Price - based techniques for Market definition & Buying Power Index[+]

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Abstract

This paper focuses on a recent merger in Greek diary sector and empirically investigates the delineation of the market of production and distribution of white milk in Greece, the role of product asymmetries in market delineation along with the unilateral effects of the merger and the Buying Power Index of a large buyer in the relevant product market for the procurement of raw milk. The empirical results indicate that the markets of production and distribution of fresh, High Pasteurization & Condensed milk in Greece are highly inelastic and constitute distinct relevant product markets. Large product asymmetries lead to broader relevant product markets, while unilateral effects are present for specific pairs of white milk products. Lastly, there are evidences that a large buyer may exercise its buying power, even thought in the case where the market elasticity of supply and the own price elasticity of demand of the competitive fringe are highly inelastic.

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1 Introduction

In 2010 a horizontal merger[1] between two major manufacturers as well as distributers of various dairy products was notified in the General Directorate for Competition («GDC») of Hellenic Competition Commission («HCC»).

Focusing on this concentration[2], the aim of this paper is on the one hand, to empirically investigate the delineation of the market of production and distribution of white milk in Greece and on the other hand, to calculate the Buying Power Index («BPI») of a large buyer in the relevant product market for the procurement of raw milk.

The remainder of the paper is organized in the following way. Section 2 theoretically and empirically reviews the literature of price – based techniques of Hypothetical Monopolist Test («HMT») and BPI. Section 3 presents the market of white milk in Greece and section 4 elaborates the empirical results. Section 5 concludes.

2 Price – based techniques of Hypothetical Monopolist test

2.1 A theoretical standpoint

The HMT is a broader concept than the Small, but Significant Nontransitory Increase in Price («SSNIP») test, the Critical loss («CL») analysis and other price based techniques used in Market definition. However, the scope of the paper is to present the role of prices and their use in Market definition analysis[3] which in turn implies

[1] Hereinafter the words merger and concentration are used interchangeable.
[2] See also the analysis of phase – II mergers in Greece from 2006 - 10 in Fotis & Polemis (2012), pp. 197-207, Fotis & Polemis (2011), pp. 338-343, Fotis & Polemis (2010a), pp. 11-23, while in Fotis et al. (2011), pp.77 there is an elaboration of 13 requested derogations from suspension of concentrations in Greece during the period from 1996 to 2008 and in Fotis (2012a), p. 574, mergers are proposed as a solution in declining markets.
[3] SSNIP test and Critical Loss analysis may be used for the definition of the geographical market as well. See, *inter alia*, Federal Trade Commission v Occidental Petroleum Corp., 1996–I Trade vs. (CCH) 67,071 (D.D.C. 1986) and Strand (2006).

that I will assume that prices are the dominant form of strategic interaction among firms[4].

In the next paragraph I elaborate the CL Analysis, Upward Pricing Pressure («UPP»), Gross Upward Price Pressure Index («GUPPI»), aka "break even SSNIP tests" and BPI in one –sided markets[5]. Also, in Appendix I analyze the conditions of a profit – maximizing SSNIP test.

2.1.1 Critical Loss Analysis, Upward Pricing Pressure and Buying Power Index

I elaborate "could approach" of CL analysis[6] by using the mathematical formulas presented by Harris & Simons (1989), Katz & Shapiro (2003), O' Brien & Wickelgren (2003), Daljord et al. (2008) and Daljord & Sørgard (2011).[7] Also, I develop GUPPI by Salop & Moresi (2009) and UPP by Farrell & Shapiro (2008, 2010). The analysis of BPI follows from Blair & Harrison (2010).

Especially, following Harris & Simons (1989), the critical loss for a percent price increase is the percentage reduction in quantity required for the price increase to leave profits unchanged[8]. If the reduction in unit sales is greater than the critical loss,

[4] In some markets, quality, advertising and other forms of non price competition are the dominant forms of strategic interaction among firms. The incorporation of these strategic variables into the analysis here is out of the scope of this paper.
[5] For the use of SSNIP & CL methodologies in two – sided markets see Filistrucchi (2008), pp. 16-21.
[6] In this paper I use the «could – approach» of CL analysis (or the EU approach). The rationale for this is that the formula of the said approach are identical either we assume linear or iso-elastic demand functions. In the literature the «could – approach» has been elaborated in relation to the profit – maximizing approach, aka the «would – approach» (or the US approach). For the latter approach see Werden (1998, 2002) and the Appendix.
[7] The reader who is interested in criticisms of CL analysis may see, *inter alia*, the papers of Moresi et al. (2008), Farrell and Shapiro (2008), Daljord et al. (2008), Katz and Shapiro (2003),O'Brien and Wickelgren (2003), Werden (2002), Danger and Frech (2001), Lagenfeld and Li (2001), for more details.
[8] Alternatively, following Daljord & Sørgard (2011) '*The critical loss is calculated as the largest relative reduction in demand the hypothetical monopolist of all products in the candidate market can profitably sustain following an increase in the price of all firms in the candidate market by a given percent*'.

then the price increase will reduce profits. If the reduction in unit sales is less than the critical loss, the price increase will increase profits[9].

Calculating the critical loss requires balancing two effects: a) a given price increase raises the profit margin earned on all units that are sold, but b) it also reduces the quantity demanded resulting in fewer units being sold. The critical loss is the percentage reduction in quantity such that these two effects just balance.

The benefit of a hypothetical monopolist from a price increase is the amount of the price increase times the quantity that will be sold at the new price. The cost of the said monopolist from the price increase is equal to the pre-merger margin times the quantity reduction caused by the price increase.

If we denote $\frac{\Delta q}{q}$ the percentage reduction of quantity sold by the percentage price increase $\frac{\Delta p}{p}$ and $mu = \frac{p-c}{p}$ the margin measured as a percentage of pre merger prices, where the pre merger variable cost is c, then the critical loss is

$$\frac{\Delta q}{q} CL = \frac{\frac{\Delta p}{p}}{\frac{\Delta p}{p} + mu} \quad (1)$$

Equation (1) implies that for a given percentage price increase, *the critical loss is smaller the larger is the margin*. Intuitively, the larger is the margin, the greater the profit lost from a given reduction in quantity, so the smaller the reduction in quantity required for a given price increase to be unprofitable.

[9] The authors assume a relative price increase of all sales of one product.

A percentage price increase of a hypothetical monopolist will be profitable if equation (2) is satisfied,

$$\frac{\Delta p}{p} A\eta^{own} < \frac{\frac{\Delta p}{p}}{\frac{\Delta p}{p} + mu} \quad (2)$$

where $A\eta^{own}$: is the actual own price elasticity, that is, the corresponding estimated coefficient from the demand function under scrutiny

$\frac{\Delta p}{p} A\eta^{own} = AL$: The Actual Loss of the hypothetical monopolist from the price increase.

Solving for $A\eta^{own}$ from equation (2) we derive equation (3),

$$A\eta^{own} < \frac{\frac{\Delta p}{p}}{\frac{\frac{\Delta p}{p} + mu}{\frac{\Delta p}{p}}} \quad (3)$$

where $C\eta^{own} = \frac{CL}{\frac{\Delta p}{p}}$ is the critical own price elasticity.

