicating strong "pricing-to-market" effects. On average, for the 41 product categories, the mean and median price difference is a full 220% and 181%, respectively. Even if one excludes alcoholic beverages, which are subject to excise taxes and products like still and sparkling water which show very large price differences, the mean and median price differences are still substantial, at 181% and 157%, respectively.

[18] On average, market leaders are about 4 per cent more expensive than the non-leading brands.

Table 1: Min Max unit value prices of market leaders

Product	Unit Equivalent	Max	Max Country	Min	Min Country	Difference
100 % Juice	*L*	2.73	IE	1.16	DE	136%
Diapers	*PIECE*	0.33	GR	0.21	DE	61%
Ground coffee	*KG*	14.64	IE	5.21	FR	181%
Instant coffee	*KG*	42.17	IT	9.63	FR	338%
All Purp. cleaners	*L*	2.13	GR	1.46	ES	46%
Auto. Dishw. Det.	*KG*	10.41	IE	6.24	PT	67%
Baby food	*KG*	12.41	GR	3.06	DE	305%
Beer	*L*	3.22	IE	1.15	ES	181%
Butter	*KG*	11.24	GR	5.07	DE	122%
Cat food	*KG*	4.27	DE	1.86	ES	130%
Cereals	*KG*	10.23	BE	4.07	IE	152%
Condoms	*PIECE*	0.80	AT	0.42	GR	89%
CSD	*L*	1.57	IE	0.83	DE	89%
Deodorant	*L*	49.37	GR	14.27	DE	246%
Dog food	*KG*	4.49	GR	1.43	ES	213%
Dry pasta	*KG*	2.78	AT	1.25	IT	122%
Fabric softener	*L*	2.29	BE	0.73	IT	215%
Frozen fish	*KG*	15.11	IT	5.23	NL	189%
Ice cream	*L*	12.36	GR	2.17	NL	469%
Jam Strawberry	*KG*	7.34	IE	1.93	NL	281%
Laundry Detergent	*KG*	4.21	BE	2.16	DE	95%
	L	4.11	IE	2.15	IT	92%
Margarine	*KG*	6.49	FR	2.08	DE	212%
Milk refrigerated	*L*	1.61	IT	0.48	NL	237%
Milk UHT	*L*	2.12	GR	0.58	FR	263%
Olive oil	*L*	8.75	BE	2.71	ES	223%
Pantyliners	*PIECE*	0.12	PT	0.05	DE	163%
Paper towels	*ROLL*	1.33	GR	0.35	NL	286%
Frozen peas	*KG*	5.11	AT	1.48	NL	246%
Rice	*KG*	5.48	IE	0.97	PT	464%
Shampoo	*L*	13.44	FR	8.40	GR	60%
Shaving preps	*L*	17.60	NL	13.78	DE	28%
	PACK	3.65	AT	2.93	BE	24%
Sugar	*KG*	1.57	FR	0.85	IT	85%
Tinned peas	*KG*	10.09	ES	1.61	NL	528%
Tinned tuna	*KG*	14.10	BE	8.17	ES	73%
Toilet tissue	*ROLL*	0.67	IE	0.19	ES	257%
Toothpaste	*L*	29.61	GR	21.25	ES	39%
Vodka	*L*	29.28	IE	9.49	IT	208%
Water Sparkling	*L*	2.51	GR	0.21	ES	1069%
Water Still	*L*	1.27	IE	0.12	FR	954%
Wet soups	*KG*	5.92	IT	3.37	AT	76%
	L	3.42	DE	1.39	PT	146%
Whiskey	*L*	37.63	IE	11.35	ES	232%
Average						220%
Median						181%

Figure 2: Price differences between market leaders, different percentiles



It may be argued that a comparison of extremes is not a justified approach, and that a comparison between the 25th and 75th percentiles reflects better euro area price dispersion. Still, when comparing different percentiles (see Figure 2) we see that price differences remain substantial up to a comparison of the 20th and the 80th percentile. While the price differences in our data have a regional dimension, they still reflect geographically aggregated data. As such, they do not reflect differences between say, prices in a store in the most expensive part in Paris vs. prices in a store in a less affluent district in Palermo. Therefore, extreme unit price values, that would need to be smoothed, so as not to mask the general picture, are not present in our data set. It is rather the case that when a unit price comparison is done between the 75th and 25th percentile entire countries are dropped from the relevant comparison set.

In Figure 3 we present the minimum and maximum unit price of a regional branded market leader within a country (averaged over time) for four different product categories. The data show that for both the lower and upper end of prices there is no overlap between countries. Take for example paper towels where Greece was shown to be the most expensive country in Table 1. The region with the lowest average unit price of a market leader in Greece is still higher than the region with the most expensive market leader in Ireland (which is the second most expensive country). Thus if we would compare the 25th and 75th percentile in this case we would exclude all regions in Greece, Ireland, the Netherlands and most of the Italian regions.[19] A similar picture is evident in the other product categories as well. For dry pasta one would exclude all regions in Ireland and Austria (most expensive) and Italy and Portugal (the cheapest).

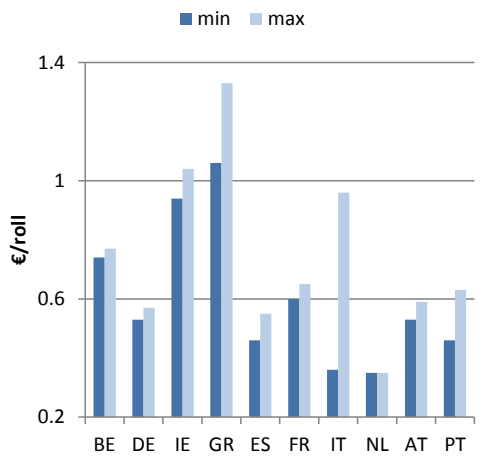
Figure 3 also shows that there are not considerable price differences within countries. The only time one observes noticeable differences within a country is when the market leader for a product is different between locations within a country, such as paper towels in Italy, tinned tuna in Belgium and ground coffee in France (a necessary but not

[19] Country rankings in terms of most/least expensive do not change even if unit prices are presented without VAT.

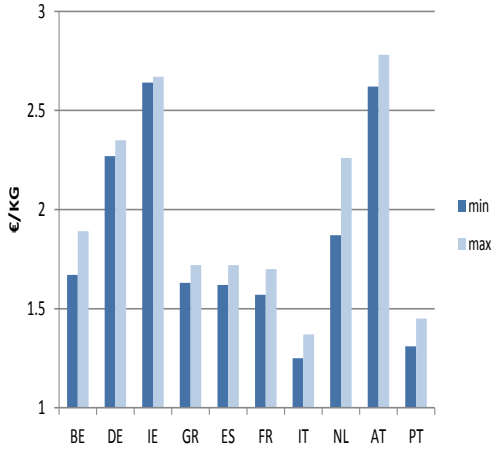
sufficient condition as even a switch of market leader often produces only marginal price differences, e.g Ground coffee in Austria).

Figure 3: Min and max unit price (incl. VAT) of regional market leaders for selected products

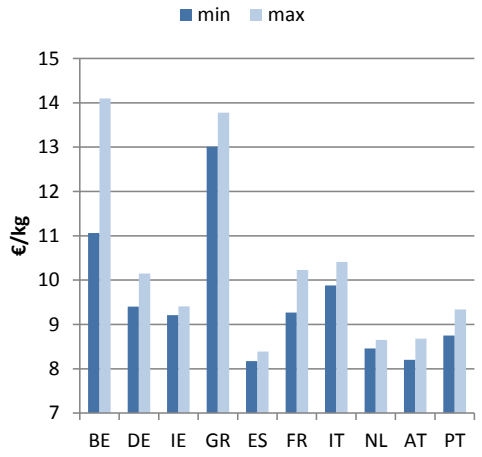
Paper towels



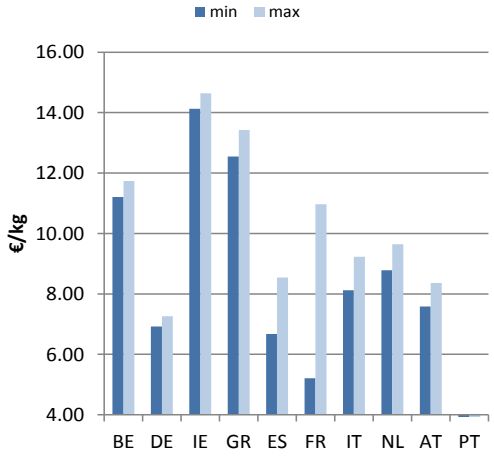
Dry pasta



Tinned tuna



Ground Coffee



Note: Based on time average unit prices of market leaders of branded products, EMU 10 sample, 58 regions.
Sources: Nielsen and Eurosystem staff calculations

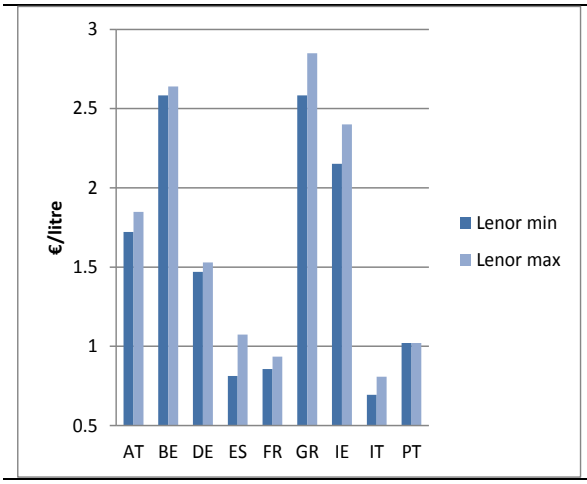
Even so, for all product categories it is evident that a country specific price clustering is often observed, irrespective of whether or not (i) the market leader is the same across regions within a country or (ii) the market leader is the same across countries. However, in the above example the market leading brands differ across countries.

We chart thus the minimum and maximum unit prices of the same brand for two different products in order to see whether the country specific clustering persists (see Figure 4). The first one is a fabric softener called Lenor. While this is a pan-european brand it is not a market leader everywhere. The second product is carbonated soft

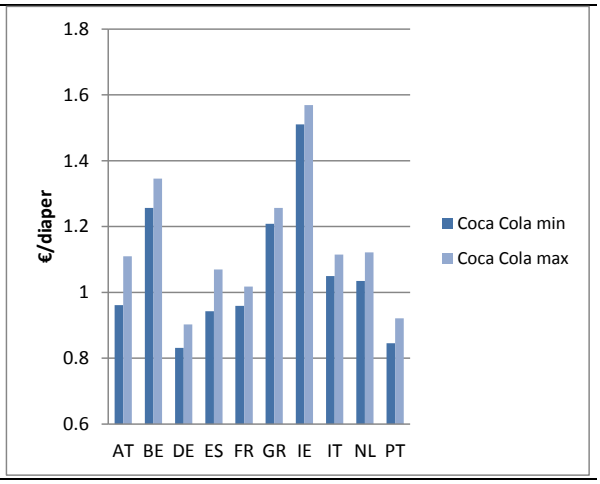
drinks where Coca Cola is a market leader everywhere. Indeed for the same brands the country specific price clustering is even stronger. In fact it is an exception rather than the rule that there is any price overlap between countries.

