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EXPLAINING THE ENDURANCE OF PRICE LEVEL DIFFERENCES IN THE EURO AREA

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ABSTRACT

In this paper we anaIyse price level differences in the euro area focusing on the impact of market structure and exploring how consumer behaviour can influence firms' pricing. We consider two elements of market structure: producer market competition structure and the less explored structure of retail market competition. Regarding consumer behaviour we focus primarily on consumer habits. 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. The competition structure of the goods' producers is found to be an important determinant of price differences. However, we also find that retail market structure and consumer habits also matter, explaining a significant and economically meaningful share of observed price differences. This points to possible new and important determinants of price differences across countries that go beyond the traditional goods market structure.

JEL codes: D4, E31, F41, C23

Keywords: Market structure, consumer behaviour, international relative prices, law of one price.

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1 Introduction

The law of one price (LOP) posits that "a good must sell for the same price in all locations". However, deviations from the LOP have been found to be significant and persistent over time.[1] Even within the euro area, which does not have any internal barriers to trade and where exchange rate fluctuations have been eliminated, the empirical evidence suggests that while price dispersion across countries has decreased over time, it still remains significant. [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 and pricing to market effects, Krugman (1987) and productivity differences between trade and non-traded goods, Balassa (1964) and Samuelson (1964). The empirical work is supportive of pricing-to-market models and it has found that for tradable products, pricing-to-market factors are more important than non-traded inputs.[3] Even so, the tradability of a good and the share of non-traded inputs required for its production and distribution are also found to be important determinants of international price differences, Cruccini et. al. (2005). Other factors are also found to be important in explaining international price differences, such as menu costs, Ghosh and Wolf (1994), as well as distance and the 'border' effect, Engel and Rogers (1994)).

More recent studies consider consumer behaviour as an additional factor that may determine international price differences. For instance, Alessandria and Kaboski (2011) emphasize search frictions as a source of market power and pricing-to-market. They develop a model based on consumer search frictions and find that pricing-to-market appears strongest for those goods for which search frictions are likely to be most important. [4]

The aim of this paper is to investigate the causes of price differences in the euro area going beyond traditional pricing-to-market explanations and exploring further the interaction between firms' pricing and consumer behaviour, with particular emphasis on consumer habits. To our knowledge, this is the first attempt to consider consumer behaviour

[1] See for example: Isard (1977), Haskel and Wolf (2001), Lach (2002), Anderson and van Wincoop (2004)
[2] See Goldberg and Verboven (2004), Engel and Rogers (2004)), Berlingierim et al (2018), and Reif and Rumler (2019).
[3] See Alessandria and Kaboski (2011).
[4] Other aspects of consumer behavior such as shopping habits and their implications for consumption expenditure have also been analysed in the literature eg. Yan et. al (2013) and Griffith et. al. (2009).

as a determinant of price differentials in the euro area. Further, since final good prices have a non-traded component, i.e. a transportation and distribution component, we go beyond the traditional pricing-to-market explanations, which emphasise the monopoly power of the seller and examine also the impact of differences across countries in the retail outlets' competition. We therefore delve deeper into the non-traded component that Cruccini et. al. (2005) have found to be a significant determinant of international price differences.

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 competition, retail market concentration, local costs and consumer habits explain a significant part of branded product price differences across countries. In terms of economic importance, it seems that each block of factors has a similar effect in terms of magnitude on price differences with consumer habits, appearing to have a somewhat higher impact. By contrast, macroeconomic factors, such as income levels (GDP per capita) and unemployment are unimportant.

From a policy perspective, our results imply that price differences are set to remain even after further product market integration. Price differences will continue due to specific characteristics of retail markets that influence the non-traded component of the product sales as well as differences in consumer habits.

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 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.[5] In

[5] 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.

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 also available on the number of packs sold.

In particular, the full dataset is multidimensional, contains approximately 3.5 million observations and covers 45 product categories in total.[6] 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 country. Moreover, for each branded product there are also data on the three most popular pack sizes or stock-keeping units "SKUs".[7]

Even though there are 'missing brands' in each market, the data available (four brands and private labels) have a mean and median coverage of total sales of 75% and 78% respectively. The high coverage on average by just 4 brands and private label products, is a strong indication that most product categories in our dataset can be characterised as oligopolistic markets (as opposed to monopolistic competition which is found in most 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).[8] 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 regional macro data from Eurostat's regional database.[9] The data have been

[6] (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.

[7] Consider a brand like Pampers. The number of pack sizes or SKUs of pampers is 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. In the data set only the most popular pack sizes are provided.

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

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

converted from four-weekly frequency to monthly calendar covering a period of just over 3 years, from September 2008 to December 2011 (inclusive).

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.[10] 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.[11] 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.

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 of prices since our dataset covers a period that coincides with the first years of their adoption of the euro.

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 for these products 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 of unit prices challenging. Chocolate is also dropped as the reporting is often done in country specific sub-categories.[12] 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

[10] 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.
[11] See for example Dutta S. et al (2002) "Pricing as a strategic capability", MIT Sloan management review.
[12] 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.

location as branded goods may not be representative for that market.[13] Finally as the start and end 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.

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.[14] In the distribution, a value of -0.5 (0.5) implies that an observation is 50 per cent below (above) the euro area average.[15]

Figure 1 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 and b) the country-specific clustering of prices for each product which is shown anon.

[13] Market leaders refer to brands with the highest quantity share for a product in a location.
[14] 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.
[15] For presentational purposes, we truncate the graphs at 3.

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.[16]

In order to view the full range of price dispersion, within the single market, among products with similar quality we compare the time averaged minimum and maximum unit value prices of market leaders (within each product category) 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). By contrast, 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.

In Figure 2 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

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

leader in Greece is still higher than the region with the most expensive market leader in Ireland (which is the second most expensive country).[17]

Figure 2 also shows that there are no 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 sufficient condition as even a switch of market leader often produces only marginal price differences, e.g. Ground coffee in Austria).

While in this example the market leading brands differ across countries, the country specific clustering is also observed when the market leader (or a Pan-European brand) is the same across countries, This can be seen in Figure 3, which charts the minimum and maximum unit prices of the same brand for two different products. 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.[18]

Thus, on balance, we observe a strong country specific clustering in prices and reaffirm that there is significant price dispersion within the euro area. Some of the potential drivers of these price level differences may be found in market characteristics and consumer habits and we delve deeper into these in the analysis below.

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

[18] It may be argued that a comparison of extremes is not a justified approach, and that a comparison between different percentiles would reflect better euro area price dispersion. Still, when comparing different percentiles (see Figure A in Appendix II) we see that price differences remain substantial up to a comparison of the 20th and the 80th percentile.

2.2.1 Producer market characteristics and consumer habits

If we, for illustrative purposes, focus again on a min-max comparison, i.e. between the least and most expensive countries, there are some consistent differences in terms of producer market characteristics and consumer habits across countries.[19]

From the producer market point of view, Greece and Ireland (very often ranked as the most expensive locations for a product) 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 (very often ranked as the least expensive locations for a product) seem 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 Appendix II).[20] In effect, in countries where the marker share of the market leading brands is lower, overall prices tend to be lower as sellers tend to be more disciplined in markets where there are many of competitors (Knetter 1993).