Therefore, a distinct relevant product market satisfies the following rule:

$$A\eta^{own} < C\eta^{own} \quad (4)$$

Katz & Shapiro (2003) assumed a hypothetical monopolist with two products, A & B. Assuming an increase in product A's price and given the fraction of sales that is

diverted to product B following the price increase of product A, that is, the Diversion Ratio («DR») of products A & B,[10] then the Actual loss of a hypothetical monopolist is

$$AL = \frac{\frac{\Delta p}{p}(1 - DR)}{mu} \quad (5)$$

A percentage price increase of product A by a hypothetical monopolist will be profitable if (5') is satisfied,

$$AL < CL \text{ if and only if } DR > CL \quad (5')$$

Following O' Brien & Wickelgren (2003), we can assess the consistency of critical loss analysis if we calculate the actual loss in unit sales from a given price increase[11]. The mathematical formula for actual loss from a given price increase is given in equation (6),

$$AL = \frac{\Delta p}{p}\left[\frac{1}{mu} - \eta^{cross}\right] \quad (6)$$

[10] The DR from product A to product B is the fraction of the reduction in sales of product A that is diverted to product B following a price increase on product A. That is, $DR_{A,B} = \frac{\partial p_B}{\partial p_A} / \frac{\partial p_A}{\partial p_A} = \frac{\eta^{cross(A,B)}}{\eta^{own(A,A)}}$. In case where own and gross price elasticities of demand cannot be estimated, the DR is calculated in the following way: $DR_{A,B} = \frac{S_B}{\sum S_i - S_A}$, where S is the market share of the i products in the market.

[11] The authors assume that a hypothetical monopolist controls two products and derive the formula of a profitable uniform price increase of the two products. The formula is called the "Break Even SSNIP Test".

where η^{cross} is the cross elasticity of demand for product B with respect to the price of product A[12]. A percentage price increase for products A and B will be profitable if the actual loss does not exceed the critical loss, that is, if

$$\frac{\Delta p}{p}\left[\frac{1}{mu}-\eta^{cross}\right]<\frac{\frac{\Delta p}{p}}{\frac{\Delta p}{p}+mu} \quad (7)$$

If $\frac{\frac{\Delta p}{p}}{\frac{\frac{\Delta p}{p}+mu}{mu}}=\frac{CL}{mu}>\eta^{cross}$ (8), then the actual loss exceed the critical loss and products A & B do not constitute a single product market.

Therefore, a percentage price increase for products A and B will be profitable if actual loss is lower than critical loss or equation (9) is satisfied,

$$\eta^{cross}>\frac{CL}{mu} \quad (9)$$

Equation (9) implies that '*holding cross elasticities between the merging firms constant, a given price increase is more likely to be profitable the larger is the margin*.' This result implies that mergers are more anticompetitive in more concentrated relevant product markets.

Respectively, equation (9) may also be written as $DR \geq CL$.

[12] Suppose that A & B are the merging products. A price increase for product A causes a reduction in the quantity demanded for product A. Assuming that products A and B are substitutes, it also causes an increase in the demand for product B.

Daljord et al. (2008) criticize the CL formula presented by Katz & Shapiro. Following the authors, product A[13] will constitute a distinct relevant product market whether equations (10) or (11) are satisfied,

$$\left(\frac{\Delta p_A}{p_A}\right) A\eta^{own} < \frac{\frac{\Delta p_A}{p_A}}{\frac{\Delta p_A}{p_A} + mu_A}\left(1 + \lambda DR_{A,B}\right) \quad (10)$$

or

$$A\eta^{own} < C\eta^{own}\left(1 + \lambda DR_{A,B}\right) \quad (11)$$

$mu_A = \frac{p_A - c_A}{p_A}$ is the product A's margin measured as a percentage of pre merger prices &variable cost and $\lambda = \frac{p_B - c_B}{p_A - c_A}$ is the relative profitability of products A & B.

Given that $\eta^{own} = \frac{1}{mu}$, equation (10) becomes,

$$\frac{\frac{\Delta p_A}{p_A}}{mu} = AL < \lambda DR_{A,B} \quad (12)$$

If $\lambda = 1$ as in Katz & Shapiro, then equation (12) is satisfied if and only if aggregate Diversion Ratio is higher than Actual Loss. That is, $DR \geq AL$.

Lastly, Daljord & Sørgard (2011) consider large product's asymmetries in terms of sales in the market. The authors consider a hypothetical monopolist who imposes a uniform price increase of both products, A – the «small product» and B – the «large

[13] The authors assume that a hypothetical monopolist increases only the price of product A, which is a «small product» in terms of sales. This is called the «single product» criterion.

product». Assuming that DR of both products are proportional to sales[14], product A will constitute a distinct relevant product market if equation (13) is satisfied[15, 16].

$$\frac{\frac{\Delta p}{p}}{2(\frac{\Delta p}{p} + mu)S_A} = AL \leq DR \quad (13)$$

The authors state that equation (12) leads to narrower relevant product market rather than equation (13) if

$$S_A < \frac{mu}{2\left(\frac{\Delta p}{p} + mu\right)} \quad (14).$$

2.1.2 UPP and GUPPI methodology

The UPP methodology assumes static price setting competition with differentiated products (i.e. firms in the market exhibit excess capacity)[17]. Consider two firms 1 & 2 that produce A & B respectively. Suppose a merger of firms 1 & 2. Farrell & Shapiro (2010)[18] state that an UPP on product sold by firm 1 will be created after the merger, if

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[14] That is, $DR = \frac{DR * S_A}{(1 - S_A)}$.

[15] For symmetric firms (identical price and marginal costs, i.e., margins) the equivalent formula of equation (13) is $S_i DR_{i,j} + (1 - S_i)DR_{j,i} \geq \frac{\frac{\Delta p}{p}}{\frac{\Delta p}{p} + mu}$.

[16] If we assume no asymmetries in Daljord et al. (2008) then equation (12) leads to a broader market rather than equation (13).

[17] In addition the UPP methodology does not take into account the effects of potential side responses (i.e., *inert alia*, entry). See for an equivalent methodology O'Brien & Salop (2000). The UPP methodology can also be used in quantity setting competition and bidding (auctions) competition. See Moresi (2009) and Moresi (2010), p 3.

[18] See equation (4), p. 12.

$$UPP_A : DR_{AB} * MU_B > VCE_A \quad (15)$$

where

DR_{AB}: the DR from product A to product B

$MU_B = P_B mu_B = P_B \frac{P_B - C_B}{P_B} = P_B - C_B$: price cost margin (currency per unit) of product B at pre-merger values

mu_B :price – cost margin of product B

VCE_A: variable cost efficiencies post merger for product A at pre-merger values.

Therefore, firm 1 has an incentive to increase the price of product A after the merger if the net profit effect of such an increase is higher than the efficiencies emerged by the merger in the production of the product in question.[19]

Farrell & Shapiro propose UPP be used as an indicator of the merger's likely unilateral effects. They propose that mergers generating positive net UPP, warrant, at least, further scrutiny[20]. They also assume that product B's price does not change after the merger and there are no productive efficiencies[21].

The GUPPI methodology in euro terms expresses the incentive of firm 1 to increase the price of its product (A) «*as a result of substitution between that product and the*

[19] The same test must be performed for product B. That is, $UPP_B : DR_{BA} * MU_A > VCE_B$.

[20] See Farrell & Shapiro (2010), p. 3.

[21] Schmalensee (2009) has proposed the following formula for UPP: $UPP_A^* = DR_{AB} * MU_B - VCE_A + DR_{AB} VCE_B$. See also Werden (1996).

product sold by its merger partner firm 2».[22] The GUPPI formula is given in equation (16)[23]

$$GUPPI_A = DR_{AB} * MU_B \quad (16)$$

The higher the diversion ration of firm1 or the price cost margin of the merger partner or both of them, the higher the GUPPI of product A after the merger. Equation (17) expresses the GUPPI using the percentage margin rather than the euro margin,[24]

$$GUPPI_A = DR_{AB} * mu_B \quad (17).$$

Following Moresi (2010), p 7, «*the products of the two merging firms would comprise a relevant antitrust market if*»,

$$GUPPI_{A,B} > 2SSNIP \quad (18)$$

where

$SSNIP$: the profit – maximizing "*small but significant non-transitory increase in price*"[25].