Figure 4: Min and max unit price (incl. VAT) of selected products

Fabric Softener – Lenor



CSD – Coca Cola



Note: Based on time average unit prices of market leaders of branded products, EMU 10 sample, 58 regions
Sources: Nielsen and Eurosystem staff calculations

Having thus observed the strong country specific clustering in prices we believe that a min-max comparison of prices is a justifiable approach and reflects existing price dispersion within the euro area in a more accurate manner than a comparison of percentiles.[20] Some of the potential drivers for these price level differences between the most expensive, on the one hand, and the least expensive on the other, may be found in market characteristics and consumer habits that may help to form retail prices.

2.3 Producer market characteristics and consumer habits

Indeed there are some consistent differences in terms of producer market characteristics and consumer habits between the most and least expensive countries. From the producer market point of view, Greece and Ireland tend to, on balance, have higher market shares – in terms of quantities – for the leading brand in the covered product categories, implying thus higher monopoly power and higher mark-ups. As other non-leading brands tend to follow the market leader when setting their prices in each country the result becomes higher overall prices. Moreover, private label goods tend to have a low quantity share of the market. By contrast, Germany and Spain seem

[20] Country rankings in terms of least to most expensive and the non-overlap of prices do not change if the analysis is done unit prices where VAT is excluded.

to be characterized by significantly lower market shares for the leading producers and a significantly higher share of private label products. (see Tables A through C in the Appendix II).[21]

Consumer behaviour also seems to differ. Greek and Irish consumers tend to buy smaller pack sizes than average and to consume on average less of each covered product category –in terms of units per person per month (see Tables D and E in the Appendix II). By contrast, German and Spanish consumers seem to be more frugal in terms of pack size purchases and to have higher consumption intensity on average.

Comparing the median characteristics between the highest and lowest prices locations for the product categories reveals that while prices tend to be higher where market leaders have higher market shares, the median difference in private label penetration is low (see Table F in the Appendix II).[22] The differences in consumer behaviour are more systematic though. Both consumption intensity as well as the average pack size tends to be systematically lower in the most expensive locations.

2.4 Retail market characteristics

An important step between the producers and consumers when determining price levels is the retail market. In general, it is found that a more competitive market structure implies lower prices and enhances consumer welfare. One way to measure competition is through concentration measures, such as the Herfindahl–Hirschman Index (HHI). Such concentration indices may be considered as an ex ante indicator of potential competition.[23] Recent research, using concentration indices both at the buying group and parent company level, has found that concentration and prices tend to move in the same direction when looking at the parental group and at the store level, whereas they tend to be negatively related at the buying group level.[24]

[21] While the data have a regional aspect they are presented in country basis in Appendix II for presentational ease.
[22] As the differences can be large on occasion, the median is preferred as a measure of comparison.
[23] This is because, although a market with low concentration (i.e. many firms with low market shares) is likely to be more competitive than one with high concentration (i.e. few firms with a high market share), it could actually be the case that a market with only two players features more fierce competition than one with many players where explicit or implicit collusion has developed.
[24] Several companies may form a buying group when making purchases in order to obtain more favourable prices from manufacturers, due to bulk. For the effects on prices see Ciapanna and Colonna (2011), and ECB occasional paper 128 (2011).

Table 3: HHI concentration measures for the Retail market (0-10,000)

	Local 5 km neighbourhood		Nielsen Regions	
	Parent level	Buying Group level	Parent level	Buying Group level
AT	2298	3562	1007	2726
BE	2721	2730	1890	1890
DE	3220	3398	2131	2361
ES	2699	2983	1224	1603
FR	3514	3953	1022	1641
GR	3296	3342	1430	1496
IE	NA	NA	NA	NA
IT	2544	2923	696	1254
NL	2671	3298	1485	2283
PT	3125	3163	1227	1258

Note: the local HHI measures are averaged over the Nielsen regions while the HHI Nielsen Regions are calculated directly at the regional level. Country HHIs presented here are averages of the regional data.

Here we use local (5km) and regional HHI indices calculated from a unique dataset encompassing the exact location of over 100,000 individual grocery stores across the euro area, for 2010, in order to investigate the effects of retail market structure on price levels.[25] Both the local as well as the regional HHI indices are calculated for the store, parent and buying group levels of the retailers at the Nielsen region.

3 Prices, market structure and estimation setup

The aim is investigate the statistical significance with regard to the drivers of price differences of branded products across euro area countries. As we have seen, the rich information contained in the Nielsen dataset allows us to disentangle several aspects of the relevant market structures that may affect prices. Specifically, our point of reference for the prices comparison will be the prices of each product in the location with the lowest price for a market leader (see Table 2). . The prices of all other locations are compared with this 'minimum price location'. However, the data in each location do not only contain information about the market leading brand, but also for the main branded competitors (up to a maximum of three competitors). Indeed, taking into account the full relative competitive market structure is non-trivial. As market leaders are on average more expensive than the 'other brands' it implies that they have obtained that position due to other virtues than low price. Consider thus the following example with locations A and B. The market leader in A has 35% of the market while

[25] This data was used for the Eurosystem 2011 Structural Issues Report. See also ECB occasional paper 128 2011. For detailed information see also Appendix 3 of the data description note. We are grateful to Mario Izquierdo and Aidan Meyler for an udated version of HHI measures at the Nielsen region.

the one in B has 30%. All else equal, the market leader in location A should be able to extract a higher price. However, if the 3 competitors in location A have each 20% of the market, while the competitors in location B have 2% the effects is less clear. Assuming that companies/brands actually compete (and don't collude), and goods are ordinary (i.e. its quantity falls when its price increases), prices would probably be lower in location A. We need thus to separate effects of market leaders and other brands when determining price differences across locations.

We will also need to make some assumptions with regard to quality differences that may be reflected in the prices of potentially heterogenous goods. We believe that when comparing the prices of different market leaders we avoid issues of quality differences to a large extent, as argued previously. With regard to the 'other brands' we will currently work under the assumption that, on average, between locations there are no significant quality differences.[26]

Thus, in the set up in equation (1) the price of the market leader (ML) in location (i) for product (j) is compared with the market leader with the minimum price (*minML) across all locations (location k) for product (j). Similarly, the other brands (ob) in location (i) for product (j) are compared with the average price of other brands (*minob) in location (k). Equation (1) is then stacked over all locations (i-1), all products (j) and all time-periods (t).[27] Note that all prices and quantities are in log-form, hence the setup is one of relative prices.

$$\begin{bmatrix} p_{ML,i,j} - p^{*}_{\min ML,k,j} \\ p_{ob1,i,j} - \bar{p}^{*}_{\min ob,k,j} \\ p_{ob1,i,j} - \bar{p}^{*}_{\min ob,k,j} \\ p_{ob1,i,j} - \bar{p}^{*}_{\min ob,k,j} \end{bmatrix}_{(i-1)*j*t} = \beta_1 \begin{bmatrix} q_{ML,i,j} - q^{*}_{\min ML,k,j} \\ q_{ML,i,j} - q^{*}_{\min ML,k,j} \\ q_{ML,i,j} - q^{*}_{\min ML,k,j} \\ q_{ML,i,j} - q^{*}_{\min ML,k,j} \end{bmatrix}_{(i-1)*j*t} + \beta_2 \begin{bmatrix} \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \\ \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \\ \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \\ \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \end{bmatrix}_{(i-1)*j*t} + \beta \mathrm{X} + \varepsilon \quad (1)$$

These price differences are explained by the relative power of the market leaders $q_{ML,i,j} - q^{*}_{\min ML,k,j}$ and the relative competition of other brands $\bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k}$. We expect $\beta_1 > 0$ as it captures the relative 'monopoly power' of the market leader and $\beta 2 < 0$ as it captures increased competition from other brands.

[26] This assumption will be relaxed later on where as a robustness check we use only the 2 brands with the largest market share in each location. It should be noted however, that even in subgroups of exactly homogenous goods in the Nielsen data cross country price differences are larger than within country price differences by a factor of about 7, see Reiff and Rumler (2014).

[27] We differentiate of course between the same products that have different equivalising units across countries but, for simplicity, do not add the extra layer in the description.

The vector β and matrix X refers to all additional explanatory variables that enter the regression in similar relative form. It includes:

The relative quantity shares of private label. We expect the coefficient on private label to be negative as the emergence of cheaper private label goods may put downward pressure on branded goods margins.[28]

Two variables measuring consumer habits are included. One measures *consumption intensity* and is calculated as the number of units sold per person per month in a location. A priory, higher consumption intensity is associated with lower prices as consumers will spend more time researching the market if they consider the product to be important.[29] The second measure is termed *consumer cost indifference* and is measured as the average pack size. While unit prices tend to be lower in general the larger the pack size, it is still the choice of the consumer what pack size to buy given that larger pack sizes exist. If this attitude of 'cost indifference' is prevalent it is only natural that brands will take advantage of it when setting their prices.[30] In this respect, a consistent attitude of (relative) small pack size purchases may be considered as a consumer trait.

We also include measures of retail concentration in order to address the effect of the retail structure on price levels. We use HHI-indices calculated at a 5 km threshold (for the neighbours) which are then averaged up to the Nielsen regions. The HHI indices are calculated for a) for each parent company (as several stores in a 5km radius, may belong to the same parent company) and b) for the buying group level (several companies may form a buying group when making purchases in order to obtain more favourable prices from manufacturers, due to bulk).[31] We expect the parent level HHI differences to have positive effects on prices as retailers will want to extract profits from the consumers. The effect of the buying group is ambiguous though, as large buying groups may be able to reduce prices from manufacturers and pass them on to the consumers.

[28] However, where there is extensive product proliferation, private labels have great difficulty competing with prices as means to capture market share in these categories, see for example Cotteril et al (2000). Moreover, in the marketing research it is documented that consumers generally switch among goods in a certain price range, see e.g. Bronnenberg and Vanhonacker (1996). As such branded goods may not see private label as competitors for the same class of customers.

[29] For example, pasta in Italy has high consumption intensity and indeed the price of pasta is an important one, compared to for example the price of strawberry jam.

[30] This will in particular be true for larger multinationals which tend to conduct encompassing market research with respect to consumer buying habits and preferences in order to elicit information about what prices consumers are willing to pay for a branded product. For some anecdotal evidence on pack sizes see also Appendix III.

[31] While the information on the HHI is available at the store level it does not make economic sense at the Nielsen region. The inclusion of the store level HHI does not alter the results.

In order to capture local cost differences we include annual country based wages of low skilled workers (including social contributions) and rents.[32] We also include several regional macroeconomic variables which may be important for determining price levels, such as GDP per capita, the unemployment rate and population density. The macro data are in an annual frequency, are held equal within each year and are aggregated up to the Nielsen regions using NUTS 2 or NUTS 3 approximations.[33]

Finally, we add VAT rates and dummy variable capturing promotions.[34] We also include time dummies and dummies controlling for differences in equivalising units within product categories.

4 Main Results

The first exploratory results (Table 4) are simple OLS, while in Table 5 we instrument all quantity variables by their third lag in order to avoid simultaneity problems between price and quantities movements.