Consumer behaviour also seems to differ between the most and least expensive locations for the various products. 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 Appendix II). By contrast, German and Spanish consumers seem to purchase larger pack size and to have higher consumption intensity on average.

In order to understand the differences in consumer and producer behaviour and how they can lead to cross country price differences, we need to think about two dimensions of consumer demand. Firstly, differences in preferences across countries. This can be captured by different demand elasticities. Secondly, the differences in market structure and how this interacts with the different demand elasticities. If country A has a more inelastic demand for a particular type of good, then the markups of price over marginal cost will tend to be higher. Moreover, within a market, larger firms will have a less elastic demand than smaller

[19] Country rankings in terms of least to most expensive and the non-overlap of prices do not change if the analysis is done with unit prices where VAT is excluded.
[20] While the data have a regional aspect, they are presented in country basis in Appendix II for presentational ease.

firms. These two factors can explain both the national differences and how these relate to market structure. To illustrate this with a simple model, we can assume that for each country N consumers have preferences over K categories of goods and services j:

$$U^N = U^N(C_1, C_2 \dots C_j .. C_K)$$

Within each of the categories, preferences are defined over the n(j) brands with a CES sub-utility function:

$$C_j = \left[\sum_{i=1}^{n(j)} \delta_{ij} \, C_{ij}^{\frac{\sigma}{\sigma-1}} \right]^{\frac{\sigma-1}{\sigma}}$$

This gives rise to the following demand for each individual product

$$C_{ij} = a \left(\frac{P_{ij}}{P_i} \right)^{-\sigma} \frac{C_j}{n(j)}$$

Where P_{ij} is the price of brand i, P_j is the price-index for category j and a is a constant that depends on the δ_{ij}. In the standard case of monopolistic competition where each seller takes the general price of product j as given, the elasticity of demand for each seller i is simply σj. However, in a Bertrand oligopoly where firms set prices taking into account the effect of their price on the overall price j, we have the elasticity of demand ε_{ij} for seller i of product j as:

$$\varepsilon_{ij} = \frac{d \ln C_{ij}}{d \ln P_{ij}} = \sigma \left(1 - \frac{d \ln P_j}{d \ln P_{ij}} \right)$$

Hence since $\left(d \ln P_j / d \ln P_{ij} \right)$ equals the expenditure share of brand i in category j, α_{ij}, it follows that[21]:

$$\varepsilon_{ij} = \sigma j (1 - \alpha_{ij})$$

As we can see, a higher market share means a less elastic demand for seller i. Thus, in markets where the leading brands have a significant market share, the markups of the

[21] It is a general property of homothetic preferences, including CES, that the elasticity of the overall price P_j index to an individual price P_{ij} is equal to the budget share α_{ij} (the budget share itself will be a homogeneous to degree 0 function of the individual prices).

leading brands will be larger than those of sellers with a low market share. As the price of *ij* increases, it also causes the price category *j* to rise. This "own price" effect, on the general price level, means that for a given rise in the price of seller *ij*, the sellers' *i* price relative to category price *j* rises by less than proportionately, because the sellers' price enters significantly into the category price.[22] Further, the higher the expenditure on good *j* the lower the marginal cost due to economies of scale. Therefore, in markets where consumers spend more on good j the marginal cost and prices will tend to be lower.

2.2.2 Retail market characteristics

An important intermediate step between producers and consumers when determining price levels is the retail market. In effect, retailers set the prices of most consumer goods. Therefore, when it comes to market structure, what matters for the prices consumers pay is competition both at the producers' and at the retailers' market. One way to measure retail market competition is through concentration measures, such as the Herfindahl-Hirschman Index (HHI). However, when assessing the market power of retailers it is important to account not only for downstream market competition (i.e. with respect to consumers) but also for upstream market competition (i.e. with respect to producers, 'buying power' of retailers), as the latter will determine significantly the price at which the retailer buys the product from the producer.[23,24] Recent research has found that concentration and prices tend to move in the same direction when looking at downstream market competition whereas they tend to be negatively related at the buying group level (see Ciapanna and Rondinelli, 2014).

In order to explore whether differences in retail market competition matter for price differences in the euro area we use two measures of retail market competition.[25] In particular, these measures are HHIs based on the market share of retailers in terms of sales area in square meters and capture both downstream and upstream market competition. Local (5km radius) and regional HHI indices are calculated from a unique dataset

[22] In the classical monopolistic competition model, the category price level j would not rise at all, as each seller's market share is approximately zero. Hence, his/her price does not enter the category price level in a significant manner and the "own price" effect is zero.

[23] For an analysis of alternative measures of retail market competition, see ECB (2011) – *Report of the ESCB Task force on the "Structural features of distributive trades and their impact on prices in the Euro Area".*

[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 (2011).

[25] See ECB (2011) for the development of these measures.

encompassing the exact location of over 100,000 individual grocery stores across the euro area, for 2010. [26] We present in Table 2 below the local and regional HHI indices for downstream market competition - parent company level - and the upstream retail market competition -buying group level.[27] As Table 2 shows, there are significant cross-country differences in retail market competition and these cross-country differences are consistent across alternative measures of retail market competition.

One could note that the magnitudes of the HHIs differ depending on the 'reference location' used for the calculation of the indices. The regional HHIs are generally lower in magnitude than the local ones, implying lower concentration at the regional level. This difference is reasonable since the reference area used for HHI calculation differs. However, the main conclusion that there are noticeable cross-country differences in retail market competition remains. Further, the ranking of many countries in terms of retail market concentration also remains. For instance, Greece and Germany have high (above average) downstream concentration at the parent group level and Spain low (below average). Similarly, Germany and Netherlands have high (above average) upstream concentration at the buying group level and Spain low irrespective of the measured used.

In order to illustrate theoretically how retail market competition structure relates to prices, we can adopt a simple model of monopsony, where the retailer faces competitive upstream firms selling products and sells on the products exploiting its monopoly power. This is of course an extreme example, being a limiting case of oligopsony (where there are a "few" retailers competing) and also it does not allow for the market power of producers, which would lead to some sort of bargaining over the wholesale and final price. However, it does provide some insights into the role of the retail sector and the markup of retail prices over wholesale prices. In the simplest example, we have one retailer buying output Q from competitive sellers at wholesale price W and selling to consumers at price P. The monopsonist's profit maximization problem can be written as:

[26] This data was used by the Eurosystem Task Force analysing "the structural features of distributive trades and their impact on prices in the euro area" (see ECB, 2011, for detailed information, see also Annex 2 of the data description note). We are grateful to Mario Izquierdo and Aidan Meyler for an updated version of HHI measures at the Nielsen regions level.