2.1.3 Buying Power Index

Monopsony may be present on the selling side of the market (i.e., see the dominant firm model). In this paper I am interested in the existence of market power on the

[22] See Salop & Moresi (2009), p. 19.

[23] The equivalent formula for firm 2's product (B) is $GUPPI_B = DR_{BA} * MU_A$.

[24] The equivalent formula for firm 2's product (B) is $GUPPI_B = DR_{BA} * mu_A$.

[25] See Appendix 1 for profit – maximizing SSNIP formulas. Following Werden (2002) the said formula may be $DR \geq \dfrac{\dfrac{\Delta p}{p}}{\left(2\dfrac{\Delta p}{p} + mu\right)}$.

buying side of the market where a large buyer may be present in several geographical areas.

In particular, the Buying Power «*is the power to reduce price below the competitive levels by restricting purchases*».[26] The existence of a large buyer on the buying side, assuming no price discrimination, may affect the total supply in the downstream market by reducing the quantities sold from the firms in the upstream market and input prices as well as may harm downstream consumers by increasing final prices.

The measurement of the Buying Power of the merged entity depends on the structure of the downstream market. In a competitive downstream market each buyer purchases the quantity supplied from the upstream firms until the value of the marginal product equals the price of the product under scrutiny. In a 'pure monopsony' downstream market, the buyer will restrict its purchases at the point where the value of the marginal product equals its marginal cost. In the latter case, the BPI is written as

$$BPI = \frac{1}{\varepsilon} \quad (19)$$

where ε is the market elasticity of supply[27]. The higher the ε, the lower the buyer's buying power. That is, the higher the ability of the firms in the upstream market to monitor the supply in response to price changes, the lower the ability of the buyer to possess monopsony power.

When the downstream market consists of a large buyer and a fringe of competitive firms the BPI is given in equation (20),

[26] See Blair Harrison (2010), p. 53. See, also, OECD (2008), p. 9.
[27] See Blair Harrison (2010), p. 54 – 55 and the footnotes therein.

$$BPI = \frac{S}{\varepsilon + \eta^{CF}(1-S)} \quad (20)$$

where S is the market share of the large buyer and η^{CF} is the own demand price elasticity of the competitive fringe.

Sensitivity analysis of equation (20) indicates that a) $\frac{\partial BPI}{\partial S} > 0$ and b) $\frac{\partial BPI}{\partial \varepsilon} = \frac{\partial BPI}{\partial \eta^{CF}} < 0$. That is, the higher the market share of the large buyer the higher the deviation from the competitive outcome. However, the higher the market elasticity of supply and the own price elasticity of demand of the competitive fringe, the lower the buying power of the large buyer.

Additionally, as the quantity supplied becomes more responsive to changes in prices, the ability of the large buyer to exercise its buying power declines and firms in the upstream market redirect its employment to other products where prices may be higher. On the other hand, as the demand elasticity of the competitive fringe becomes more elastic, the deviation from the competitive level declines since any decline of the large buyer's purchases are captured by the enhanced purchases of the competitive fringe.

2.2 An empirical standpoint

Price based techniques for merger control have been used in many merger cases much like in the European Union and the U.S.A. Table 1 presents selected merger cases where the said techniques were used by the competition authorities.

[***Please insert Table 1 about here***]

The horizontal acquisition between the Ineos Group Limited and the Norwegian company Kerling ASA in the market of Standard PVC (hereinafter «S – PVC») provides a standard example of application of price – based techniques in merger control. The said acquisition was declared to be compatible with the common market and the functioning of the EEA Agreement on 2008.[28]

One of the issues of controversy in this case was that if UK S – PVC market was part of a European market or could be delineated in National grounds. The Chief Economist Team («CET») of |DG Comp used CL analysis in order to estimate market elasticity of supply with respect to domestic prices. Imports were claimed by the parties in the merger to be the competitive constraint of the domestic producers.

The critical loss estimates «ranged from 61 to 108 Kt and from 107 to 170 Kt, respectively for 5% and 10% price increases».[29] The actual loss was estimated by surveys or other qualitative data (planned uncommitted capacity expansions, demand forecasts or the costs of switching).[30]

Daljord & Sørgard (2011) elaborate CL methodology in a grocery market in Norway.[31] The authors evaluate single – product criterion (eq. 12) and uniform price SSNIP test (eq. 13) and conclude that the delineation of the product market depends on «*whether we impose a price increase on only one or all the products*».

In particular, for a 5% SSNIP, the estimate of the critical diversion ratio, the left – hand side of eq. (13), is 16,7%, while the corresponding estimate of eq. (12) is 20%. The application of the said estimates in the above mentioned grocery market indicates

[28] See Commission Decision of 30/1/2008.
[29] See Amelio et al. (2008), p. 57.
[30] The CET estimated a partial residual demand elasticity of the merging parties using instrumental variable regression. However, the empirical results weren't statistical significant.
[31] See Daljord & Sørgard (2011), pp 8-11.

that single – product criterion leads to narrower product markets than uniform price SSNIP test in 2 out of 28 outlets under scrutiny.

Application of the UPP methodology is limited in the literature. Cheung (2011) analyses the merger between US Airways and America West that was cleared in 2005 by the Department Of Justice («DOJ»). The author mostly addresses the theoretical issues between UPP analysis and merger simulation. Also, she investigates if UPP may produce false estimates depending on the type of products under scrutiny (complements or substitutes) and she compares the structural estimates of price changes with UPP results. She states that on average 10% of the elaborated observations of airlines markets, the UPP formula produces wrong estimates. Lastly, she examines the UPP with the traditional HHI test and she concludes that the HHI is a more severe test in both cases.

Varma (2009) simulates 10.000 different industries with a hypothetical merger in each industry in order to elaborate usefulness of UPP methodology. The author compares the traditional structural approach of market definition with UPP methodology and concludes «*that some mergers that would not create a structural presumption under the approaches to market definition typically used in practice would likely create a presumption under the UPP test with a 10 percent presumptive efficiency credit*».[32]

Competition authorities also use diversion ratios to simulate the anticompetitive effects of a merger. Walters (2007) elaborated diversion ratios in order to calculate anticompetitive effects of retail chain mergers in UK.[33] The author stated that the

[32] See Varma (2009), p. 31.
[33] «*The 2006 Vue/A3 Cinema cinema merger and the 2006 HMV/Ottakar's book store merger*». See Walters (2007), p. 15.

empirical results of diversion ratios were promised in the majority of the merger local markets were estimated and these results, combined with local characteristics of the local markets, may be used in order to elaborate the unilateral effects of mergers.

Mathiesen et al. (2009) also analysed diversion ratios in order to elaborate the unilateral effects of Somerfield's acquisition of Morrison's 115 grocery stores in UK.[34] The authors concluded that market shares may be poor predictors of the actual competition among asymmetrically differentiated products. They found that the price increase following the above mentioned acquisitions was 40% lower using the observed diversion ratios than the ones based upon market shares.

The European Commission («EC») has assessed the existence of buyer power in many cases. In the case of buying co-operatives[35] the EC declared that the presence of a large supplier in the upstream market may countervail the increase of the prices in the downstream market. Besides, «*an example of a dominant position existing in both the downstream and upstream market was highlighted in the case British Airways, which has been a dominant buyer on the British market for air travel agency services*»[36].