The results show that the estimated market structure variables are significant and with the expected sign. To wit, they show that increased competition by the non-leading brands is associated with lower prices. Specifically in columns (1)-(4) of Table 4 the point estimates, with regard to the share of non-leading brands, compared to the minimum location, range from -0.031 to -0.052. This implies that a 10 per cent increase is associated with a decrease of the price difference by 0.31-0.52 per cent depending on the specification.

In terms of our data in the sample, assuming that the shares in the minimum location remain constant, it implies that if one of the 'other brands' increases its share from 5.4

[32] Wages are often set at a national level in the countries included and tend to show little local variation. With regard to rents, regional data are not available. Wages are taken from the structure of earnings survey (SES) and are annual earnings for elementary occupations. Alternative wage measures such as hourly earnings from the SES or from the Economist Intelligence Unit (EUI) produce similar results. Rents are taken from the EUI and refer to the typical annual gross rent for a 1,000 sq metre unit in a Class A building in a prime location. The use of a typical annual gross rent for a top-quality units of 2,000 sq metres suitable for warehousing or factory use produces similar results. While the EUI has city data it often refers to the capital only. In the cases it refers to than one more cities we take the country average as there is no correspondence with the Nielsen regions.

[33] As a test we also included the OECD index on Product Market Regulation (PMR) for the retail sector in 2008 as an additional measure for competition as it is a widely used and monitored index measuring how conducive to competition the economic environment is. While statistically significant with a positive sign, implying that higher regulation in the retail market is associated with higher prices, the index captures to some extent similar effects to the share of the market leader and the retail HHI. Given the econometric implications we decided to drop it from the analysis.

[34] Sales are defined as a drop in price by more than 6.25% (implying a 25% reduction in a week- which is a typical promotion period) in a month and increases by more than 6.25% in the next.

per cent (which is the lowest average in the sample and refers to Spain) to 8.6 per cent (which is the highest average in the sample and refers to Ireland), i.e. an increase of 60%, the price difference will decrease at most (depending on the specification) by 3.12 percent.

Table 4: First results

Dependent variable: Differences log prices vs minimum location				
VARIABLES	(1)	(2)	(3)	(4)
log average quantity of non-leading brands difference vs min loc	-0.0310***	-0.0406***	-0.0400***	-0.0517***
	(0.00173)	(0.00157)	(0.00158)	(0.00170)
log of private label quantities vs min loc	-0.0105***	-0.00759***	-0.00536***	0.000244
	(0.00146)	(0.00137)	(0.00137)	(0.00142)
log of market leader difference vs min loc	0.0505***	0.0198***	0.0220***	0.0488***
	(0.00260)	(0.00242)	(0.00243)	(0.00270)
log of consumer intensity vs min loc		-0.0568***	-0.0577***	-0.0611***
		(0.00148)	(0.00148)	(0.00157)
log of consumer cost indifference vs min loc		-0.482***	-0.480***	-0.471***
		(0.00300)	(0.00303)	(0.00315)
log pop density/km2 vs min loc			-0.00502***	-0.0129***
			(0.000788)	(0.00123)
VAT Diff vs min loc			0.00572***	0.0100***
			(0.000285)	(0.000335)
Sales Dummy vs min loc			-0.0906***	-0.0918***
			(0.00486)	(0.00518)
log HHI 5 km Parent level vs min loc				0.271***
				(0.00730)
log HHI 5 km Buying group vs min loc				-0.480***
				(0.00930)
log of wages vs min loc	0.167***	0.134***	0.144***	0.133***
	(0.00344)	(0.00321)	(0.00325)	(0.00358)
log of rents vs min loc	-0.0297***	-0.0374***	-0.0357***	0.0364***
	(0.00415)	(0.00404)	(0.00406)	(0.00434)
Observations	223874	181274	181274	164461
R-squared	0.202	0.394	0.397	0.400
F-Stat	842.8	1450	1421	1269

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1,*
Time Dummies and Product Unit Equivalent Dummies Not Shown

By contrast, a 10 per cent increase in the market leaders share (versus the market leader in the minimum location) is associated with an increase in the price differences by 0.2– 0.5 per cent (depending on the specification), indicating thus that an increasing tendency towards monopoly – less competition – is associated with higher prices.

In our sample, similarly, this implies that if the market leader increases its share from 22 per cent (which refers to the average share in Germany in the sample, see Table B in Appendix) to 36 per cent (Austria and Greece in the sample), i.e. a 60% increase, the price difference would increase by, at most, 3.6 per cent. Over all, a rearrangement of market shares in e.g. Austria, where 14 percentage points of the market leader is rearranged into $4^{2/3}$ percentage points to each of the three other brands would on average imply a combined price reduction of about 11 percent.

As regards private label market shares, there is a tendency that increased private label share has a dampening effect on branded product prices as a 10 per cent increase in private label shares (compared to the minimum location) will decrease relative branded product prices by 0.05 to 0.1 per cent. This implies if private label say in Italy (see Table C) increase to the share in Spain, i.e. a 120% increase, the consumers will face lower prices by, at most 1.2 per cent. The small effect which is observed in the full specification may be an indication that, in terms of pricing, branded goods do not respond to private label developments to the same extent as they target different consumer categories. Moreover in the full model, column (4) the estimated effect of private label is insignificant.

Local costs in terms of wages of low skilled workers also play an important part in explaining observed price differences. Specifically a 10 per cent increase in relative wages is associated with an increase of 1.3-1.7 per cent in branded goods prices. In terms of our sample, if a low skilled worker in Spain had the same annual wage as in Ireland (which is about 100 per cent higher) consumers would face by, at most, 17 per cent higher prices.

Rents however, enter with the wrong sign in most specifications. This counterintuitive result is driven by Ireland, which can be seen in the final specification in which Ireland is missing (there are no HHI measures available for Ireland). Data on Irish rents show a drop of about 50 per cent between 2008 and 2009, making Ireland from one of the most expensive countries to one of the cheapest.[35] In the specification of column 4, where rents enter with a positive sign, it implies that a 10 per cent increase in rents implies 0.36 per cent higher prices on branded goods.

The variables measuring consumer habits are highly significant and with the expected sign. Higher consumption intensity is associated with lower prices as consumers search costs may be lower from products they buy more frequently. Specifically, if an

[35] One problem with EUI data is that it refers to new rents. In practice however rents could not be negotiated downwards as there were 'upward only' clauses in the signed leases. Thus, most retailers where stuck with the rents they signed at the peak of cycle.

Irish person consumed as much past as an Italian (0.03 kg per person and month vs 0.14 kg, see Table E in the Appendix), i.e. an increase of about 467%, the Irish consumer would face, at most, 28 per cent lower prices.

The variable measuring 'consumer cost indifference' (the average pack size) is also negative and economically very significant. A 10 per cent increase in the average pack size implies close to 5 per cent lower prices. In our sample, if the average pack size of Juice in Greece increased from 0.8 litres to the German average of 1.21 litres, ie a 50% increase it would imply lower juice prices by 25 per cent. On balance the results imply that consumers' habits and attitudes play a major role when brands set their prices. Moreover, when the consumer attitude variables are included the point estimate on the market leaders impact on prices is halved (see columns 1 and 2 in Table 4), implying possibly that as large firms are better (or more able) at 'exploiting' consumers attitudes in their price setting behaviour the market leaders' variable may, in the restrictive specification, be capturing part of the consumer attitudes' impact.

Moving on, the HHI indices on retail market concentration show positive effects on prices for the store and parent level implying that the more limited competition is - in a 5 km neighbourhood- the higher the prices, as retailers take advantage of the scarceness of competitors. Specifically a 10 per cent increase in the parent level HHI is associated with 2.7 per cent higher prices. For example, from Table 3 we see that if the Spanish HHI increased to the level of the French HHI, i.e. by 30 per cent, prices would, ceteris paribus, increase by about 8 per cent. By contrast, at the buying group level the HHI index is negative, which may be an indication that large buying groups can negotiate lower prices from manufacturers, which they pass on to consumers. Again if the Spanish buying group HHI was at the level of Frances', an increase of 33 per cent it would imply a price reduction of almost 16 per cent. [36]

Finally, macro variables such as GDP per capita and the unemployment rate are either insignificant or have consistently wrong sign (they are not shown for space consideration issues). VAT differences while statistically significant are not economically important. The dummy variable capturing sales enters with the correct sign and is significant. Population density is statistically significant and has a negative sign, implying that in areas that are more densely populated, prices will be lower due the fact that more retail store will choose to locate there so as to exploit the 'big' market. However, it may capture aspects similar to the HHIs and we thus exclude it from the analysis that follows in order to avoid the related econometric problems.

[36] Results are similar in significance sign and magnitude for the regional level HHI for the parent and buying group level.

Simple OLS estimates suffer though from simultaneity bias as prices and quantities are jointly determined each period. In order to address this issue we instrument all quantity based variables (quantities of market leaders, other brands and private label as well as the variables measuring consumer preferences) by their third lag.[37] The results using instruments are presented in Table 5. They confirm the OLS findings for all variables in terms of signs, magnitudes and significance.

Table 5: IV-estimates

VARIABLES	(1)	(2)	(3)	(4)
log average quantity of non-leading brands difference vs min loc	-0.0241***	-0.0393***	-0.0394***	-0.0522***
	(0.00158)	(0.00154)	(0.00153)	(0.00161)
log of private label quantities vs min loc	-0.00932***	-0.00736***	-0.00510***	0.00101
	(0.00150)	(0.00134)	(0.00134)	(0.00142)
log of market leader difference vs min loc	0.0612***	0.0214***	0.0223***	0.0503***
	(0.00278)	(0.00263)	(0.00263)	(0.00300)
log of consumer intensity vs min loc		-0.0550***	-0.0565***	-0.0617***
		(0.00138)	(0.00138)	(0.00147)
log of consumer cost indifference vs min loc		-0.491***	-0.491***	-0.480***
		(0.00259)	(0.00258)	(0.00268)
VAT Diff vs min loc			0.00601***	0.0104***
			(0.000264)	(0.000313)
Sales Dummy vs min loc			-0.0861***	-0.0877***
			(0.00508)	(0.00545)
log HHI 5 km Parent level vs min loc				0.293***
				(0.00726)
log HHI 5 km Buying group vs min loc				-0.441***
				(0.00887)
log of wages vs min loc	0.160***	0.131***	0.138***	0.120***
	(0.00362)	(0.00326)	(0.00327)	(0.00353)
log of rents vs min loc	-0.0320***	-0.0351***	-0.0318***	0.0469***
	(0.00469)	(0.00466)	(0.00465)	(0.00490)
Observations	199687	160986	160986	146062
R-squared	0.201	0.394	0.397	0.400
F-Stat	642.6	1344	1331	1207

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1,*
Time Dummies and Product Unit Equivalent Dummies Not Shown

[37] Results are similar when using the first and second lag as well.

5 Robustness checks

As a first robustness check we re-estimate our full model by dropping one region at a time and subsequently a product category at a time, in order to investigate the robustness of our estimates due to region or product specific inclusion.