[27] The construction of indices based on store locations and the concentration of stores in a vicinity of a given radius assume that consumers have information on product prices from a limited number of stores close to their home and compare prices in these stores (see ECB, 2011 and Ciapanna and Rondinelli, 2014). Also, focusing on the parent company rather than the individual stores assumes that there is no competition among individual stores that belong to the same group.

$$Max_Q \; QP(Q) - W(Q)Q$$

where $P(Q)$ is the (inverse) demand curve and $W(Q)$ is the supply price for Q (inverse supply curve). W is upward sloping, meaning that to get more output from suppliers it is necessary to raise the wholesale price. The first-order condition for choosing Q is:

$$P + QP' + W + W'Q = 0$$

which can be written as:

$$P\left(1 - \frac{1}{\varepsilon_D}\right) - W\left(1 + \frac{1}{\varepsilon_S}\right) = 0$$

The first term is the familiar marginal revenue from selling an additional unit to the consumer, which depends on the elasticity of demand ε_D, which is assumed to be greater than 1. The second term is the marginal cost to the retailer of buying-in an additional unit from its suppliers. Since the supply is increasing in the wholesale price, or equivalently that the supply price is increasing in the quantity ($W' > 0$ so that $\varepsilon_s > 0$), the marginal cost exceeds the wholesale price W. In the case where there was no monopsony power and the retailer was a price taker ($\varepsilon_s = \infty$), then the retailer would simply markup the wholesale price set by the supplier. In the case of oligopsony, the retail markup and the marginal cost would be adjusted by the market share S_R for retailer share and S_B the market share of the retailer on the wholesale market so that:

$$\frac{P}{W} = \frac{\left(1 + \frac{S_B}{\varepsilon_S}\right)}{\left(1 - \frac{S_R}{\varepsilon_D}\right)}$$

The markup of the retail price over the wholesale price is increasing in the market share on both the retail and the wholesale side.

Whilst it is usual to assume that the marginal cost of wholesale goods is increasing in Q, it is also possible in the case of monopsony that marginal cost is slightly decreasing, with $W'<0$ and $\varepsilon_s < 0$. As in the case of producer monopoly, the marginal cost can decrease but not too rapidly and still satisfy the second order conditions when the first order conditions are satisfied. Marginal cost can be decreasing, so long as it decreases less rapidly than marginal revenue.

In the data we find that bigger retailers obtain lower wholesale prices and charge lower prices to consumers. This can be explained by the monopsony behaviour of retailers when they are buying from suppliers with declining marginal costs of production.

3 Prices, market structure and estimation setup

The aim of this section is to investigate the statistical significance of the drivers of price differences of branded products across euro area countries. As we have shown in previous sections, the rich information contained in the Nielsen dataset allows us to disentangle several aspects of the relevant market structures that may affect prices and there are indications that certain characteristics tend to correlate with prices.

One question is how to define price differentials for the purpose of our analysis. Usually, price differences are defined as deviations from an average price (see Crucini et. al. 2005). Our rich dataset though includes prices of branded products at the regional level and information on the basis of which we can analyse how various aspects of market structure and consumer preferences correlate with price differences in the euro area. Focusing on deviations from an average would ignore significant available information at the level of the region. Therefore choosing a certain location as the reference point for defining price differences is more warranted. For this purpose, the deviation from the median price appears as the most relevant measure of the distribution's central tendency or a better representation of a typical value in the presence of non-normal distributions. Thus, in what follows the point of reference for the prices comparison will be, for each product, the price in the location with the *median price for a market leader*.[28] The prices of all other locations are then compared with this *'median price location'*.

The available data in each location do not only contain information for the market leading brand, but also for the main branded competitors (up to a maximum of three competitors). Therefore, we have for each region/product up to four prices of branded products and the question is how to set up our estimation in order to fully exploit this rich information. First of all, it appears that market leaders, are on average more expensive

[28] Most of the time the relevant median price for a product corresponds to the price of a specific location. If the median price does not correspond to the price of specific location, we choose as 'median' location, the location with the smallest difference from the median price.

than the *'other brands'* , which may imply that they have obtained that position due to other virtues rather than low price. Therefore, perceived better quality may determine the prices of market leaders. We believe that when comparing the prices of different market leaders across locations we avoid issues of quality differences to a large extent. We will also need to make some assumptions with regards to quality differences that may be reflected in the prices of the three other brands. Currently we will work under the assumption that, on average, between locations there are no significant quality differences between what we call 'other brands'.[29]

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 *median* price (**medML*) across all locations (location k) for product (j). Similarly, the prices of other brands (*ob*) in location (i) for product (j) are compared with the average price of other brands (**medob*) in location (k). Equation (1) is then stacked over all locations (i-1), all products (j) and all time-periods (t).[30] All prices and quantities are in log-form, hence the setup is one of relative prices.

$$\begin{bmatrix} p_{ML,i,j} - p^*_{medML,k,j} \\ p_{ob1,i,j} - \overline{p}^*_{medob,k,j} \\ p_{ob2,i,j} - \overline{p}^*_{medob,k,j} \\ p_{ob3,i,j} - \overline{p}^*_{medob,k,j} \end{bmatrix}_{(i-1)*j*t} = \beta_1 \begin{bmatrix} q_{ML,i,j} - q^*_{medML,k,j} \\ q_{ML,i,j} - q^*_{medML,k,j} \\ q_{ML,i,j} - q^*_{medML,k,j} \\ q_{ML,i,j} - q^*_{medML,k,j} \end{bmatrix}_{(i-1)*j*t} + \beta_2 \begin{bmatrix} \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \\ \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \\ \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \\ \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \end{bmatrix}_{(i-1)*j*t} + \beta X + \varepsilon \quad (1)$$

Coming now to the issue of market competition. Accounting for the market share of the market leader is not sufficient to characterise the nature of market competition in a location. Consider for instance the following example with locations A and B. The market leader in A has 35% of the market while the one in B has 30%. All else equal, the market leader in location A should be able to extract a higher price. Suppose now, that the other 3 competitors in location A have each 20% of the market, while in location B the other 3 competitors have 2%. Under the assumption that companies/brands actually compete (and

[29] This assumption will be relaxed later on where as a robustness check we confine our analysis to 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).

[30] We differentiate of course between the same products that have different equivalising units (i.e. l or kg) across countries but, for simplicity, do not add the extra layer in the description.

don't collude), and goods are ordinary (i.e. its quantity falls when its price increases), prices would probably be lower in location A due to fiercer competition from other brands. We need thus to separate the effects of the market share of market leaders from the effects of the market share of other brands when determining price differences across locations.

Therefore price differences in equation (1) are explained by the relative power of the market leaders $q_{ML,i,j} - q^*_{medML,k,j}$ and the relative competition of other brands $\overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j}$. We expect $\beta_1 > 0$ as it captures the relative *'monopoly power'* of the market leader and $\beta 2 < 0$ as it captures the increased competition from other brands.

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

The relative quantity shares of private label. We expect the coefficient on private label shares to be negative as the emergence of cheaper private label goods may put downward pressure on branded goods margins.[31]

Two variables measuring consumer habits are included. One measures what we call *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 and spend on it a relatively higher share of their disposable income.[32] The second measure is based on the average pack size and captures the preferences of consumers for certain pack sizes. 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).[33] In this respect, a consistent attitude of (relative) small pack size purchases may be considered as a consumer trait indicating some type of '*consumer cost indifference or*

[31] 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 Cotterill 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.

[32] For example, pasta in Italy has a high consumption intensity (see Table E Appendix III) and has correspondingly one of the lowest prices for pasta.

[33] 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.

inattention'. If this attitude of *'cost indifference or inattention'* is prevalent it will allow for higher prices to be set by firms.

We also include measures of retail market concentration in order to address the effect of the retail market structure on price levels. In the econometric analysis we include HHI-indices for the downstream and upstream market competition – described earlier - calculated at a 5 km radius and then averaged up to the Nielsen regions. We use the HHI indices that are calculated a) for the downstream market 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 (upstream competition) to account for the fact that several companies may form a buying group when making purchases in order to obtain more favourable prices from manufacturers, due to bulk).[34] 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 expected to be negative, as large buying groups may be able to reduce prices from manufacturers and pass them on to the consumers.[35]

In order to capture local cost differences we include annual country based wages of low skilled workers (including social contributions) and rents.[36] 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.