In the merger between REWE and Adeg[37] the EC stated that the ability of the merged entity to exercise its buying power may be outweighed by the ability of the consumers to buy from the alternative supermarkets and therefore to increase the sales of the rivals. Moreover, in British Airways case[38] the EC depicted that British Airways had infringed article 82 by making arrangements with travel agents intending to exclude its rivals from the downstream

[34] See Mathiesen (2009), p. 1 & footnotes therein.
[35] See the judgment of the European Court Gøttrup-Klim e.a. Grovvareforeninger v. Dansk Landbrugs Grovvareselskab AmbA [ECR 5641 (1994)].
[36] See OECD, (2008), p. 258.
[37] See Case COMP/M.5047.
[38] See IV/D-2/34.780 Virgin/British Airways.

market. However, the said exclusionary effect on British Airways' rivals was upheld by the European Court of Justice.[39]

3 The market of production and distribution of white milk in Greece

The market of production and distribution of white milk in Greece can be grouped into three segments: a) the segment of total market of white milk ($\mathbf{S_1}$), b) the product's segment ($\mathbf{S_2}$) and c) the brand's segment ($\mathbf{S_3}$). Figure 1 depicts the market of production and distribution of white milk[40].

The product's segment of white milk market in Greece consists of three major products, fresh, high pasteurization and condensed milk. The said products constitute the majority of sales of white milk. The brand's segment of white milk market consists of, *inter alia*, four major brands. The brands in question constitute between 65% - 70% of the total sales of fresh milk in Greece.[41]

[***Please insert figure 1 about here***]

In the following paragraphs I present the main results of HCC's decision (No 515/VI/2011) concerning the delineation of the market of production and distribution of white milk in Greece. I also evaluate Katz & Shapiro (2003), Daljord & Sørgard (2011), GUPPI and UPP methodologies in the above mentioned market and I present the empirical results from the calculation of BPI.

[39] Dynamic effects of buying power have also been analysed. See OECD (2008), p. 260. For an application of buying power in merger and antitrust cases see OECD (2008), pp 141-302.
[40] See Fotis & Polemis (2011), pp. 342-343.
[41] The remaining brands of fresh milk consist of the 30%-35% of total sales of fresh milk. See HCC's Decision No 515/VI/2011, pp 30-31.

4 Empirical Assessment

4.1 Empirical results of HCC's decision in relation with the delineation of market of production and distribution of white milk

The empirical results of HCC's decision regarding the delineation of the market of production and distribution of white milk in Greece may be summarized into three categories: a) the estimation of the own and cross price elasticities by elaborating a log – linear demand system in first (S1) and second (S2) segments of white milk market[42], b) the analysis of CL methodology by Harris & Simons (1989), O' Brien & Wickelgren (2003) and Daljord et al. (2008)[43] and c) the analysis of price correlation and cointegration methodology.

The monthly time – series data of prices used in the econometric estimations is from Nielsen. The period under scrutiny spans from 2000 until September 2009.

In terms of the econometric results in the second (S2) segment, the conditional own - price elasticities of fresh, high pasteurization and condensed milk are of considerable significance rather than the cross – price elasticities. The results indicate that the price elasticity of conditional demand for the said products are highly significant inelastic[44] (p - value < 0,01) and may constitute distinct product markets.

[42] The demand functions in question (aggregate demand in first segment and product's demand in the second segment) estimated with an autoregressive scheme of order 1 and Cochrane-Orcutt estimation procedure. The purpose of the paper is not to focus on the brand's segment. However, the GDC has estimated the brand's demand functions. For more details about the estimated demand models see HCC's Decision No 515/VI/2011, Appendix 1, 'Econometric estimations', pp 117-119. See also Case Comp. M.5046 Campina/Friesland, Appendix 1, p. 14.

[43] See HCC's Decision No 515/VI/2011, Appendix 1, 'Econometric estimations', pp 117-125. See also Fotis & Polemis (2011), p. 342.

[44] This result coincides with the majority of studies in the last 2 decades. See the review of empirical results presented in the Appendix of Case Comp. M.5046 Campina/Friesland, Table 2, p. 4.

The aggregate demand for dairy products is considered to be price inelastic. In particular, the estimated coefficient of aggregate price index[45] in first segment is almost zero.[46]

The last conclusion indicates that price elasticities could be used as evidence toward a delineation of the above – mentioned products of white milk. However, since here the elasticities in question are conditional price elasticities, they are conditional on the level of expenditure of white milk in the total market of white milk (S1), a researcher must handle with proper care their interpretation and especially the indirect effect of prices on the total amount of expenditure of white milk[47].

Therefore, the estimates of price elasticities for market definition must be accompanied with formal tests that used for the delineation of product markets, such as profit – maximizing SSNIP tests and the CL methodology and cointegration analysis, whose empirical results are presented below.

The empirical results of CL analysis by Harris & Simons (1989), O' Brien & Wickelgren (2003) and Daljord et al. (2008) for several percentage price increases of fresh, high pasteurization & condensed milk indicate that the production and distribution of the products in question constitute distinct product markets. Therefore,

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[45] $\Pi_t = \sum_{\mathrm{T}=F,HP,C} s_t^{\mathrm{T}} \log P_t^{\mathrm{T}}$: deflated (white) milk price index, where s_t^T : market shares of fresh, high pasteurization and condensed milk in first segment (S1) and $\log P_t^T = \sum_{\mathrm{T}=F,HP,C} \log P_t^{\mathrm{T}}$: the natural log of the price index of fresh, high pasteurization and condensed milk. See also HCC's Decision No 515/VI/2011, Appendix 1, 'Econometric estimations', pp. 117-118.

[46] An analytic review of log-linear demand models can be found in Davis & Garces (2010), pp. 447-50. See also Deaton & Muellbauer (1980b), Hausman et al. (1994).

[47] For example, suppose that the price of fresh milk goes up. Then part of the consumption of fresh milk will reallocate to other types of white milk, but total consumption of white milk might also fall either because consumers switch to other dairy products or reduce consumption altogether. In order to overcome the indirect effect of prices on total expenditure of white milk we may regress income (GDP) instead of expenditure on total demanded quantity of white milk along with the appropriate use of instrumental variables, such as cost shifters of white milk products or price of products that share the same cost shocks with white milk products but are not substitutes or complements with them.

CL analysis verifies the highly inelastic estimated own price elasticities from log - linear demand functions[48].

In particular, the application of the single – product criterion (Daljord et al., 2008) in two pairs of the said products (between fresh – high pasteurization and fresh – condensed milk) indicates that for various increases in the price of fresh milk (5% - 30%), eq. (12) is satisfied since $DR \geq AL$.

Figure 2 presents the evolution of log prices and its differences of fresh, high pasteurization & condensed milk in Greece from 2000 to 2009. It is evident that the series are moving in the same direction. Especially, the correlation coefficient between the said products is estimated 0,94 and the corresponding coefficient between fresh & condensed milk is estimated 0.91[49].

However, the graph with the differences of the log prices of the abovementioned types of white milk highlights a temporal trend. Especially, even though the graph with the log prices depicts a drifting upward together at roughly the same rate of all types of white milk in Greece, the graph with their differences indicates that this drifting must be due to a stochastic trend and not a structural relationship among the log prices[50].