With the exception of private label all variables are found to be robust with regard to the stepwise exclusion of regions and products. The point estimates are highly significant, at the 1% significance level and economically meaningful.[38]

Table 6: Robustness, dropping

	one region at a time		***one product at a time***	
	Coefficient Range		**Coefficient Range**	
	min	max	min	max
log average quantity of non-leading brands difference vs min loc	**-0.048**	**-0.054**	**-0.043**	**-0.061**
log of private label quantities vs min loc	*-0.001*	*0.005*	*-0.008*	*0.006*
log of market leader difference vs min loc	**0.044**	**0.056**	**0.035**	**0.072**
log of consumer intensity vs min loc	**-0.056**	**-0.064**	**-0.056**	**-0.069**
log of consumer cost indifference vs min loc	**-0.476**	**-0.483**	**-0.456**	**-0.528**
VAT Diff vs min loc	**0.010**	**0.011**	**0.009**	**0.015**
Sales Dummy vs min loc	**-0.086**	**-0.090**	**-0.082**	**-0.095**
log HHI 5 km Parent level vs min loc	**0.260**	**0.450**	**0.256**	**0.326**
log HHI 5 km Buying group vs min loc	**-0.382**	**-0.575**	**-0.400**	**-0.481**
log of wages vs min loc	**0.095**	**0.133**	**0.095**	**0.142**
log of rents vs min loc	**0.034**	**0.073**	**0.026**	**0.070**

[38] Some issues seem to arise if we exclude a country at a time, i.e. several regions. Specifically, when Belgium is dropped from the sample the retail concentration indices become insignificant and the point estimate of wages changes sign. The main reason for these results is that Belgium is at 'the extremes' with regard to these variables. On the one hand, it is one of the most expensive countries in our sample and on the other it has one of the lowest retail concentration values and the highest wages for low skilled workers. A study from the Federal Planning Bureau finds that a large part of Belgium's price differences with neighbouring countries is due to wage, rent and VAT differences.

5.1 An alternative specification

In order to further test the robustness of our findings we proceed with an alternative estimation specification. To wit, we investigate whether our findings are affected by our assumption that there are, on average, no quality differences with regard to 'other brands' between various locations. We restrict thus our sample to include only the unit prices of the two largest brands in each product group and location in terms of quantity shares. Equation (1) becomes thus:

$$\begin{bmatrix} p_{ML,i,j} - p^{*}_{\min ML,k,j} \\ p_{ob1,i,j} - p^{*}_{\min ob1,k,j} \end{bmatrix}_{(i-1)^{*}j^{*}t} = \beta_1 \begin{bmatrix} q_{ML,i,j} - q^{*}_{\min ML,k,j} \\ q_{ML,i,j} - q^{*}_{\min ML,k,j} \end{bmatrix}_{(i-1)^{*}j^{*}t} + \beta_2 \begin{bmatrix} \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \\ \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \end{bmatrix} + \beta \mathrm{X} + \varepsilon \qquad (2)$$

The main difference is the characterisation of the price vector, where the unit price of the market leader in each location is relative to the lowest unit price of a market leader in each product category. Similarly the price of the second largest brand each location is expressed relative to the second largest brand in the minimum price location. In this specification we assume that the difference in the unit price of market leaders and the difference of the unit price of the second largest brands respectively are not driven by quality differences. The explanatory variables measuring the market structure of the producers and the retailers, consumer habits and local costs remain unchanged.

On balance, Table 6 shows that the point estimates of the explanatory variables retain their signs and significance. Moreover, their magnitudes are within the range observed in previous estimations. Even so, there are some notable differences. First, private label enters now most often with a positive sign, implying that an increase in private label penetration is associated with slightly higher prices for the two largest brands. This may indicate that an increasing private label penetration has an impact, first and foremost, on smaller brands. By contrast, for large brands this implies that their main competitors, i.e. smaller brands, are affected which gives a higher pricing power for the customer segment that is attached to branded goods. The second variable that differs is rents, which is now positive and mostly significant. In fact, in the full model specification in column (4) differences in rents are now economically as large as differences in wages.

Table 6: IV-estimates

VARIABLES	(1)	(2)	(3)	(4)
log average quantity of non-leading brands difference vs min loc	-0.0263***	-0.0391***	-0.0391***	-0.0547***
	(0.00197)	(0.00187)	(0.00187)	(0.00197)
log of private label quantities vs min loc	-0.000448	0.00372**	0.00603***	0.00855***
	(0.00195)	(0.00170)	(0.00170)	(0.00179)
log of market leader difference vs min loc	0.0489***	0.0217***	0.0226***	0.0309***
	(0.00361)	(0.00332)	(0.00331)	(0.00378)
log of consumer intensity vs min loc		-0.0594***	-0.0615***	-0.0704***
		(0.00175)	(0.00174)	(0.00186)
log of consumer cost indifference vs min loc		-0.480***	-0.474***	-0.459***
		(0.00417)	(0.00417)	(0.00432)
VAT Diff vs min loc			0.00674***	0.0114***
			(0.000335)	(0.000397)
Sales Dummy vs min loc			-0.0729***	-0.0682***
			(0.00679)	(0.00728)
log HHI 5 km Parent level vs min loc				0.258***
				(0.00919)
log HHI 5 km Buying group vs min loc				-0.384***
				(0.0112)
log of wages vs min loc	0.154***	0.130***	0.138***	0.106***
	(0.00471)	(0.00413)	(0.00414)	(0.00445)
log of rents vs min loc	0.00332	0.0183***	0.0218***	0.107***
	(0.00613)	(0.00593)	(0.00592)	(0.00620)
Observations	102419	82541	82541	74861
R-squared	0.229	0.416	0.420	0.429
F-Stat	389.5	754.3	748.6	697.5

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1,*

Time Dummies and Product Unit Equivalent Dummies Not Shown

As a final robustness check we also assume that the unit prices of the market leader and the second largest brand are not characterized by quality differences. Our relevant relative price vector versus the minimum location is thus characterized by equation (3), where the price vector now captures differences in prices between each of the two largest brands (in terms of quantity shares) relative to the prices of each of the two larger brands in minimum price location. We assume that the unit prices of the two largest brands, in terms of quantity related market shares, do not reflect quality differences. The results remain robust and very similar to those obtained in Table 6.[39]

[39] See Table G in Appendix II. Moreover, all alternative specifications are robust to region and product exclusion.

$$\begin{bmatrix} p_{ML,i,j} - p^{*}_{\min ML,k,j} \\ p_{ob1,i,j} - p^{*}_{\min ML,k,j} \\ p_{ML,i,j} - p^{*}_{\min ob1,k,j} \\ p_{ob1,i,j} - p^{*}_{\min ob1,k,j} \end{bmatrix}_{(i-1)^{*}j^{*}t} = \beta_1 \begin{bmatrix} q_{ML,i,j} - q^{*}_{\min ML,k,j} \\ q_{ML,i,j} - q^{*}_{\min ML,k,j} \\ q_{ML,i,j} - q^{*}_{\min ML,k,j} \\ q_{ML,i,j} - q^{*}_{\min ML,k,j} \end{bmatrix}_{(i-1)^{*}j^{*}t} + \beta_2 \begin{bmatrix} \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \\ \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \\ \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \\ \bar{q}_{ob,i,j} - \bar{q}^{*}_{\min ob,l,k} \end{bmatrix} + \beta \mathrm{X} + \varepsilon \qquad (3)$$

Overall, the results indicate that observed price differences in the euro area depend on a wide variety of factors. Specifically, the competition structure in the producer and retail market, on local costs and consumer habits all have an important role to play. The results are robust to region and product exclusion but also to alternative estimation specifications.

6 Conclusions

Branded products, in the fast moving consumer goods market, exhibit large differences within the euro area, beyond what would be justified by transportation costs, indicating significant impediments to the functioning of the common market. By utilising an extensive data set on retail prices and quantities of consumer goods across the euro area regions, we have attempted to disentangle several effects that are related to observed price differences.

Our results indicate that observed price differences reflect effects from diverse sources. To wit, the competition structure of the goods' producers and retailers, consumer habits and local costs each contribute a significant and economically meaningful share to the observed price differences. The estimated coefficients of our explanatory variables show substantial differences in terms of elasticities. Even so, the feasible economic impact, which one can descry from the in sample differences of our variables, suggests a similar importance of the different 'blocks' of variables, with some added importance of consumer habits. By contrast, macroeconomic factors, like regional GDP per capita and unemployment differences are not found to be important in explaining price differences within the euro area.

The policy implications are similarly diverse if the goal is to reduce observed price differences in the euro area. Namely, reducing product market regulation and increasing competition is important, but is also only one step in the process. Of equal importance is the structure of the retail market. With regard to the prices consumers face it would seem that there are gains to be had if retailers a) are located in close proximity to each other – say two hypermarkets side by side which b) co-operate in terms of buying from producers. In this respect, regulations that restrict the entry of

retailers of certain size in various local markets allow for higher consumer prices. Local costs, measured as annual wages of low skilled workers – a predominant group within the retail market and rents also have an upward impact on prices.

Differences in consumer habits seem to have a larger impact on observed price differences. While some differences may be culturally inclined preferences, e.g. not all are inclined to consume pasta like the Italian regions or consume sparkling water like the Austrian regions, it nevertheless points to the importance of educating and informing consumers that their habits affect the prices they face.