[34] While the information on the HHI is also available at the store level, it may not be particularly useful at the Nielsen region level, as one would not expect stores belonging to the same group to compete with each other. In any case the inclusion of the store level HHI does not alter the results.

[35] The literature in general confirms the inverse relation between downstream market competition and prices. The evidence for the relationship between upstream market competition and prices is less clear cut but there are indications of a welfare enhancing role of buying groups (see Ciapanna and Rondinelli, 2014).

[36] 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 more than one cities we take the country average as there is no correspondence with the Nielsen regions.

Finally, we add VAT rates and dummy variable capturing promotions.[37] We also include time dummies and dummies controlling for differences in equivalising units within product categories.

4 Main results

The first exploratory results -Table 3- are simple OLS, while in Table 4 we instrument all quantity variables by their third lag in order to avoid simultaneity problems between price and quantities movements.[38] 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 3, the point estimates, with regard to the share of non-leading brands, compared to the *median price location*, range from -0.052 to -0.077. This implies that a 10 per cent increase is associated with a decrease of the price difference by -0. 52 to -0.77 per cent depending on the specification. In terms of the data in our sample, it implies that if one of the 'other brands' increases its share from 5.4 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 prices faced by consumers will, ceteris paribus, be at most (depending on the specification) 4.62 percent lower.

By contrast, a 10 per cent increase in the market leader's share (versus the share of the market leader in the median price location) is associated with an increase in the price differences by 0.49- 0.52 per cent (depending on the specification), indicating thus that an increasing tendency towards monopoly – i.e. less competition – is associated with higher prices. In our sample, 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 (the share of the market leading brand in Austria and Ireland in our sample), i.e. a 63% increase, the prices consumer face would increase by, at most, 3.3 per cent.

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

[38] Results using clustered standard errors at the region-product level are presented in Table 3, which accounts for intragroup correlation at the product-region level. The statistical significance of the results is unaffected if we estimate the regressions using the standard robust estimator of variance.

As regards private label market shares, it appears 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 median price location) will decrease branded product prices by 0.1 to 0.2 per cent. In effect, if the private label share in Italy (see Table C) increased and became similar to that in Spain, i.e. a 120% increase, the consumers would face lower prices by, at most 2.4 per cent. The smaller impact compared to that of the other brands may imply that, in terms of pricing, branded goods may not respond to private label product price developments to the same extent as they do with competing branded products since they target different consumer categories. It should be noted also that in our first and second specification, columns (1) and (2) 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 1.3-1.6 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, 16 per cent higher prices. Rents however, are either insignificant or enter with the wrong sign in most specifications.

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 for products they buy more frequently. Specifically, if an individual in Ireland consumed as much pasta as an Italian consumer (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, 30 per cent lower prices. The variable measuring 'consumer cost indifference/inattention' (the average pack size) is also negative and economically very significant. A 10 per cent increase in the average pack size implies close to 4.5 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, i.e. a 50% increase it would imply lower juice prices by 22.5 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 declines (see columns 1 and 2 in Table 3), 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 parent level measure –downstream market competition - 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 almost 3.3 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 10 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 15 per cent. [39]

Finally, macro variables such as GDP per capita, population density and the unemployment rate are either insignificant or have consistently the wrong sign (they are not shown for space consideration issues).[40] VAT differences while statistically significant are not economically important. The dummy variable capturing sales enters with the correct sign and is significant.

Simple OLS estimates may 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.[41] The results using instruments are presented in Table 4. They confirm the OLS findings for all variables in terms of signs, magnitudes and significance.

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

[40] Also, as in the case of rents the significance and sign of macro variables are sensitive to the exclusion of countries from the sample, i.e. in an exercise where one country is dropped at a time.

[41] 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.

As Table 5 illustrates 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.[42]

5.1.1 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, on average, there are 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:

$$\begin{bmatrix} p_{ML,i,j} - p^*_{medML,k,j} \\ p_{ob1,i,j} - p^*_{medob1,k,j} \end{bmatrix}_{(i-1)*j*t} = \beta_1 \begin{bmatrix} q_{ML,i,j} - q^*_{medML,k,j} \\ q_{ML,i,j} - q^*_{medML,k,j} \end{bmatrix}_{(i-1)*j*t} + \beta_2 \begin{bmatrix} \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \\ \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \end{bmatrix}_{(i-1)*j*t} + \beta X + \varepsilon \quad (2)$$

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 median unit price of a market leader in each product category. Similarly the price of the second largest brand in each location is expressed relative to the second largest brand in the median price location (and not the

[42] 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 index at the parent and buying group level becomes insignificant and the point estimate of wages become insignificant. 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 by Van der Linden (2012) finds that a large part of Belgium's price differences with neighbouring countries is due to wage, rents and VAT differences.

average price of all other brands as the previous analysis). [43] 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 across locations. 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 comparable to those 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.

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 median price 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 the median 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 5 (see Table F in Appendix IV).

$$\begin{bmatrix} p_{ML,i,j} - p^*_{medML,k,j} \\ p_{ob1,i,j} - p^*_{medML,k,j} \\ p_{ML1,i,j} - p^*_{medob1,k,j} \\ p_{ob1,i,j} - p^*_{medob1,k,j} \end{bmatrix}_{(i-1)*j*t} = \beta_1 \begin{bmatrix} q_{ML,i,j} - q^*_{medML,k,j} \\ q_{ML,i,j} - q^*_{medML,k,j} \\ q_{ML,i,j} - q^*_{medML,k,j} \\ q_{ML,i,j} - q^*_{medML,k,j} \end{bmatrix}_{(i-1)*j*t} \beta_1 \begin{bmatrix} \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \\ \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \\ \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \\ \overline{q}_{ob,i,j} - \overline{q}^*_{medob,k,j} \end{bmatrix}_{(i-1)*j*t} + \beta X + \varepsilon \quad (3)$$

[43] In equation 1 when the other brands are concerned, the price difference of other brands relative to the median location is defined on the basis of the average price of other brands in the median location assuming therefore no quality differences among other brands.

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 and assumptions about quality differences among the various brands.

Finally, we can note that we have performed all the estimations presented in Tables 3-5 as well all the other robustness tests using as reference location for the price differences the location with the minimum price of a price leader for each product. The results obtained are very similar both in terms of statistical and economic significance. Moreover, in this setup, rents tend to enter with the correct sign. On balance, this implies that our results do not depend on the choice of the reference location.

6 Conclusions

Branded products, in the fast moving consumer goods market, exhibit large cross-country 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 cross-country 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 also have an upward impact on prices.

Finally, differences in consumer habits seem to have a larger impact on observed price differences. While some differences may be location specific inclined preferences, it nevertheless points to the importance of educating and informing consumers that their habits affect the prices they face.