[***Please insert figure 2 about here***]

[48] See HCC's Decision No 515/VI/2011, Appendix 1, 'Econometric estimations', pp 121-123.
[49] European Commission has used the said test for market definition in many cases. See, *inter alia*, Case IV/M 619 Gencor/Lonhro, Case COMP/M.2187 CVC/Lenzzing and Case COMP/M. 4513 Arjowiggins/M-real Zanders Reflex. In Case COMP/M.2187 the European Commission stated that for correlation coefficients between 0,65 and 0,80 the delineation of product market must be further enhanced by other tests such as SSNIP tests and cointegration analysis.
[50] Time series with the abovementioned characteristics are called random walk or first – order integrated I(1) time series.

Two products belong in the same product market if their time series of log prices are cointegrated, that is, there exists a stable and structural relationship between each other. A prerequisite for this is that each time series to be a random walk, since if the time series are I(1), the difference among them may be stable around a fixed mean[51].

GDC performed unit root tests[52] and Johansen Cointegration – Unrestricted Cointegration Rank (max eigenvalue) tests[53], between fresh & high pasteurization milk, fresh & condensed milk and in the total market of white milk in Greece[54].

The unit – root tests indicate that each type of white milk is a first – order integrated I(1) time series. The Augmented Dickey-Fuller (ADF) t-statistic[55] and the Phillips-Perron (PP) unit root test[56] cannot reject the null hypothesis of the existence of a unit root since the associated values of MacKinnon one-sided p-values are above 0,05 test critical value. The unit root tests between the differences of the log prices of the products in question show that the series are I(1) time series.. The ADF t- statistic (in level) of the differences is above 1 and almost 1 for the deflated (white) milk price index, while the associated MacKinnon one-sided p-values are statistically insignificant (for two of the three series the p-value is close to 1).

Regarding the cointegration analysis, the null hypothesis of the trace statistic elaborates whether there are at most r cointegrating relations against the alternative hypothesis of m cointegrating relations (i.e., the series are stationary, $r = 0, 1, \ldots, m - 1$). The maximum eigenvalue test statistic tests the null hypothesis that there are r

[51] See Green (1993), p. 567; Forni (2004); O'Donoghue & Padilla (2006), section 2.3.2.
[52] See, *inter alia*, Breitung, & Pesaran (2007).
[53] See Johansen (1991).
[54] For an application of unit root & cointegration tests in gasoline market see Fotis & Polemis (2012), pp. 62-68.
[55] See Dickey & Fuller (1979) & Rothenberg & Stock (1996).
[56] See Phillips & Perron (1988)

cointegrating relations against the alternative hypothesis that there are r +1 cointegrating relations.[57]

The empirical results clearly indicate that the 3 types of white milk in Greece constitute distinct relevant product markets. Especially, the MacKinnon – Haug – Michelis p-values of both cointegration tests indicate that the series are not cointegrated. The associated p-values are higher than the critical value of 0,05 and therefore the null hypothesis cannot be rejected.

4.2 Further results from the "Could Approach". The role of product asymmetries in market definition

The CL methodology by Katz & Shapiro (2003) also indicates that fresh, high pasteurization and condensed milk constitute distinct relevant product markets[58]. Given eq. (5) the Actual Loss is lower than Critical Loss for almost all the estimated pairs of products in question since the corresponding Diversion Ratio is higher than the Critical Loss (Table 2).

[***Please insert Table 2 about here***]

The phenomenon of «Cellophane Fallacy», states that in monopoly prices the level of substitution is high and the researcher will estimate larger product markets than the researcher would if competitive prices were used instead.[59] However, in the paper,

[57] The models and the number of the lags of the Johansen & max eigenvalue Cointegration tests have been automatically chosen by Schwartz criterion.

[58] The estimated variable costs of white milk products are 46%, 51% and 57% of the average price of fresh, high pasteurization and condensed milk respectively during the period 2000 - 2009. The estimates are based on market reports, expert's opinions and internet sources (see, *inter alia*, http://dspace.aua.gr/xmlui/bitstream/handle/10329/49/%CE%A3%CF%85%CE%BC%CE%B5%CF%89%CE%BD%CE%AF%CE%B4%CE%BF%CF%85-secure.pdf?sequence=3, http://www.tanea.gr/-oikonomia/article/?aid=70406, http://estia.hua.gr:8080/dspace/bitstream/-1234-56789/1029/-1/gala-toulas.pdf, http://nefeli.lib.teicrete.gr/browse/sdo/ba/2011/DrouganiAnastasia,-TzatzarakiAnastasia/-attached-document-1326097873-423613-29440/Drougani_Tzatzaraki2011.pdf).

[59] See United States v. E.I. du Pont de Nemours & Co., 351 U.S. 377 (1956).

the estimated CL formulas indicate narrowly delineated product markets for each type of white milk[60].

Table 2 also presents the estimates by Daljord & Sørgard (2011) CL methodology. One interesting result from the Table in question is that for a 10% price increase of fresh milk in relation to high pasteurization milk, the former type of milk does not constitute a single product market. This result contradicts with the estimated result from the application of Daljord et al. (2008) CL methodology. It is evident that for a 10% increase of fresh milk the CL methodology by Daljord & Sørgard (2011) leads to a broader market definition than the CL methodology by Daljord et al. (2008).

This in turn implies that the asymmetry between the two products is large or eq. (14) for a 10% price increase of fresh milk in relation to high pasteurization milk must be satisfied. The calculation of the said equation clearly indicates that the inequality holds, that is,

$$S_A < 36.5\%$$

where S_A : the market share of the «small product».

4.3 Unilateral effects

In this section I present the estimated coefficients of GUPPI and UPP (Table 3). The calculation of GUPPI[61] intends to measure the upward pricing pressure solely from the closeness of substitution between the products under scrutiny.

[60] Froeb & Werden (1992) have pointed out that product markets are narrowly delineated even if the observed market prices are below competitive prices («Reverse Cellophane Fallacy»). Reasons for this may be predatory pricing or infrequently large increases of nominal prices instead of frequently small increases of prices (see Sportech/Vernons merger inquiry, UK Competition Commission, http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/rep_pub/reports/2007/fulltext/533).

[***Please insert Table 3 about here***]

It is evident from the Table in question that a hypothetical monopolist would have an incentive to increase the price of high pasteurization milk in relation to fresh and condensed milk (Unilateral effects). This result is due to the highly estimated coefficient of Diversion Ratio (the fraction of the reduction in sales of high pasteurization milk that is diverted to fresh or condensed milk following a price increase on high pasteurization milk) and a high estimated price – cost margin or both. That is, «*The higher the diversion ratio or the higher the margin of the merging partner, the greater the profits that are recaptured by the merging partner and thus the greater the incentive to raise price*».[62]

Regarding the other pairs of types of white milk the magnitude of estimated GUPPI is lower. The said index of condensed milk in relation to fresh milk is 15%, while the corresponding index of the same type of milk in relation to high pasteurization milk is 6%.

The empirical results from the calculation of Upward Pricing Pressure imply that the downward pricing pressure due to the emerged efficiencies must be high enough in order to outweigh the incentive of a hypothetical monopolist to raise the price of the product under scrutiny. Efficiencies (variable cost savings) tend to reduce price due to cost savings (Figure 3).

[***Please insert figure 3 about here***]

Assume the pair of fresh and high pasteurization milk. A hypothetical monopolist would have an incentive to raise the price of fresh milk for any price increase lower

[61] See eq. 17 & 18.
[62] Moresi (2010), p. 3.

than 11,18%. However, for any price increase above the said percentage (or equal to 11,18%), the price effect due to diversion effect is lower than the variable cost saving effect.