References

1. Alessandria George & Joseph P. Kaboski,. "Pricing-to-Market and the Failure of Absolute PPP," *American Economic Journal: Macroeconomics*, American Economic Association, 2011, 3(1) , pp. 91-127.
2. Balassa, Bela. "The Purchasing-Power Parity Doctrine: A Reappraisal." *Journal of Political Economy*, 1964, *72*(6), pp. 584–96.
3. Broda, Christian and David E. Weinstein. (2008): \Understanding International Price Differences Using Barcode Data", 2008, *NBER Working Paper* No. 14017.
4. Bronnenberg Bart J. and Wilfried R. Vanhonacker. "Limited Choice Sets, Local Price Response and Implied Measures of Price Competition". *Journal of Marketing Research*, 33(2), 1996, pp. 163-173.
5. Bronnenberg Bart J, Jean-Pierre Dubé, Matthew Gentzkow and Jesse M. Shapiro: "Do Pharmacists buy Bayer? Informed Shoppers and the Brand Premium.", 2014, *NBER Working Papers*, No. 20295.
6. Ciapanna Emmanuela and Fabrizio, Colonna, "The effect of retail sector concentration on prices and SME performance in Italy", 2011, mimeo.
7. Cotterill Ronald W., William P. Putsis Jr., and Ravi Dhar, "Market Share and Price Setting Behavior For Private Labels and National Brands", 2000, *Food Marketing Policy Center Research* Report No. 51.
8. Crucini, Mario J., Christopher I. Telmer and Marios Zachariadis , "Understanding European Real Exchange Rates," *American Economic Review*, 2005, 95(3), pp. 724-738.
9. Dumas, Bernard. "Dynamic Equilibrium and the Real Exchange Rate in a Spatially Separated World." *Review of Financial Studies*, 1992, *5*(2), pp. 153–80.
10. Dutta Shantanu, Mark Bergen, Daniel Levy, Mark Ritson and Mark Zbaracki "Pricing As A Strategic Capability", 2002, S*loan Management Review,* 43(3), pp. 61-66.
11. Engel Charles & John H. Rogers, 2004. "European product market integration after the euro," *Economic Policy*, 19(39), pp. 347-384.
12. Ghosh, Atish and Holger Wolf (1994): Pricing in International Markets: Lessons from the Economist", NBER Working Papers, No. 4806.
13. Goldberg Koujianou Pinelopi & Frank Verboven, 2004. "Cross-country price dispersion in the euro era: a case study of the European car market", *Economic Policy*, 19(40), pp. 483-521.
14. Haskel, Jonathan and Holger Wolf, "The Law of One Price: A Case Study", *Scandinavian Journal of Economics*, 2001, 103(4), pp. 545-458.
15. Isard, Peter, "How Far Can We Push the Law of One Price?" *American Economic Review*, 1977, 67(5), pp. 942-948.
16. Krugman, Paul R. "Pricing to Market When the Exchange Rate Changes," in Sven W. Arndt and J. David Richardson, eds., *Real-financial linkages among open economies*. Cambridge, MA: MIT Press, 1987, pp. 49–70.
17. Lach, Saul. "Existence and Persistence of Price Dispersion: An Empirical Analysis." *The Review of Economics and Statistics*, 2002, 84(3), pp. 433-444.
18. Reif Adam and Fabio Rumler. "Within- and Cross-Country Price Dispersion in the Euro Area.", 2014, ECB Working paper series No. XXX
19. Task Force of the Monetary Policy Committee of the European System of Central Banks, "Structural features of distributive trades and their impact on prices in the euro area," , 2011, OccasionalPaper Series 128, European Central Bank.
20. Samuelson, Paul A. "Theoretical Notes on Trade Problems." *Review of Economics and Statistics*, 1964, 46(2), pp. 145–54.
21. Van der Linden Jan. "Consumer prices in Belgium and its neighbouring countries: Policy issues", 2012, Working paper 13-12 Federal Planning Bureau.

Appendix I

location	Region description	NUTS correspondance
AT1	(1) East	AT31
AT2	(1) West	AT34 + AT32 + AT331-AT332 + AT334-335
AT3	(2) North	AT12 + AT111-112
AT4	(2) South	AT22 + AT21 + AT113 + AT333
AT5	(3) Vienna	AT13
BE1	(I) NW prov. of E. & W. Flanders	BE23 + BE25
BE2	(II) NE prov. of Antw, Limb & Fl. Brab	BE21 + BE22 + BE24
BE3	(III) Brussels	BE10
BE4	(IV) SW prov. of Hain & Wa. Brab	BE31 + BE32
BE5	(V) SE prov. of Nam, Liege & Lux	BE33 + BE34 + BE35
DE1	(1) Hamb, Brem, Sch-Hols & N.Sachs	DE5 + DE6 + DE9 + DEF
DE2	(2) Nord Rhein Westfalen	DEA
DE3	(3a) Hess, Rh-Pfalz & Saarland	DEB + DEG + DE7
DE4	(3b) Baden-Wuttemburg	DE1
DE5	(4) Bayern	DE2
DE6	(5+6) Berlin, Meck-Vorp, Brand & S-Anh	DE3 + DE4 + DE8 + DEE
DE7	(7) Thüringen, Sachsen	DED + DEG
ES1	North East	ES512-514 + ES241 + ES243 + **ES53**
ES2	Centre East	**ES52** + ES421 + ES62
ES3	South	ES61 + ES431
ES4	Centre	ES422-425 + ES415-419 + ES411 + ES432
ES5	North West	ES111-114 + ES12 + ES413
ES6	North Centre	ES211-213 + ES22 + ES23 + ES13 + ES412 + ES414
ES7	Barcelona (Area Metropolitana)	ES511
ES8	Madrid (Area Metropolitana)	ES3
FR1	(1) Paris Region	FR1
FR2	(2E) Champagne Alsace	FR21 + FR41 + FR42
FR3	(2N) Nord Picardie	FR22 + FR30 + FR232
FR4	(3N) Normandie Bretagne	FR52 + FR25 + FR231
FR5	(3S) Touraine Charentes	FR51 + FR53 + FR242 + FR244-245
FR6	(4C) Bourgone Auvergne	FR63 + FR72 + FR26 + FR241 + FR243 + FR246
FR7	(4E) Alpes Jura	FR43 + FR711 + FR714-718
FR8	(5E) Provence Lanquedoc	FR81 + FR82 + FR712-713
FR9	(5W) Pyrenees Aquitane	FR61 + FR62
GR1	Attica	EL30
GR2	Salonica	EL122
GR3	North Greece	EL11 + EL13 + EL121 + EL123-127
GR4	Central Greece	EL21 + EL22 + EL24 + EL14
GR5	Peloponnese	EL23 + EL25
GR6	Crete	EL43
IE1	Dublin	IE021
IE2	Rest of Leinster	IE012 + IE022 + IE01*** + IE07*** + IE14*** + IE10***
IE3	Munster	IE023 + IE025 + IE23*** + IE24*** + IE25***
IE4	Connaught/Ulster	IE013 + (IE011 EXC. IE10***)
IT1	(1) NW	ITC
IT2	(2) NE	ITH
IT3	(3) Centre	ITI + ITG2
IT4	(4) S & E & Islands	ITF + ITG1
NL1	Distrikt1 - Cities of Ams, Rott & Hague	NL326 + NL339 + NL332
NL2	Distrikt2 - Prov. of N. Holl, S. Holl & Utrecht	(m)NL32 + (m)NL33 + NL31

NL3	Distrikt3 - Prov. of Gron., Friesl. & Drente	NL1
NL4	Distrikt4 - Prov. of Overij, Gelderl. & Flevol.	NL2
NL5	Distrikt5 - Prov. of Zeel., N. Brab. & Limb.	NL4 + NL34
PT1	(I) Lisbon (Greater)	PT17
PT2	(II) Oporto (Greater)	PT114
PT3	(III) North	PT111-113 + PT115-116 + PT161-162
PT4	(III) South	PT163 + PT16B + PT16C
PT5	(IV) North West	PT117-118 + PT164-169 + PT16A
PT6	(V) South East	PT15 + PT18

Appendix II

Table A: Average Unit Price Values of Branded Products

Product	Unit Equivalent	AT	BE	DE	ES	FR	GR	IE	IT	NL	PT	Mean	S.D
100 % Juice	*L*	1.5		1.2		1.9	1.7	2.8	1.4	1.6	1.3	1.7	30%
Diapers	*PIECE*	0.30	0.25	0.28	0.24	0.31	0.26		0.28			0.27	9%
Ground coffee	*KG*	8.2	11.4	9.0	6.7	8.6	16.8	15.2	10.1	14.9		11.2	32%
Instant coffee	*KG*	21.6	26.4	15.1	19.2	25.5	26.0	27.1	30.5	15.3	15.9	22.3	25%
All Purp. cleaners	*L*	2.7	2.2	1.6	1.8		2.3			2.0		2.1	19%
Auto. Dishw. Det.	*KG*	5.9	8.7	6.2	7.1	7.8		9.3			7.8	7.6	16%
Baby food	*KG*	5.6	6.4	4.7	5.2	6.1	12.2	12.3	8.4	5.0	5.0	7.1	41%
Beer	*L*	1.6	2.0	1.7	1.3	2.2	1.9	3.1	1.7	1.5		1.9	27%
Butter	*KG*	6.1	7.3	6.0	7.7	6.3	10.9		7.7	4.5		7.1	27%
Cat food	*KG*	3.8	4.3	4.2	4.0		3.7	3.7		3.5	4.6	3.9	9%
Cereals	*KG*		7.2		5.5	6.1	7.1	5.3	6.7	6.4	5.7	6.2	12%
Condoms	*PIECE*	0.6	0.4	0.5	0.4	0.5	0.4		0.6		0.6	0.5	17%
CSD	*L*	0.76	0.99	0.68	0.68	0.77	0.97	1.23	0.82	0.89	0.66	0.84	21%
Deodorant	*L*	25.1	20.1	16.3	25.7	23.2	34.7	18.5	27.1		35.0	25.1	26%
Dog food	*KG*	3.9	3.2	6.3	2.6		4.7	3.0		3.1	2.5	3.7	35%
Dry pasta	*KG*	2.3	2.5	1.9	2.5	2.1	1.5	2.7	1.5	2.2	1.5	2.1	21%
Fabric softener	*L*	1.6	2.1	1.4	1.2	0.8	1.5	1.8	0.8		1.2	1.4	32%
Frozen fish	*KG*	12.3	9.4	9.0		9.1		9.4	10.0	7.0		9.5	17%
Ice cream	*L*	5.9	5.4	4.5	7.9	5.1	6.8	4.6	7.7	4.7	5.1	5.8	22%
Jam Strawberry	*KG*	6.1	5.5	5.2	4.2	4.5	6.3	7.7	5.4	3.2		5.4	25%
Laundry Detergent	*KG*		3.6	2.3	2.3						2.1	2.6	27%
	L							4.0	1.7			2.9	57%
Margarine	*KG*	4.1	6.2	3.0	4.3	4.8	7.2		3.5	3.0	4.2	4.5	31%
Milk refrigerated	*L*	1.0	3.2	0.9	1.0		1.1	1.0	1.4	0.7	0.7	1.2	63%
Milk UHT	*L*	0.8	1.0	0.9	0.9	0.8	1.4		1.0	0.7	0.7	0.9	25%
Olive oil	*L*	7.3	7.2	8.8	2.7	6.4	4.4	7.7	4.1		3.5	5.8	37%
Pantyliners	*PIECE*	0.06	0.06	0.04	0.06		0.06	0.06			0.10	0.06	29%
Paper towels	*ROLL*	0.6	0.8	0.5	0.5	0.8	1.4	1.0	0.7	0.5	0.6	0.7	38%
Frozen peas	*KG*	3.1	3.3	2.8				3.1	3.2	2.5	2.4	2.9	13%
Rice	*KG*	2.4	3.3	3.2	1.9	2.8	3.3	6.1	2.8	2.4	1.6	3.0	41%
Shampoo	*L*	10.1	9.9	8.5	8.3	10.3	8.2	8.7	10.1	10.1		9.4	10%
Shaving preps	*L*			13.5					17.5	17.2		16.0	14%
	PACK	2.9	3.4		2.9							3.0	10%
Sugar	*KG*	2.8	3.4	1.8	1.9	1.4		1.6	0.9	1.0		1.8	48%
Tinned peas	*KG*	2.4	2.8	1.3	5.1	4.2		2.3	2.5	2.0		2.8	43%
Tinned tuna	*KG*	9.9	10.2	6.3	11.1	9.5	10.7	7.8	9.7	7.8	8.8	9.2	16%
Toilet tissue	*ROLL*	0.3	0.4	0.3	0.2	0.3	0.5	0.5	0.4	0.3	0.3	0.4	28%
Toothpaste	*L*		26.1	24.5	23.8	25.3	30.2		24.2		27.8	26.0	9%
Vodka	*L*	16.0	15.8	12.2	11.7	15.6	17.8	27.5	11.3		13.6	15.7	31%
Water Sparkling	*L*	0.4	0.7	0.5	0.8	0.6	1.6	0.9	0.4	0.5		0.7	54%
Water Still	*L*	0.51	0.44	0.54	0.31	0.29	0.24	0.95	0.26	0.45		0.44	49%
Wet soups	*KG*	3.6						4.5	6.3			4.8	28%
	L			2.8	2.8	2.2				2.3	2.0	2.4	14%
Whiskey	*L*	18.9	19.8	17.8	15.0	17.7	21.8	35.0	18.4	21.6	17.7	20.4	27%
Average		**5.34**	**6.34**	**5.21**	**5.30**	**6.49**	**7.57**	**7.29**	**6.70**	**4.80**	**6.18**		**27%**