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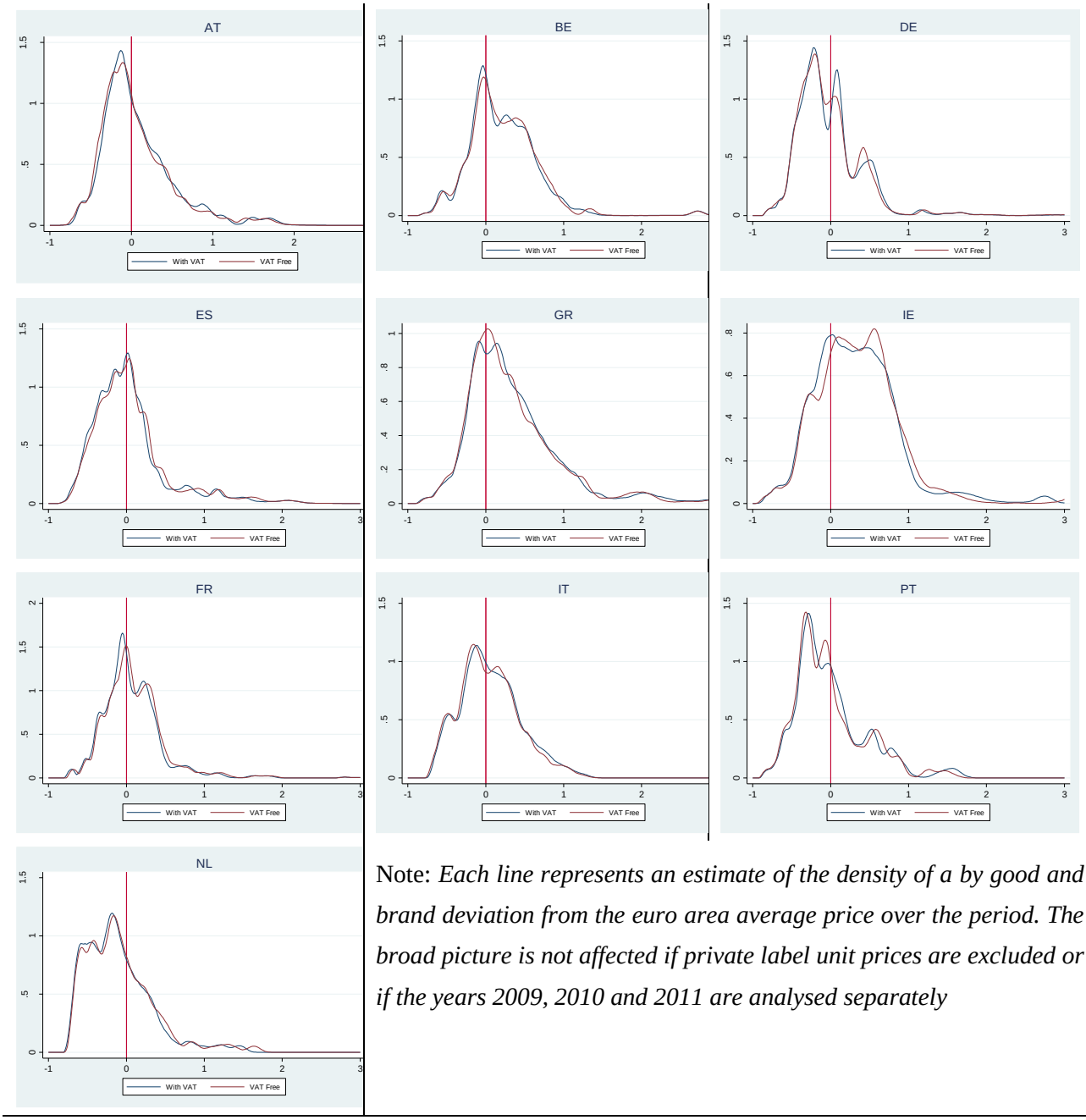
Tables and Figures

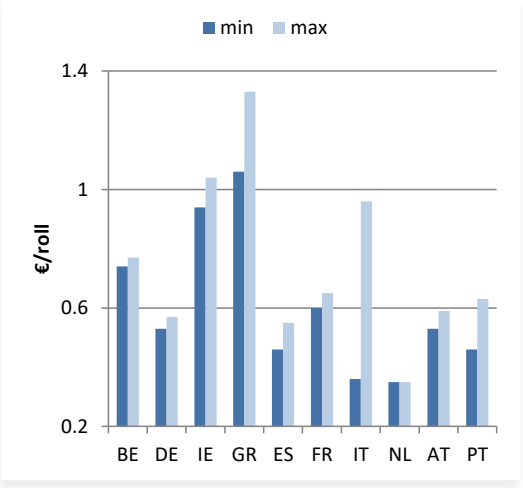
Figure 1: Empirical distributions of LOP deviations



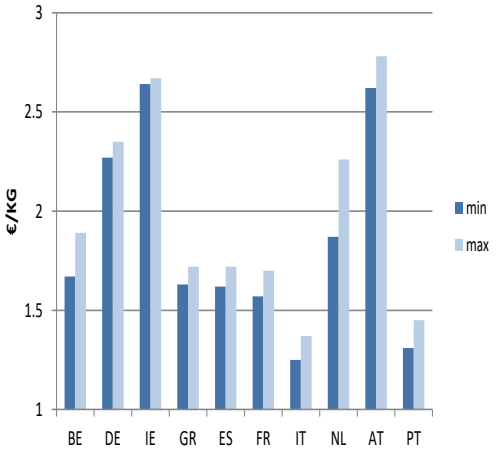
Note: *Each line represents an estimate of the density of a by good and brand deviation from the euro area average price over the period. The broad picture is not affected if private label unit prices are excluded or if the years 2009, 2010 and 2011 are analysed separately*

Figure 2: Min and max unit price (incl. VAT) of regional market leaders for selected products