As it concerns the UPP of high pasteurization milk in relation to fresh and condensed milk the empirical results verify the corresponding results from the calculation of GUPPI. Both fresh and condensed milk create strong UPP on high pasteurization milk and a hypothetical monopolist would find difficult not to increase the price of the latter.

Nevertheless, condensed milk does not impose strong UPP on fresh milk since all the price increases of the latter above or equal to 1.3% are less profitable than the efficiencies generated from a decrease of fresh milk's price by 1.6%.

4.4 Measuring the Buying Power of the merged entity in the relevant product market for the procurement of raw milk

4.4.1 Sensitivity Analysis & Buyer Power Index

Figure 4 illustrates the results of sensitivity analysis of eq. (20). Recall that the properties of the said equation are $\frac{\partial BPI}{\partial S} > 0$ and $\frac{\partial BPI}{\partial \varepsilon} = \frac{\partial BPI}{\partial \eta^{CF}} < 0$. That is, the higher the market share of the large buyer the higher the deviation from the competitive outcome and the higher the market elasticity of supply and the own price elasticity of demand of the competitive fringe, the lower the buying power of the large buyer. In particular, for $\varepsilon = \eta^{CF} = 4$ and $s = 35\%$, the deviation from the

competitive level is 5,3%, but for $\varepsilon = \eta^{CF} = 1$ and $s = 65\%$, the BPI of a large buyer is 48,1%.[63]

[***Please insert figure 4 about here***]

In Table 4 we present the range of estimated BPI of a large buyer in one of the biggest prefectures in Greece for the year 2010.

[***Please insert Table 4 about here***]

It is evident from the Table in question that the BPI of a large buyer is lower in markets with high elasticity of supply and price demand elasticity of the competitive fringe than in inelastic markets. Hereto, if the market elasticity of supply is 0 and the own price elasticity of demand of the competitive fringe is 0.5 then the estimated BPI is between 230% and 240%.

5 Concluding remarks

Focusing on a recent horizontal merger in the Greek diary sector, the aim of this paper is on the one hand to empirically investigate the delineation of the market of production and distribution of white milk in Greece and on the other hand, to calculate the Buying Power Index of a large buyer in the relevant product market for the procurement of raw milk.

The econometric results in combination with price – based techniques of Hypothetical Monopolist Test and cointegration analysis indicate that the markets of production and distribution of fresh, high pasteurization & condensed milk in Greece are highly inelastic and constitute distinct relevant product markets.

[63] The DOJ uses a 35% as a threshold for s (Blair & Harrison, 2010, p. 59).

Moreover, product asymmetries (in terms of sales) play a crucial role in market definition. That is, for a 10% increase of fresh in relation to high pasteurization milk, the Critical Loss methodology by Daljord & Sørgard (2011) estimates broader relevant product market than the "Single Product Criterion" by Daljord et al. (2008). This in turn implies that the asymmetry between the two products is large.

Besides, the evidences from the calculation of Upward Pricing Pressure imply that unilateral effects are present. The downward pricing pressure due to the efficiencies (variable cost savings) generated by the merger must be high enough in order to outweigh the incentive of a hypothetical monopolist to raise the price of the products.

The empirical results from the calculation of the Buying Power Index of a large buyer in the relevant product market for the procurement of raw milk indicate its ability to deviate from the competitive equilibrium even in the cases where its responsiveness to monitor the quantity supplied to changes in prices is low and the demand elasticity of the competitive fringe is highly elastic.

An interesting result indicates that if the demand elasticity of the competitive fringe falls from 1 to 0.5, while the market elasticity remains stable, the BPI of a large buyer almost doubles.

Summarizing, price – based techniques of merger control are useful tools in order to define relevant product markets as well as market power, so as long as they are handled with proper care in markets where other forms of non price competition are the dominant forms of strategic interaction among firms.

Appendix

Conditions of a profit - maximizing SSNIP test. The "Would Approach".

The SSNIP test assumes a fixed price increase of a group of products or a single product. It evaluates whether a SSNIP of a product in a market will be profitable for a hypothetical monopolist. It is based on the idea that a set of products do not face significant competition from outside the market products.

Let c be the constant marginal cost[64] for all levels of production, $D\left(p_A^M; p_2^C .....p_i^C\right)$ the inverse demand function, p_A^M a hypothetical monopolist's price and $p_2^C .....p_i^C$ the prices of competitors' products. In a homogeneous single – product market a hypothetical monopolist maximizes its profits with respect to its price:

$$\max_{p_A^M} \pi^M\left(p_A^M; p_2^C .....p_i^C\right) = \max_{p_1^M}\left(p_A^M - c\right)D\left(p_A^M; p_2^C .....p_i^C\right) \quad (1.1)$$

The monopolist will increase its price as long as it generates more profits than the monopolist's profits prior to the increase of the price. That is,

$$\text{Monopolist's mark up} = \frac{p_A^M - c}{p_A^M} \leq \frac{1}{\varepsilon_{AA}^M\left(p_A^M; p_2^C .....p_i^C\right)}^{65} \quad (1.2)$$

where ε_{AA}^M is the own price elasticity of demand of monopolist's product.

In terms of hypothetical monopolist profits' prior and after the price increase, equation (1.2) can be written as

[64] Equivalently, if marginal cost data is absent the researcher may use average variable cost (hereafter and AVC) as a proxy of marginal cost of production.

[65] In terms of hypothetical monopolist profits' prior and after the price increase, equation (1.2) can be written as $\pi^M\left(p_A^M; p_2^C .....p_i^C\right) - \pi^M\left(p_0^M p_2^C .....p_i^C\right) > 0$, where p_0^M is the price of the product prior the increase.

$$\pi^{M}\left(p_{A}^{M};p_{2}^{C}.....p_{i}^{C}\right)-\pi^{M}\left(p_{0}^{M}\,p_{2}^{C}.....p_{i}^{C}\right)>0 \quad (1.3)$$

where p_0^M is the price of the product prior the increase.

In a differentiated product market, where all the products in the market are considered to be perfect substitutes, equation (1.2) becomes

$$\text{Monopolist's mark up}=\frac{p_A^M-c}{p_A^M}\leq\frac{1}{\eta_A^{MA}\left(p_A^M;p_2^C.....p_i^C\right)}^{66} \quad (1.4)$$

where η_A^{MA} is the own price elasticity of candidate market demand faced by a hypothetical monopolist[67].

In a multiproduct market a hypothetical monopolist must recognize the cross – product effects[68]. That said, given hypothetical (multiproduct) monopolist product's *A* & *B*[69], their price increase will be profitable if

$$\text{Monopolist's mark up}=\frac{p_A^M-c}{p_A^M}\leq\frac{1}{\varepsilon_{AA}^M\left(p_A^M;p_2^C.....p_k^C\right)}+\frac{p_B-c_B}{p_A}*\text{DR}_{\text{A, B}} \quad (1.5)$$

$$\text{Monopolist's mark up}=\frac{p_B^M-c}{p_B^M}\leq\frac{1}{\varepsilon_{BB}^M\left(p_B^M;p_2^C.....p_k^C\right)}+\frac{p_A-c_A}{p_B}*\text{DR}_{\text{B, A}} \quad (1.6).$$

---

[66] If the price elasticity of demand is low, a hypothetical monopolist has an incentive to increase the price.

[67] Recall that $\eta_A^{MA}\left(p_A^M;p_2^C.....p_i^C\right)=\frac{\partial\ln D_A^{MA}\left(p_A^M;p_2^C.....p_i^C\right)}{\partial p_A^M}$, where $D_A^{MA}\left(p_A^M;p_2^C.....p_i^C\right)$ is the market demand.