Table B Quantity share of market leader

Product	Unit Equivalent	AT	BE	DE	ES	FR	GR	IE	IT	NL	PT	Mean
100 % Juice	*L*	0.3		0.2		0.2	0.3	0.3	0.1	0.3	0.2	0.2
Diapers	*PIECE*	0.76	0.57	0.66	0.56	0.49	0.66		0.60			0.61
Ground coffee	*KG*	0.2	0.3	0.2	0.2	0.2	0.6	0.2	0.4	0.4		0.3
Instant coffee	*KG*	0.4	0.5	0.2	0.4	0.2	0.9	0.6	0.7	0.5	0.1	0.4
All Purp. cleaners	*L*	0.3	0.3	0.2	0.1		0.4			0.2		0.3
Auto. Dishw. Det.	*KG*	0.4	0.3	0.1	0.3	0.5		0.5			0.3	0.3
Baby food	*KG*	0.7	0.4	0.4	0.3	0.7	0.5	0.4	0.4	0.7	0.5	0.5
Beer	*L*	0.2	0.4	0.1	0.2	0.3	0.3	0.2	0.2	0.2		0.2
Butter	*KG*	0.3	0.2	0.1	0.1	0.2	0.4		0.2	0.3		0.2
Cat food	*KG*	0.2	0.2	0.1	0.2		0.2	0.4		0.2	0.2	0.2
Cereals	*KG*		0.1		0.1	0.1	0.3	0.1	0.1	0.0	0.1	0.1
Condoms	*PIECE*	0.7	0.6	0.3	0.5	0.5	0.5		0.5		0.4	0.5
CSD	*L*	0.38	0.42	0.27	0.50	0.61	0.49	0.18	0.38	0.28	0.37	0.39
Deodorant	*L*	0.2	0.2	0.2	0.1	0.1	0.2	0.3	0.2		0.2	0.2
Dog food	*KG*	0.2	0.2	0.1	0.1		0.1	0.4		0.1	0.1	0.2
Dry pasta	*KG*	0.2	0.5	0.2	0.3	0.3	0.3	0.4	0.4	0.2	0.2	0.3
Fabric softener	*L*	0.4	0.2	0.5	0.2	0.5	0.3	0.6	0.2		0.2	0.3
Frozen fish	*KG*	0.5	0.1	0.3		0.2		0.5	0.1	0.2		0.3
Ice cream	*L*	0.6	0.2	0.2	0.1	0.1	0.1	0.6	0.1	0.2	0.1	0.2
Jam Strawberry	*KG*	0.3	0.2	0.3	0.2	0.3	0.2	0.4	0.2	0.2		0.3
Laundry Detergent	*KG*		0.2	0.3	0.2						0.3	0.2
	L							0.2	0.2			0.2
Margarine	*KG*	0.6	0.2	0.3	0.3	0.2	0.4		0.4	0.3	0.4	0.3
Milk refrigerated	*L*	0.3	0.3	0.1	0.4		0.2	0.3	0.2	0.2	0.7	0.3
Milk UHT	*L*	0.3	0.1	0.1	0.2	0.2	0.3		0.2	0.3	0.3	0.2
Olive oil	*L*	0.2	0.1	0.2	0.1	0.3	0.2	0.4	0.1		0.2	0.2
Pantyliners	*PIECE*	0.47	0.37	0.36	0.46		0.37	0.42			0.41	0.41
Paper towels	*ROLL*	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2
Frozen peas	*KG*	0.4	0.1	0.2				0.4	0.5	0.1	0.2	0.3
Rice	*KG*	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.1	0.2	0.1	0.2
Shampoo	*L*	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1		0.1
Shaving preps	*L*			0.2					0.7	0.3		0.4
	PACK	0.2	0.3		0.3							0.3
Sugar	*KG*	0.9	0.5	0.3	0.6	0.3		0.2	0.2	0.3		0.4
Tinned peas	*KG*	0.2	0.2	0.3	0.1	0.2		0.7	0.2	0.2		0.3
Tinned tuna	*KG*	0.4	0.1	0.2	0.1	0.3	0.5	0.6	0.3	0.3	0.2	0.3
Toilet tissue	*ROLL*	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Toothpaste	*L*		0.3	0.1	0.3	0.4	0.4		0.2		0.6	0.3
Vodka	*L*	0.3	0.2	0.2	0.3	0.3	0.4	0.5	0.2		0.4	0.3
Water Sparkling	*L*	0.3	0.2	0.1	0.3	0.2	0.5	0.3	0.1	0.3		0.3
Water Still	*L*	0.56	0.33	0.19	0.14	0.26	0.26	0.17	0.13	0.25		0.25
Wet soups	*KG*	0.5						0.3	0.6			0.5
	L			0.2	0.4	0.4				0.5	0.5	0.4
Whiskey	*L*	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.2	0.2	0.2
Average		**0.36**	**0.26**	**0.22**	**0.25**	**0.28**	**0.34**	**0.36**	**0.28**	**0.26**	**0.27**	**0.29**

Table C: Quantity share of Private Label

Product	Unit Equivalent	AT	BE	DE	ES	FR	GR	IE	IT	NL	PT	Mean
100 % Juice	*L*	0.3		0.4		0.6	0.2	0.4	0.4	0.3	0.8	0.4
Diapers	*PIECE*	0.23	0.41	0.31	0.34	0.33	0.11		0.14			0.27
Ground coffee	*KG*	0.1	0.5	0.1	0.5	0.3	0.1	0.2	0.1	0.3		0.2
Instant coffee	*KG*	0.2	0.5	0.2	0.4	0.2	0.0	0.1	0.2	0.0	0.2	0.2
All Purp. cleaners	*L*	0.2	0.3	0.3	0.5		0.2			0.3		0.3
Auto. Dishw. Det.	*KG*	0.3	0.2	0.2	0.4	0.3		0.1			0.4	0.3
Baby food	*KG*		0.0	0.0		0.0		0.0	0.0	0.2		0.1
Beer	*L*	0.0	0.2		0.4	0.1	0.2	0.0	0.1	0.1		0.1
Butter	*KG*	0.4	0.4	0.4	0.5	0.4	0.1		0.3	0.4		0.4
Cat food	*KG*	0.3	0.5	0.5	0.5		0.5	0.2		0.2	0.4	0.4
Cereals	*KG*		0.4		0.5	0.3	0.2	0.1	0.1	0.2	0.4	0.3
Condoms	*PIECE*	0.0	0.1	0.1	0.2	0.0	0.0		0.1		0.0	0.1
CSD	*L*	0.13	0.32	0.28	0.22	0.17	0.10	0.02	0.17	0.13	0.23	0.18
Deodorant	*L*	0.1	0.1	0.1	0.2	0.1	0.0		0.1		0.1	0.1
Dog food	*KG*	0.5	0.6	0.7	0.6		0.6	0.3		0.3	0.4	0.5
Dry pasta	*KG*	0.6	0.0	0.5	0.7	0.4	0.2	0.5	0.2	0.3	0.5	0.4
Fabric softener	*L*	0.2	0.3	0.1	0.6	0.3	0.2	0.2	0.2		0.6	0.3
Frozen fish	*KG*	0.3	0.8	0.4		0.6		0.1	0.1	0.3		0.4
Ice cream	*L*	0.3	0.5	0.4	0.8	0.4	0.6	0.2	0.3	0.4	0.5	0.4
Jam Strawberry	*KG*	0.5	0.5	0.4	0.6	0.5	0.4		0.4	0.4		0.5
Laundry Detergent	*KG*		0.3	0.1	0.4						0.2	0.3
	L							0.1	0.1			0.1
Margarine	*KG*	0.0	0.3	0.1	0.4	0.2	0.0		0.2	0.2	0.1	0.2
Milk refrigerated	*L*	0.4	0.2	0.6	0.4		0.1	0.3	0.2	0.4	0.0	0.3
Milk UHT	*L*	0.4	0.8	0.7	0.5	0.4	0.2		0.3	0.3	0.3	0.4
Olive oil	*L*	0.3	0.7	0.5	0.4	0.5	0.3	0.3	0.2		0.3	0.4
Pantyliners	*PIECE*	0.22	0.49	0.30	0.36		0.11	0.25			0.33	0.30
Paper towels	*ROLL*	0.6	0.9	0.8	0.7	0.7	0.6	0.5	0.4	0.4	0.6	0.6
Frozen peas	*KG*	0.5	0.9	0.6				0.3	0.3	0.4	0.4	0.5
Rice	*KG*	0.5	0.6	0.5	0.7	0.5	0.4	0.4	0.4	0.4	0.4	0.5
Shampoo	*L*	0.1	0.2	0.1	0.3	0.1	0.1	0.1	0.1	0.1		0.1
Shaving preps	*L*			0.3					0.0			0.2
	PACK	0.3	0.3		0.3							0.3
Sugar	*KG*	0.0	0.1	0.5	0.0	0.3		0.5	0.3	0.1		0.2
Tinned peas	*KG*	0.3	0.7	0.5	0.8	0.7		0.3	0.5	0.4		0.5
Tinned tuna	*KG*	0.2	0.8	0.5	0.7	0.5	0.4	0.2	0.3	0.0	0.5	0.4
Toilet tissue	*ROLL*	0.4	0.8	0.7	0.8	0.7	0.6	0.4	0.4	0.2	0.6	0.6
Toothpaste	*L*		0.1	0.1	0.2	0.1	0.0		0.0		0.1	0.1
Vodka	*L*		0.4	0.5	0.5	0.2	0.1	0.1	0.1			0.3
Water Sparkling	*L*	0.1	0.5	0.2	0.1	0.2	0.0	0.5	0.1	0.2		0.2
Water Still	*L*	0.14	0.21	0.36	0.30	0.23	0.11	0.29	0.09	0.23		0.22
Wet soups	*KG*	0.1						0.1	0.1			0.1
	L			0.3	0.3	0.2				0.2	0.4	0.3
Whiskey	*L*	0.1	0.3	0.2	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.1
Average		**0.27**	**0.42**	**0.36**	**0.44**	**0.33**	**0.21**	**0.24**	**0.20**	**0.24**	**0.34**	**0.30**

Table D: Consumer Cost Indifference (average pack-size)