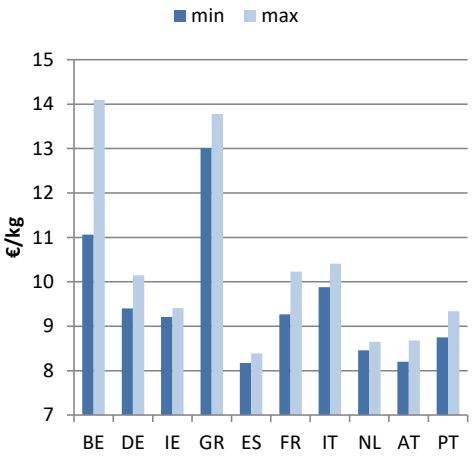
Paper towels



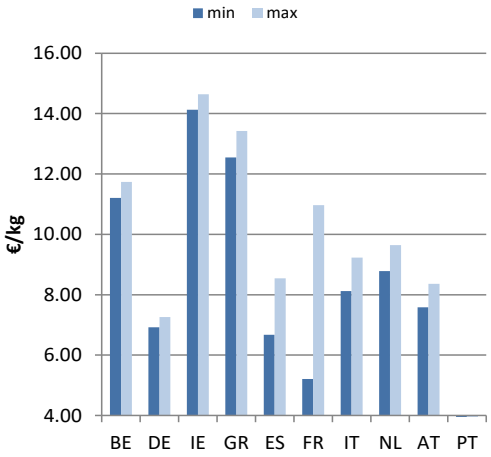
Dry pasta



Tinned tuna



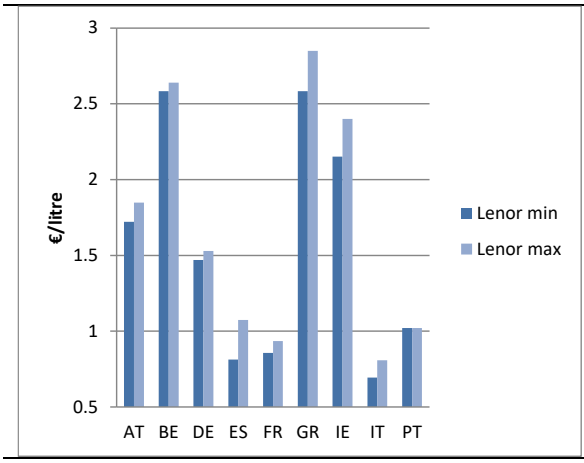
Ground Coffee



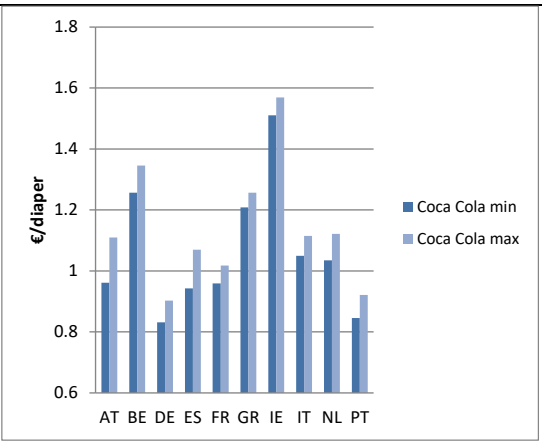
Note: Based on time average unit prices of market leaders of branded products, EMU 10 sample, 58 regions.
Sources: Nielsen and authors' calculations

Figure 3: 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

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*	0.8	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	8.4	GR	60%
Shaving preps	*L*	17.6	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*	14.1	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%

Table 2: HHI concentration measures for the Retail market (0-10,000)[44]

	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 Nielsen Regions HHI are calculated directly at the regional level. Country HHIs presented here are averages of the regional data.

[44] HHIs are calculated by squaring the market share of each firm competing in a market and summing the resulting numbers. *It can range from close to zero to 10,000.* How can one interpret the numbers we observe in Table 2? If, for instance, there was only one firm in a market, that firm would have 100% market share, and the Herfindahl-Hirschman Index (HHI) would equal 10,000, indicating a monopoly. On the other hand, if there were many firms in a market with very small market shares, i.e. around 0%, the HHI would be close to zero, indicating nearly perfect competition.

Table 3: First results

Dependent variable: Differences log prices vs median location				
VARIABLES	(1)	(2)	(3)	(4)
log average quantity of non-leading brands difference vs med loc	-0.0518***	-0.0632***	-0.0763***	-0.0770***
	(0.00700)	(0.00634)	(0.00656)	(0.00664)
log of private label quantities vs med loc	-0.0132	-0.00969	-0.0242***	-0.0198**
	(0.00991)	(0.00879)	(0.00782)	(0.00775)
log of market leader difference vs med loc	0.0493***	0.0345**	0.0465***	0.0516***
	(0.0149)	(0.0135)	(0.0133)	(0.0133)
log of consumer intensity vs med loc		-0.0603***	-0.0630***	-0.0647***
		(0.00798)	(0.00790)	(0.00770)
log of consumer cost indifference/inattention vs med loc		-0.453***	-0.434***	-0.435***
		(0.0157)	(0.0169)	(0.0171)
log HHI 5 km Parent level vs med loc			0.320***	0.336***
			(0.0415)	(0.0408)
log HHI 5 km Buying group vs med loc			-0.424***	-0.456***
			(0.0501)	(0.0489)
VAT Diff vs med loc				0.00790***
				(0.00157)
Sales Dummy vs med loc				-0.0466***
				(0.00588)
log of wages vs med loc	0.164***	0.135***	0.130***	0.137***
	(0.0211)	(0.0201)	(0.0220)	(0.0218)
log of rents vs med loc	-0.0324	-0.103***	-0.0885***	-0.0774***
	(0.0245)	(0.0247)	(0.0270)	(0.0276)
Observations	230597	188291	155819	155819
R-squared	0.193	0.395	0.400	0.405
F-Stat	24.89	41.73	42.07	46.42

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Clustered standard errors at the region-product level. Time Dummies and Product Unit Equivalent Dummies Not Shown*

Table 4: IV estimates

VARIABLES	(1)	(2)	(3)	(4)
log average quantity of non-leading brands difference vs med loc	-0.0456***	-0.0602***	-0.0742***	-0.0751***
	(0.00133)	(0.00126)	(0.00137)	(0.00136)
log of private label quantities vs med loc	-0.0127***	-0.00907***	-0.0243***	-0.0193***
	(0.00131)	(0.00116)	(0.00138)	(0.00138)
log of market leader difference vs med loc	0.0602***	0.0412***	0.0539***	0.0584***
	(0.00246)	(0.00238)	(0.00280)	(0.00279)
log of consumer intensity vs med loc		-0.0590***	-0.0614***	-0.0634***
		(0.00117)	(0.00131)	(0.00131)
log of consumer cost indifference/inattention vs med loc		-0.458***	-0.438***	-0.440***
		(0.00225)	(0.00241)	(0.00241)
log HHI 5 km Parent level vs med loc			0.323***	0.339***
			(0.00695)	(0.00695)
log HHI 5 km Buying group vs med loc			-0.424***	-0.456***
			(0.00843)	(0.00846)
VAT Diff vs med loc				0.00831***
				(0.000249)
Sales Dummy vs med loc				-0.0472***
				(0.00507)
log of wages vs med loc	0.158***	0.131***	0.127***	0.134***
	(0.00321)	(0.00294)	(0.00331)	(0.00330)
log of rents vs med loc	-0.0358***	-0.105***	-0.0874***	-0.0768***
	(0.00423)	(0.00424)	(0.00478)	(0.00477)
Observations	208000	169358	140033	140033
R-squared	0.191	0.394	0.398	0.403
F-Stat	633.9	1432	1258	1253

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

Table 5: 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 med loc	**-0.0712**	**-0. 0771**	**-0.052**	**-0.083**
log of private label quantities vs med loc	***-0.014***	***-0.021***	***-0.014***	***-0.029***
log of market leader difference vs med loc	**0.0504**	**0.0618**	**0.043**	**0.069**
log of consumer intensity vs med loc	**-0.058**	**-0.065**	**-0.059**	**-0.070**
log of consumer cost indifference vs med loc	**-0.436**	**-0.443**	**-0.415**	**-0.483**
VAT Diff vs med loc	**0.008**	**0.009**	**0.006**	**0.011**
Sales Dummy vs med loc	**-0.045**	**-0.050**	**-0.042**	**-0.056**
log HHI 5 km Parent level vs med loc	**0.309**	**0.490**	**0.291**	**0.375**
log HHI 5 km Buying group vs med loc	**-0.398**	**-0.586**	**-0.404**	**-0.505**
log of wages vs med loc	**0.114**	**0.147**	**0.113**	**0.160**
log of rents vs med loc	**-0.058**	**-0.090**	**-0.048**	**-0.095**