[68] That is, given that products A & B belong to hypothetical monopolist, the effect of the increase of product's A price on the demand for product B.

[69] In a general multiproduct environment a hypothetical monopolist compares the profits of k products prior to price increase with the profits that generated after a $\frac{\partial p}{p}$ on prices $p_A, p_B,....,p_k$.

The 1984 US Merger guideline test by Ivaldi & Lorincz

While the profit – maximizing SSNIP test assumes a fixed price increase of a group of products or a single product (see equation (1.7)), the 1984 US merger guideline test by Ivaldi & Lorincz (2011) assumes equilibrium price increase. It also predicts that other products in the market («the outside goods») react to the price increase of candidate products by increasing their prices too (see equation (1.8))[70].

Following Ivaldi & Lorincz (2011, pp. 37-38), a subset of products is a single product market of product A if equation (1.7)[71] below is satisfied,

$$\Delta\Pi_M^{SSNIP} \equiv \left(\frac{\sum_{A \in M} \left[\pi_A \left(\frac{\Delta p^{SSNIP}}{p} \right) - \pi_A(p_0) \right]}{\sum_{i \in M} \pi_i(p_0)} \right) * 100 > 0 \quad (1.7)$$

where

M : a subset of firms in the single product market

i : products, other than j, in the single product market

p_0 : the price of product A prior its increase.

According to 1984 US merger guidelines test, [Ivaldi & Lorincz (2011, pp. 39-40)], the equilibrium relevant market price index of a subset of products M is defined as

[70] The use of a simple merger simulation model for Market definition purposes has also been pointed out by Schmalensee (2009). See also Fotis & Polemis (2011), pp. 326-329.
[71] See also equation (1.3).

$$P^{1984\,US} = \left\{ \frac{\sum_{A \in M} \left(\frac{\Delta p_A^{1984\,US}}{p_A} \right) q_A}{\sum_{A \in M} p_A q_A} - 1 \right\} * 100 \quad (1.8)$$

A single product market M exists whether $P^{1984\,US} > \frac{\Delta p_A^{1984\,US}}{p_A}$, where price increases take values between 5% – 15% and M is the smallest subset of products among all the subsets of products in the market that satisfies the above mentioned inequality[72].

[72] See, *inter alia*, CM5885, *Centrica Plc/Dynegy Storage Ltd and Dynegy Onshore Processing*, August 2003, Case COMP/M. 3216, *Oracle/PeopleSoft*, [2005] L218/6, Case COMP/M.1672, *Volvo/Scania*, [2001] O.J. L143/74, Case COMP/M.3083, *GE/Instrumentarium*, [2004] O.J. L109/1 for an application of merger simulation analysis in merger cases.

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List of Figures & Tables

Figure 1: The market of production and distribution of white milk

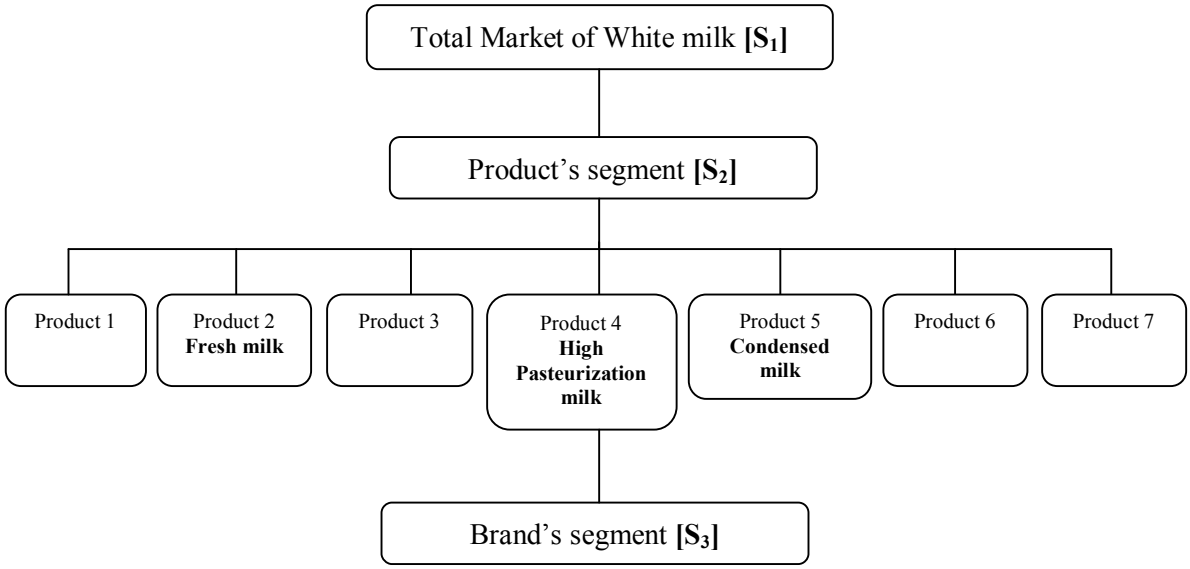


Figure 2: The evolution of log prices & its differences of fresh, high pasteurization & condensed milk in Greece: 2000 - 2009