Product	Unit Equivalent	AT	BE	DE	ES	FR	GR	IE	IT	NL	PT	Mean
100 % Juice	*L*	1.07		1.21			0.80	0.90	0.93	1.14	0.83	0.98
Diapers	*PIECE*	38.0	57.1	36.8	63.2		38.4		28.4			43.6
Ground coffee	*KG*	0.50	0.31	0.45	0.28		0.27	0.27	0.41	0.28		0.35
Instant coffee	*KG*	0.23	0.21	0.23	0.16		0.14	0.14	0.10	0.20	0.15	0.17
All Purp. cleaners	*L*	0.97	1.38	0.95	1.35		1.17			0.99		1.13
Auto. Dishw. Det.	*KG*	1.25	1.01	0.92	0.78	0.82		0.70			1.04	0.93
Baby food	*KG*	0.30	0.34	0.24	0.33	0.34	0.33	0.19	0.22	0.29	0.36	0.29
Beer	*L*	0.67	1.80	2.50	0.78		0.82	1.78	0.75	1.96		1.38
Butter	*KG*	0.25	0.26	0.24	0.28	0.28	0.25		0.22	0.25		0.25
Cat food	*KG*	0.29	0.43	0.19	0.67		0.34	0.63		0.50	0.60	0.46
Cereals	*KG*		0.51		0.44		0.41	0.54	0.39	0.40	0.47	0.45
Condoms	*PIECE*	12.64	10.14	10.57	12.21		10.54		10.58		7.98	10.67
CSD	*L*	1.39	2.21	1.94	1.11	1.86	1.14	1.22	1.32	1.63	1.53	1.54
Deodorant	*L*	0.11	0.14	0.12	0.11	0.14	0.09	0.15	0.10		0.09	0.12
Dog food	*KG*	0.52	1.30	0.34	2.40		1.26	1.04		0.75	3.80	1.43
Dry pasta	*KG*	0.68	0.58	0.55	0.53		0.59	0.55	0.59	0.50	0.53	0.57
Fabric softener	*L*	1.52	1.75	1.08	1.94		1.89	1.35	2.72		2.64	1.86
Frozen fish	*KG*	0.43	0.56	0.38				0.40	0.40	0.43		0.43
Ice cream	*L*	0.56	0.99	0.76	0.53		0.89	0.73	0.43	0.66	0.82	0.71
Jam Strawberry	*KG*	0.38	0.39	0.32	0.34		0.41	0.32	0.37	0.42		0.37
Laundry Detergent	*KG*		2.65	2.21	2.81						4.02	2.92
	L							1.48	3.01			2.25
Margarine	*KG*	0.34	0.39	0.44	0.40	0.40	0.36		0.28	0.43	0.40	0.38
Milk refrigerated	*L*	0.94	0.64	1.03	1.19		1.10	1.48	0.93	1.10	1.01	1.05
Milk UHT	*L*	0.97	1.96	1.01	1.39		1.00		0.95	0.99	1.15	1.18
Olive oil	*L*	0.65	0.91	0.59	1.19		2.08	0.58	0.98		0.92	0.99
Pantyliners	*PIECE*	38.6	46.0	46.2	32.1		33.1	29.4			24.1	35.6
Paper towels	*ROLL*	5.0	4.7	4.1	3.6	5.4	1.9	2.6	2.9	4.0	3.1	3.7
Frozen peas	*KG*	0.61	0.65	0.61				0.65	0.65	0.56	0.62	0.62
Rice	*KG*	0.75	0.73	0.60	0.91		0.64	0.53	0.88	0.90	0.93	0.76
Shampoo	*L*	0.31	0.32	0.28	0.36	0.32	0.46	0.34	0.26	0.26		0.32
Shaving preps	*L*			0.19					0.18	0.18		0.19
	PACK	1.02	1.01		1.02							1.02
Sugar	*KG*	0.75	0.83	0.67	0.84			0.87	0.99	0.88		0.83
Tinned peas	*KG*	0.38	0.47	0.67	0.23			0.38	0.50	0.43		0.44
Tinned tuna	*KG*	0.19	0.22	0.19	0.24	0.23	0.32	0.31	0.27	0.18	0.13	0.23
Toilet tissue	*ROLL*	10.8	12.3	8.90	19.4	13.2	9.6	7.8	8.4	12.7	12.3	11.5
Toothpaste	*L*		0.09	0.08	0.09	0.09	0.08		0.09		0.08	0.09
Vodka	*L*	0.68	0.72	0.65	0.73	0.77	0.71	0.56	0.69		0.70	0.69
Water Sparkling	*L*	1.6	3.4	4.5	1.2		1.0	1.6	1.6	1.5		2.0
Water Still	*L*	1.76	4.03	3.04	2.12		3.84	1.62	1.85	2.08		2.54
Wet soups	*KG*	0.52						0.48	0.22			0.41
	L			0.53	0.83					0.86	0.77	0.75
Whiskey	*L*	0.67	0.71	0.71	0.75	0.86	0.72	0.50	0.70	0.82	0.71	0.71

Table E: Consumption Intensity

Product	Unit Equivalent	AT	BE	DE	ES	FR	GR	IE	IT	NL	PT	Mean
100 % Juice	*L*	1.3		0.7		0.6	0.4	0.4	0.9	0.4	0.1	0.6
Diapers	*PIECE*	2.77	3.19	2.35	3.32	3.41	2.45		2.47			2.85
Ground coffee	*KG*	0.21	0.24	0.18	0.09	0.15	0.02	0.01	0.16	0.30		0.15
Instant coffee	*KG*	0.02	0.02	0.04	0.02	0.02	0.03	0.02	0.00	0.02	0.02	0.02
All Purp. cleaners	*L*	0.06	0.17	0.05	0.21		0.10			0.12		0.12
Auto. Dishw. Det.	*KG*	0.07	0.04	0.09	0.09	0.05		0.02			0.04	0.06
Baby food	*KG*	0.02	0.04	0.08	0.05	0.13	0.01	0.04	0.08	0.03	0.04	0.05
Beer	*L*	3.88	2.69	9.11	1.81	1.03	0.44	1.90	0.97	3.08		2.77
Butter	*KG*	0.17	0.14	0.22	0.02	0.19	0.01		0.03	0.06		0.11
Cat food	*KG*	0.40	0.50	0.28	0.13		0.07	0.23		0.28	0.19	0.26
Cereals	*KG*		0.18		0.12	0.12	0.10	0.45	0.08	0.14	0.18	0.17
Condoms	*PIECE*	0.14	0.04	0.10	0.10	0.09	0.12		0.06		0.07	0.09
CSD	*L*	2.59	5.22	3.94	3.15	2.10	1.23	5.24	2.10	3.80	1.63	3.10
Deodorant	*L*	0.02	0.02	0.03	0.03	0.02	0.01	0.03	0.01		0.01	0.02
Dog food	*KG*	0.19	0.41	0.21	0.37		0.11	0.44		0.25	0.50	0.31
Dry pasta	*KG*	0.07	0.04	0.05	0.06	0.05	0.10	0.03	0.14	0.06	0.14	0.07
Fabric softener	*L*	0.15	0.25	0.17	0.43	0.29	0.27	0.15	0.47		0.34	0.28
Frozen fish	*KG*	0.07	0.17	0.08		0.07		0.07	0.10	0.10		0.10
Ice cream	*L*	0.22	0.28	0.22	0.23	0.22	0.04	0.25	0.21	0.30	0.18	0.21
Jam Strawberry	*KG*	0.01	0.04	0.02	0.02	0.02	0.01	0.00	0.01	0.03		0.02
Laundry Detergent	*KG*		0.60	0.33	0.71						0.63	0.56
	L							0.28	0.68			0.48
Margarine	*KG*	0.12	0.32	0.22	0.05	0.10	0.10		0.01	0.43	0.14	0.17
Milk refrigerated	*L*	1.95	0.05	0.69	0.06		1.80	5.35	0.80	2.44	0.13	1.47
Milk UHT	*L*	0.4	2.8	1.2	4.8	2.6	0.0		1.8	0.7	4.2	2.1
Olive oil	*L*	0.03	0.06	0.02	0.63	0.07	0.26	0.02	0.28		0.26	0.18
Pantyliners	*PIECE*	3.13	3.14	3.26	0.23		1.78	0.99			4.31	2.40
Paper towels	*ROLL*	0.7	0.9	0.6	0.7	1.0	0.3	0.5	0.7	0.8	0.6	0.7
Frozen peas	*KG*	0.02	0.01	0.01				0.04	0.06	0.01	0.06	0.03
Rice	*KG*	0.13	0.12	0.07	0.32	0.14	0.12	0.09	0.21	0.16	0.65	0.20
Shampoo	*L*	0.06	0.05	0.06	0.08	0.06	0.07	0.04	0.07	0.03		0.06
Shaving preps	*L*			0.00					0.00	0.00		0.00
	PACK	0.02	0.02		0.02							0.02
Sugar	*KG*	0.35	0.34	0.26	0.33	0.25		0.25	0.38	0.30		0.31
Tinned peas	*KG*	0.00	0.04	0.02	0.01	0.03		0.08	0.04	0.04		0.03
Tinned tuna	*KG*	0.03	0.06	0.02	0.17	0.07	0.02	0.03	0.14	0.02	0.11	0.07
Toilet tissue	*ROLL*	3.37	3.53	2.08	5.23	3.77	2.00	2.49	3.01	4.55	3.73	3.38
Toothpaste	*L*		0.02	0.02	0.02	0.02	0.01		0.02		0.02	0.02
Vodka	*L*	0.03	0.02	0.03	0.01	0.02	0.01	0.06	0.00		0.01	0.02
Water Sparkling	*L*	4.72	1.57	6.35	0.10	1.21	0.07	0.19	3.45	0.42		2.01
Water Still	*L*	0.62	5.18	1.66	5.25	5.41	2.82	1.52	6.84	0.65		3.33
Wet soups	*KG*	0.04						0.12	0.04			0.06
	L			0.03	0.13	0.15				0.27	0.11	0.14
Whiskey	*L*	0.01	0.04	0.01	0.04	0.12	0.03	0.04	0.01	0.05	0.03	0.04