Table 6: IV estimates

VARIABLES				
log average quantity of non-leading brands difference vs med loc	-0.0247***	-0.0369***	-0.0479***	-0.0486***
	(0.00159)	(0.00151)	(0.00166)	(0.00165)
log of private label quantities vs med loc	0.00321**	0.0126***	-0.00717***	-0.00266
	(0.00158)	(0.00141)	(0.00167)	(0.00167)
log of market leader difference vs med loc	0.0515***	0.0374***	0.0354***	0.0392***
	(0.00297)	(0.00288)	(0.00338)	(0.00336)
log of consumer intensity vs med loc		-0.0701***	-0.0720***	-0.0743***
		(0.00142)	(0.00160)	(0.00159)
log of consumer cost indifference/inattention vs med loc		-0.396***	-0.369***	-0.369***
		(0.00345)	(0.00377)	(0.00375)
log HHI 5 km Parent level vs med loc			0.234***	0.252***
			(0.00844)	(0.00843)
log HHI 5 km Buying group vs med loc			-0.308***	-0.342***
			(0.0103)	(0.0103)
VAT Diff vs med loc				0.00796***
				(0.000301)
Sales Dummy vs med loc				-0.0410***
				(0.00656)
log of wages vs med loc	0.151***	0.119***	0.0917***	0.0986***
	(0.00389)	(0.00357)	(0.00402)	(0.00401)
log of rents vs med loc	-0.00715	-0.0555***	-0.0269***	-0.0158***
	(0.00512)	(0.00517)	(0.00582)	(0.00581)
Observations	105904	86262	71286	71286
R-squared	0.185	0.354	0.350	0.357
F-Stat	312.7	611.5	520.3	522.7

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

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

Figure A: Price differences between market leaders, different percentiles

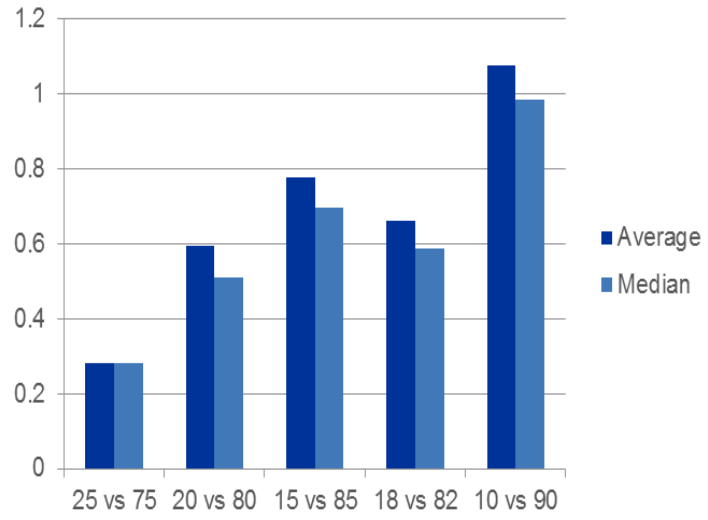


Table A: Average Unit Price Values of Branded Products

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*	0.3	0.25	0.28	**0.24**	**0.31**	0.26		0.3			0.27	9%
Ground coffee	*KG*	8.2	11.4	9	**6.7**	8.6	**16.8**	15.2	10	15		11.2	32%
Instant coffee	*KG*	21.6	26.4	**15.1**	19.2	25.5	26	27.1	**31**	15	15.9	22.3	25%
All Purp. cleaners	*L*	**2.7**	2.2	**1.6**	1.8		2.3			2		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	5	7.1	41%
Beer	*L*	1.6	2	1.7	**1.3**	2.2	1.9	**3.1**	1.7	1.5		1.9	27%
Butter	*KG*	6.1	7.3	6	7.7	6.3	**10.9**		7.7	**4.5**		7.1	27%
Cat food	*KG*	3.8	4.3	4.2	4		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**	0.8	0.9	**0.66**	0.84	21%
Deodorant	*L*	25.1	20.1	**16.3**	25.7	23.2	34.7	18.5	27		**35**	25.1	26%
Dog food	*KG*	3.9	3.2	**6.3**	2.6		4.7	3		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		9.1		9.4	10	**7**		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**	**1.7**			2.9	57%
Margarine	*KG*	4.1	6.2	**3**	4.3	4.8	**7.2**		3.5	**3**	4.2	4.5	31%
Milk refrigerated	*L*	1	**3.2**	0.9	1		1.1	1	1.4	**0.7**	**0.7**	1.2	63%
Milk UHT	*L*	0.8	1	0.9	0.9	0.8	**1.4**		1	**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			**0.1**	0.06	29%
Paper towels	*ROLL*	0.6	0.8	**0.5**	**0.5**	0.8	**1.4**	1	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	41%
Shampoo	*L*	10.1	9.9	8.5	8.3	**10.3**	**8.2**	8.7	10	10		9.4	10%
Shaving preps	*L*			**13.5**					**18**	17		16	14%
	PACK	**2.9**	**3.4**		**2.9**							3	10%
Sugar	*KG*	2.8	**3.4**	1.8	1.9	1.4		1.6	**0.9**	1		1.8	48%
Tinned peas	*KG*	2.4	2.8	**1.3**	**5.1**	4.2		2.3	2.5	2		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		27.8	26	9%
Vodka	*L*	16	15.8	12.2	11.7	15.6	17.8	**27.5**	**11**		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**	0.3	0.5		0.4	49%
Wet soups	*KG*	**3.6**						4.5	**6.3**			4.8	28%
	L			**2.8**	**2.8**	2.2				2.3	**2**	2.4	14%
Whiskey	*L*	18.9	19.8	17.8	**15**	17.7	21.8	**35**	18	22	17.7	20.4	27%
Average		**5.34**	**6.34**	**5.21**	**5.3**	**6.49**	**7.57**	**7.29**	**6.7**	**4.8**	**6.18**		
Times country ranked among most expensive location		3	7	3	4	2	**8**	**13**	4	0	4		
Times country ranked among least expensive location		4	1	**12**	**10**	1	4	1	6	8	9		

Note: pink denotes the most expensive and green the least expensive location

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		0.6			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	**0.05**	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	0.5	**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	
Times country ranked among the highest market share locations		**13**	3	1	1	5	**11**	**19**	6	5	6	
Times country ranked among the lowest market share locations		4	13	**19**	**16**	6	4	5	14	7	7	

Note: pink denotes the highest and green the lowest market share location

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	0.05	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*		0.01	0.04		0.04		**0.00**	0.04	**0.2**		**0.1**
Beer	*L*	0.04	0.2		**0.4**	0.1	0.2	**0.01**	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*	0.04	0.1	0.1	**0.2**	0.04	**0.01**		0.1		0.03	**0.1**
CSD	*L*	0.1	**0.3**	0.3	0.2	0.2	0.1	**0.0**	0.2	0.1	0.2	**0.18**
Deodorant	*L*	0.1	0.1	0.1	**0.2**	0.1	**0.05**		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	**0.001**	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*	**0.01**	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	**0.02**	**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*	0.2	**0.5**	0.3	0.4		**0.1**	0.3			0.3	**0.3**
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**					**0.03**			**0.2**
	PACK	**0.3**	**0.3**		**0.3**							**0.3**
Sugar	*KG*	0.04	0.1	**0.5**	**0.03**	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	**0.01**	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		**0.00**		0.1	**0.1**
Vodka	*L*		0.4	**0.5**	**0.5**	0.2	**0.10**	**0.1**	**0.1**			**0.3**
Water Sparkling	*L*	0.1	**0.5**	0.2	0.1	0.2	**0.03**	**0.5**	0.1	0.2		**0.2**
Water Still	*L*	0.1	0.2	**0.4**	0.3	0.2	0.1	0.3	**0.1**	0.2		**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	0.04	0.1	0.1	**0.03**	0.1	**0.1**
Average		0.27	0.42	0.36	0.44	0.33	0.21	0.24	0.2	0.24	0.34	
Times country ranked among highest share locations for PL products		**2**	**16**	**7**	**22**	**0**	**1**	**4**	**2**	**1**	**4**	
Times country ranked among lowest share locations for PL products		7	2	5	2	2	**14**	**16**	**15**	11	2	