Table F: Characterizing the Min Max differences

		Min Max prices and locations					*Market share of leader*			*Private label*			*Cons. Intens.*			*Cons. Indiff.*		
Product	**Unit Equivalent**	**Max**	**Country**	**Min**	**Country**	**Diff**	**Max**	**Min**	**Diff**	**Max**	**Min**	**Diff**	**Max**	**Min**	**Diff**	Max	**Min**	**Diff**
100 % Juice	*L*	2.73	IE	1.16	DE	136%	0.31	0.25	23%	0.41	0.41	0%	0.43	0.77	-44%	0.95	1.48	-35%
Diapers	*PIECE*	0.33	GR	0.21	DE	61%	0.63	0.60	4%	0.09	0.35	-74%	2.33	2.32	0%	41.3	54.2	-24%
Ground coffee	*KG*	14.64	IE	5.21	FR	181%	0.27	0.18	48%	0.21	0.24	-15%	0.01	0.17	-94%	0.34		
Instant coffee	*KG*	42.17	IT	9.63	FR	338%	0.61	0.14	343%	0.22	0.23	-4%	0.00	0.02	-97%	0.10		
All Purp. cleaners	*L*	2.13	GR	1.46	ES	46%	0.45	0.11	294%	0.18	0.45	-59%	0.13	0.22	-41%	1.17	1.56	-25%
Auto. Dishw. Det.	*KG*	10.41	IE	6.24	PT	67%	0.54	0.29	89%	0.14	0.33	-56%	0.03	0.03	-7%	0.73	1.38	-47%
Baby food	*KG*	12.41	GR	3.06	DE	305%	0.49	0.36	35%	.	0.04		0.02	0.09	-83%	0.32	0.29	12%
Beer	*L*	3.22	IE	1.15	ES	181%	0.18	0.17	4%	0.01	0.44	-98%	2.31	2.13	9%	1.41	1.03	38%
Butter	*KG*	11.24	GR	5.07	DE	122%	0.27	0.16	71%	0.04	0.34	-87%	0.01	0.39	-96%	0.24	0.25	-6%
Cat food	*KG*	4.27	DE	1.86	ES	130%	0.09	0.14	-34%	0.60	0.51	17%	0.46	0.18	151%	0.21	1.33	-84%
Cereals	*KG*	10.23	BE	4.07	IE	152%	0.12	0.11	18%	0.42	0.12	234%	0.20	0.58	-67%	0.52	0.63	-17%
Condoms	*PIECE*	0.80	AT	0.42	GR	89%	0.66	0.49	34%	0.04	0.01	355%	0.15	0.08	97%	10.3	10.8	-4%
CSD	*L*	1.57	IE	0.83	DE	89%	0.18	0.39	-54%	0.02	0.22	-90%	4.67	4.00	17%	0.98	2.20	-55%
Deodorant	*L*	49.37	GR	14.27	DE	246%	0.17	0.15	13%	0.05	0.08	-40%	0.00	0.03	-86%	0.08	0.13	-42%
Dog food	*KG*	4.49	GR	1.43	ES	213%	0.11	0.08	32%	0.59	0.55	8%	0.11	0.53	-78%	0.46	5.68	-92%
Dry pasta	*KG*	2.78	AT	1.25	IT	122%	0.17	0.37	-55%	0.62	0.17	254%	0.07	0.13	-44%	0.51	0.72	-30%
Fabric softener	*L*	2.29	BE	0.73	IT	215%	0.23	0.24	-5%	0.22	0.34	-35%	0.55	0.24	129%	3.24	1.87	74%
Frozen fish	*KG*	15.11	IT	5.23	NL	189%	0.10	0.21	-52%	0.11	0.24	-53%	0.08	0.10	-24%	0.36	0.49	-28%
Ice cream	*L*	12.36	GR	2.17	NL	469%	0.07	0.18	-60%	0.53	0.34	54%	0.01	0.37	-97%	0.47	0.62	-24%
Jam Strawberry	*KG*	7.34	IE	1.93	NL	281%	0.43	0.25	73%	.	0.38		0.01	0.05	-89%	0.34	0.45	-23%
Laundry Detergent	*KG*	4.21	BE	2.16	DE	95%	0.19	0.25	-23%	0.32	0.13	152%	0.53	0.37	41%	3.03	1.70	78%
	L	4.11	IE	2.15	IT	92%	0.26	0.21	24%	0.10	0.06	55%	0.22	0.64	-65%	1.55	3.59	-57%
Margarine	*KG*	6.49	FR	2.08	DE	212%	0.26	0.41	-36%	0.15	0.13	11%	0.06	0.11	-44%	0.34	0.49	-30%
Milk refrigerated	*L*	1.61	IT	0.48	NL	237%	0.21	0.33	-38%	0.16	0.31	-48%	0.98	2.22	-56%	0.92	1.04	-12%
Milk UHT	*L*	2.12	GR	0.58	FR	263%	0.28	0.14	102%	0.20	0.43	-54%	0.05	3.04	-98%	0.99		
Olive oil	*L*	8.75	BE	2.71	ES	223%	0.10	0.13	-17%	0.70	0.51	36%	0.05	0.49	-91%	0.63	1.47	-57%
Pantyliners	*PIECE*	0.12	PT	0.05	DE	163%	0.47	0.39	21%	0.29	0.30	-5%	3.60	3.06	17%	22.7	53.8	-58%
Paper towels	*ROLL*	1.33	GR	0.35	NL	286%	0.17	0.14	23%	0.53	0.35	50%	0.07	0.88	-92%	2.23	4.21	-47%
Frozen peas	*KG*	5.11	AT	1.48	NL	246%	0.46	0.15	217%	0.46	0.38	22%	0.01	0.01	33%	0.37	0.45	-18%
Rice	*KG*	5.48	IE	0.97	PT	464%	0.37	0.12	219%	0.46	0.33	38%	0.09	0.83	-90%	0.41	1.00	-59%
Shampoo	*L*	13.44	FR	8.40	GR	60%	0.14	0.16	-12%	0.09	0.04	114%	0.05	0.12	-55%	0.28	0.45	-38%

Shaving preps	*L*	17.60	NL	13.78	DE	28%	0.25	0.17	44%	.	0.39		0.00	0.00	-41%	0.20	0.19	2%
	PACK	3.65	AT	2.93	BE	24%	0.15	0.33	-54%	0.34	0.30	12%	0.02	0.02	-8%	1.00	1.01	-1%
Sugar	*KG*	1.57	FR	0.85	IT	85%	0.38	0.14	164%	0.32	0.28	14%	0.14	0.41	-65%		1.00	
Tinned peas	*KG*	10.09	ES	1.61	NL	528%	0.04	0.14	-74%	0.90	0.41	122%	0.01	0.04	-78%	0.19	0.34	-46%
Tinned tuna	*KG*	14.10	BE	8.17	ES	73%	0.08	0.09	-8%	0.81	0.72	14%	0.08	0.15	-47%	0.16	0.28	-44%
Toilet tissue	*ROLL*	0.67	IE	0.19	ES	257%	0.17	0.17	3%	0.40	0.70	-43%	2.29	5.03	-54%	7.1	25.7	-73%
Toothpaste	*L*	29.61	GR	21.25	ES	39%	0.36	0.32	11%	0.05	0.26	-82%	0.02	0.02	44%	0.08	0.09	-6%
Vodka	*L*	29.28	IE	9.49	IT	208%	0.46	0.23	101%	0.13	0.09	50%	0.06	0.00	1321%	0.46	0.70	-34%
Water Sparkling	*L*	2.51	GR	0.21	ES	1069%	0.27	0.27	1%	.	0.11		0.01	0.06	-84%	1.06	1.49	-29%
Water Still	*L*	1.27	IE	0.12	FR	954%	0.20	0.25	-19%	0.25	0.29	-15%	1.31	5.78	-77%	1.20		
Wet soups	*KG*	5.92	IT	3.37	AT	76%	0.55	0.51	8%	0.09	0.11	-15%	0.02	0.04	-54%	0.23	0.51	-56%
	L	3.42	DE	1.39	PT	146%	0.13	0.58	-78%	0.29	0.34	-12%	0.04	0.07	-46%	0.48	0.98	-51%
Whiskey	*L*	37.63	IE	11.35	ES	232%	0.38	0.21	82%	0.08	0.19	-56%	0.03	0.04	-26%	0.47	0.87	-46%
Median						181%			12%			-2%			-51%			-30%

Table G: IV-estimates

VARIABLES	(1)	(2)	(3)	(4)
log average quantity of non-leading brands difference vs min loc	-0.0215***	-0.0326***	-0.0325***	-0.0476***
	(0.00137)	(0.00132)	(0.00131)	(0.00139)
log of private label quantities vs min loc	-0.000117	0.00341***	0.00587***	0.00862***
	(0.00136)	(0.00119)	(0.00119)	(0.00126)
log of market leader difference vs min loc	0.0481***	0.0199***	0.0210***	0.0272***
	(0.00251)	(0.00233)	(0.00233)	(0.00266)
log of consumer intensity vs min loc		-0.0621***	-0.0642***	-0.0736***
		(0.00123)	(0.00123)	(0.00131)
log of consumer cost indifference vs min loc		-0.450***	-0.444***	-0.428***
		(0.00293)	(0.00293)	(0.00304)
VAT Diff vs min loc			0.00690***	0.0115***
			(0.000235)	(0.000280)
Sales Dummy vs min loc			-0.0551***	-0.0483***
			(0.00477)	(0.00513)
log HHI 5 km Parent level vs min loc				0.247***
				(0.00647)
log HHI 5 km Buying group vs min loc				-0.374***
				(0.00791)
log of wages vs min loc	0.154***	0.131***	0.139***	0.105***
	(0.00329)	(0.00290)	(0.00291)	(0.00314)
log of rents vs min loc	-0.000883	0.0110***	0.0149***	0.101***
	(0.00427)	(0.00417)	(0.00416)	(0.00437)
Observations	204834	165078	165078	149718
R-squared	0.234	0.412	0.415	0.423
F-Stat	801.8	1485	1472	1362

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1,*

Time Dummies and Product Unit Equivalent Dummies Not Shown

Appendix III: Average pack size and the data. Some anecdotes:

Nielsen also provides the three most popular pack sizes (or stock keeping units-SKUs) for each brand in each product category. Some delving into the details provides us with some interesting insights regarding consumer habits when shopping. We can consider two examples: juice and sparkling water. Consider the following: In Greece (the country with the lowest average pack size in Juice), the most popular pack size of 100% juice is most often the personalised pack size between 250-500 ml, while in Germany (the country with the highest average pack size in Juice) these pack sizes are not within the top three SKUs in any brand. A Greek family with 2 kids tends to pack their lunchboxes with an individual 500ml bottle. The 500ml bottle price implies a litre cost of about 2 euro (about twice as much as a 1 or 1.5 litre bottle). With approximately 200 lunch box days per year this implies an extra cost of 200€ per family and year, just for juice. By contrast, a German family would buy the kids canteens which are filled up each day from a 1.5 or 2 litre bottle. In sum, the Greek consumers' choice of packing a personal bottle rather than filling two canteens from a 2 litre bottle is costly.

Consider also sparkling water which exhibits significant price dispersion. Consider Italy and Austria which have the lowest average price, see Table A in Appendix II: out of the 12 SKUs reported only 3 for Italy and 1 for Austria are for packs with less than 0.75 litres and the per litre price for smaller packs is between 25 to 100 % more expensive, within each brand. Now consider Greece: out of all SKUs only 3 are 0.75 litres or more, despite that all brands have packages that are at least 0.75 or more at the shelves (most SKUs are four or six packs of small bottles). Even so, when comparable, the price of small bottles is about twice that of larger bottles. This implies that that the Greek unit price could be almost halved if consumers bought larger bottles. However, while sparkling water in Italy and Austria is 'just' water sparkling water in Greece is considered to be more akin to a csd or even a luxury good and is consumed accordingly. Thus while one could expect an informed consumer to buy larger packs of juice, we should not necessarily expect Greeks will be as cost-conscious as Italians and Austrians with regard to sparkling water so as to bring prices down. Thus, while systematic differences in shopping habits play an important role in the prices consumers face we should consider our empirical results as an upper bound to what is feasible and economically meaningful to attain by making consumers aware of the effects of their shopping attitudes.