Note: pink denotes the highest and green the lowest share locations for private label products

Table D: Average pack-size

Product	Unit Equivalent	AT	BE	DE	ES	FR	GR	IE	IT	NL	PT	Mean
100 % Juice	*L*	1.07		**1.21**			**0.8**	0.9	0.93	1.14	0.83	0.98
Diapers	*PIECE*	38	57.1	36.8	**63.2**		38.4		**28.4**			43.6
Ground coffee	*KG*	**0.5**	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	**0.1**	0.2	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		**0.7**			1.04	0.93
Baby food	*KG*	0.3	0.34	0.24	0.33	0.34	0.33	**0.19**	0.22	0.29	**0.36**	0.29
Beer	*L*	**0.67**	1.8	**2.5**	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		0.5	0.6	0.46
Cereals	*KG*		0.51		0.44		0.41	**0.54**	**0.39**	0.4	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**	0.1		**0.09**	0.12
Dog food	*KG*	0.52	1.3	**0.34**	2.4		1.26	1.04		0.75	**3.8**	1.43
Dry pasta	*KG*	**0.68**	0.58	0.55	0.53		0.59	0.55	0.59	**0.5**	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**				0.4	0.4	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**	0.4	0.4	0.36		**0.28**	0.43	0.4	0.38
Milk refrigerated	*L*	0.94	**0.64**	1.03	1.19		1.1	**1.48**	0.93	1.1	1.01	1.05
Milk UHT	*L*	0.97	**1.96**	1.01	1.39		1		**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	**46.2**	32.1		33.1	29.4			**24.1**	35.6
Paper towels	*ROLL*	5	4.7	4.1	3.6	**5.4**	**1.9**	2.6	2.9	4	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	0.6	0.91		0.64	**0.53**	0.88	0.9	**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	0.5	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	8.9	**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		0.7	0.69
Water Sparkling	*L*	1.6	3.4	**4.5**	1.2		**1**	1.6	1.6	1.5		2
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	**0.5**	0.7	0.82	0.71	0.71
Times country ranked as the location with the biggest average pack size		**7**	**8**	**8**	**6**	5	3	4	5	2	4	
Times country ranked as the location with the smaller average pack size		1	2	**10**	2	0	**6**	**11**	**10**	4	5	

Note: pink and green denote the location with the biggest and smallest average pack size, respectively

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	**0.3**		0.15
Instant coffee	*KG*	0.02	0.02	**0.04**	0.02	0.02	0.03	0.02	**0.002**	0.02	0.02	0.02
All Purp. cleaners	*L*	0.06	0.17	**0.05**	**0.21**		0.1			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**	1.9	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*	0.4	**0.5**	0.28	0.13		**0.07**	0.23		0.28	0.19	0.26
Cereals	*KG*		0.18		0.12	0.12	0.1	**0.45**	**0.08**	0.14	0.18	0.17
Condoms	*PIECE*	**0.14**	**0.04**	0.1	0.1	0.09	0.12		0.06		0.07	0.09
CSD	*L*	2.59	5.22	3.94	3.15	2.1	**1.23**	**5.24**	2.1	3.8	1.63	3.1
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	**0.5**	0.31
Dry pasta	*KG*	0.07	0.04	0.05	0.06	0.05	0.1	**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**	0.1	0.1		0.1
Ice cream	*L*	0.22	0.28	0.22	0.23	0.22	**0.04**	0.25	0.21	**0.3**	0.18	0.21
Jam Strawberry	*KG*	0.01	**0.04**	0.02	0.02	0.02	0.01	**0.004**	0.01	0.03		0.02
Laundry Detergent	*KG*		0.6	**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	0.1	0.1		**0.01**	**0.43**	0.14	0.17
Milk refrigerated	*L*	1.95	**0.05**	0.69	0.06		1.8	**5.35**	0.8	2.44	0.13	1.47
Milk UHT	*L*	0.4	2.8	1.2	**4.8**	2.6	**0.04**		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**	2.4
Paper towels	*ROLL*	0.7	0.9	0.6	0.7	**1**	**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**	0.2
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*			**0.003**					**0.001**	0.002		0
	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**	0.3		0.31
Tinned peas	*KG*	**0.004**	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**	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**	**0.004**		0.01	0.02
Water Sparkling	*L*	4.72	1.57	**6.35**	0.1	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
Times country ranked among locations with the highest consumption intensity		3	5	**8**	**11**	5	0	7	**7**	4	6	
Times country ranked among locations with the lowest consumption intensity		7	4	**9**	2	2	**14**	**9**	8	3	2	

Note: pink and green denotes the location with the highest and lowest consumption intensity, respectively

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 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 tend 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 unnecessary 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 differences. Consider Italy (which has together with Austria the lowest average price, see Table A in Appendix II): out of 12 SKUs reported only 3 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, sparkling water in Greece is 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 Austrians with regard to sparkling water so as to bring prices down as the good itself is viewed differently in the two locations.

Appendix IV

Table F: IV estimates

VARIABLES				
log average quantity of non-leading brands difference vs med loc	-0.0239***	-0.0344***	-0.0448***	-0.0454***
	(0.00115)	(0.00110)	(0.00122)	(0.00121)
log of private label quantities vs med loc	0.00313***	0.0132***	-0.00677***	-0.00226*
	(0.00114)	(0.00103)	(0.00122)	(0.00122)
log of market leader difference vs med loc	0.0514***	0.0370***	0.0351***	0.0389***
	(0.00214)	(0.00210)	(0.00247)	(0.00247)
log of consumer intensity vs med loc		-0.0677***	-0.0691***	-0.0714***
		(0.00104)	(0.00117)	(0.00117)
log of consumer cost indifference/inattention vs med loc		-0.417***	-0.391***	-0.391***
		(0.00252)	(0.00276)	(0.00275)
log HHI 5 km Parent level vs med loc			0.236***	0.254***
			(0.00618)	(0.00618)
log HHI 5 km Buying group vs med loc			-0.313***	-0.347***
			(0.00752)	(0.00755)
VAT Diff vs med loc				0.00794***
				(0.000221)
Sales Dummy vs med loc				-0.0352***
				(0.00480)
log of wages vs med loc	0.150***	0.119***	0.0930***	0.0999***
	(0.00281)	(0.00260)	(0.00295)	(0.00294)
log of rents vs med loc	-0.00647*	-0.0555***	-0.0288***	-0.0178***
	(0.00370)	(0.00377)	(0.00427)	(0.00426)
Observations	211712	172444	142488	142488
R-squared	0.179	0.346	0.341	0.347
F-Stat	600.0	1184	997.5	1000

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

Time Dummies and Product Unit Equivalent Dummies Not Shown

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