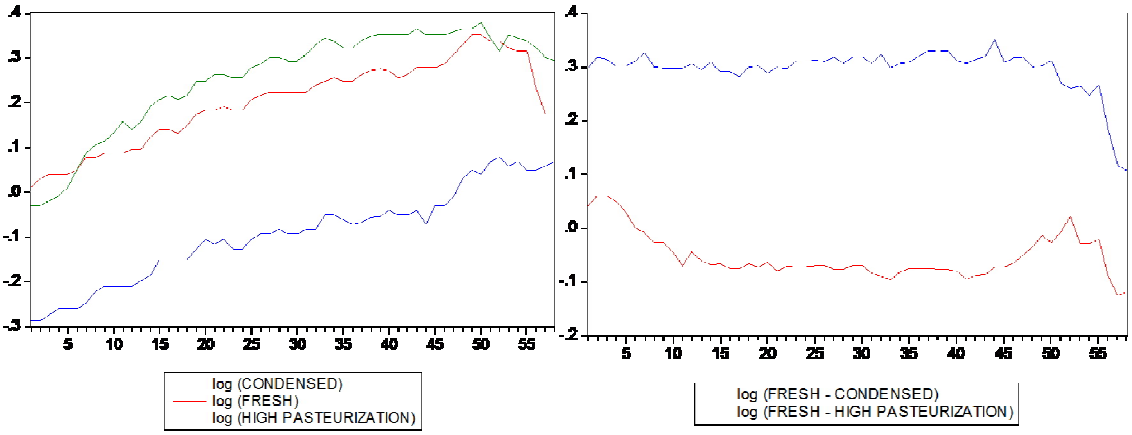
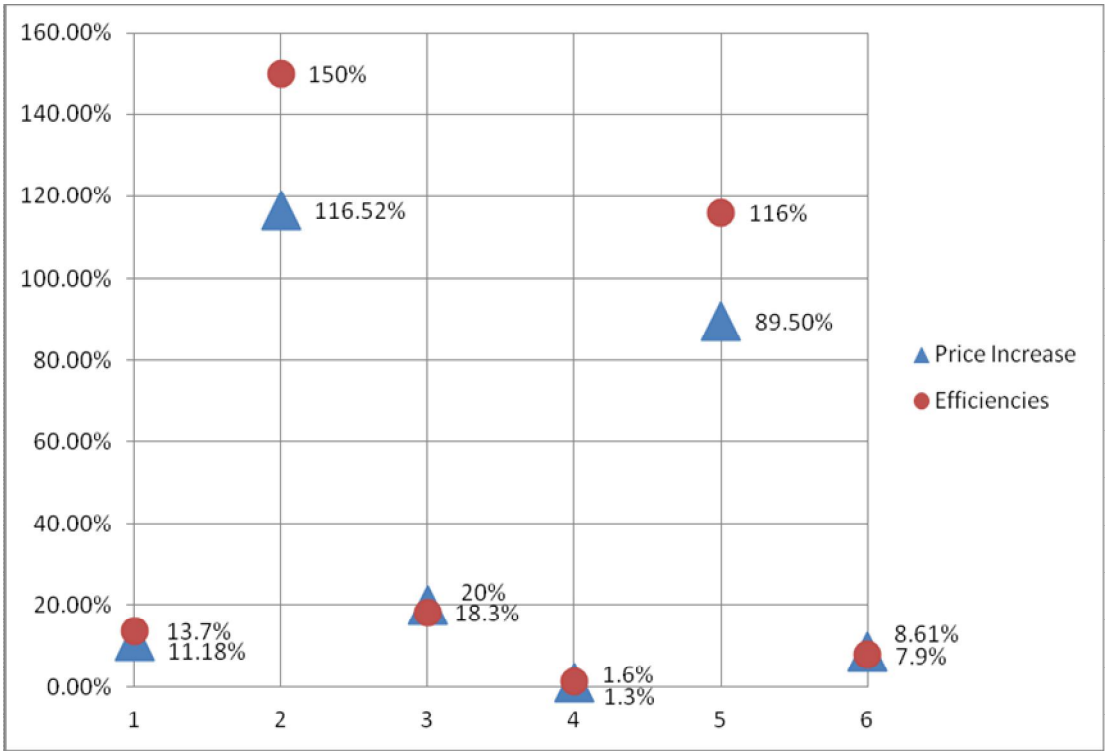
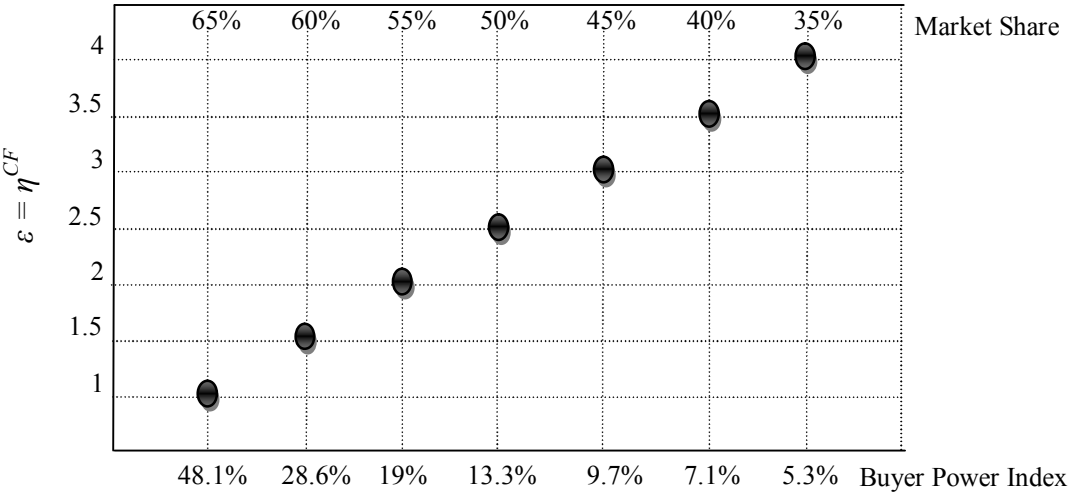


Figure 3: Efficiencies and Upward Pricing Pressure



Notes: 1 (fresh – hp), 2 (hp – fresh), 3 (con – fresh), 4 (fresh – con), 5 (hp – con), 6 (con – hp).
hp: high pasteurization milk
con: condensed milk
Source: Author's estimations

Figure 4: Buyer Power Index & sensitivity analysis



Source: Author's estimations

Table 1: Application of CL analysis: merger cases from EU and U.S.A.

EUROPEAN COMMISSION	Arjowiggins / M-real Zanders Reflex[1] Ineos / Kerling[2] ABF / GBI[3] Alo / MX[4] KLM / Martinair[5] Arsenal / DSP[6] Lufthansa / SN Airholding[7] Dunfermline Press / Berkshire Trinity[8] Mirror Homebase / Focus[9] Lovefilm / Amazon[10]	FTC v Occidental Petroleum Corp[11] FTC v TenetHealthcare Corp.[12] US v SunGard and Comdisco[13] FTC v Swedish Match North America Inc.[14] Plaintiff, v. Whole Foods Market, Inc. and Wild Oats Markets, Inc.[15]
		U.S.A.

Notes: [1]Case COMP/M. 4513 Arjowiggins/M-real Zanders Reflex, [2] Case COMP/M. 4734 Ineos/Kerling, [3] Case COMP/M. 4980 ABF/GBI, [4] Case COMP/M. 4989 Alo/MX, [5] Case COMP/M. 5141 KLM/Martinair, [6] Case COMP/M. 5153 Arsenal/DSP, [7] Case COMP/M. 5335 Lufthansa/SN Airholding, [8] **No.** ME/3315/07 (http://www.oft.gov.uk/OFTwork/mergers/decisions/2008/dunfermline2), [9]**No.** ME/3427/07 (http://www.oft.gov.uk/OFTwork/mergers/Mergers_home/decisions/2008/Home), [10]**No.** ME/3534/08 (http://www.oft.gov.uk/OFTwork/mergers/Mergers_home/decisions/2008/LOVEFiLM), [11] *Federal Trade Commission v Occidental Petroleum Corp.*, 1996–I Trade vs. (CCH) 67,071 (D.D.C. 1986), [12] *Federal Trade Commission v Tenet Healthcare Corporation*, 186 F. 3d 1045 (Eight Circuit 1999), [13] *US v SunGard and Comdisco*, 172 F. Supp. 2d 172, 182,186–92 and n.21 (D.D.C. 2001), [14] *Federal Trade Commission v Swedish Match North America Inc.*, 131 F. Supp. 2d 151, 160–62 (D.D.C. 2000), [15]*Federal Trade Commission, Plaintiff, v. Whole Foods Market, Inc., and Wild Oats Markets, Inc.* (United States District Court for the District of Columbia), Civ. No. 07-cv-01021-PLF, FTC File No. 071 0114.
Source: Author's elaboration of data.

Table 2: Empirical results from Katz & Shapiro (2003) and Daljord & Sørgard (2011) Critical Loss methodologies

	Critical Loss Analysis							
	Products	Price increase*			Products	Price increase*		
		5%	7.5%	10%		5%	7.5%	10%
Katz & Shapiro (2003)	fresh – hp**	☒	☒	☒	fresh - hp**	✓	✓	×
	hp** - fresh	☑	☑	☑	hp** - fresh	✓	✓	✓
	con*** – fresh	☑	☑	☑	con*** – fresh	✓	✓	✓
	Fresh - con***	☑	☑	☑	Fresh - con***	✓	✓	✓
	hp** - con***	☑	☑	☑	hp** - con***	✓	✓	✓
	con*** - hp**	☑	☑	☒	con*** - hp**	✓	✓	✓
								Daljord & Sørgard (2011)

Notes: *price increase of a hypothetical monopolist, **high pasteurization milk, ***condensed milk
☒: AL > CL since DR < CL (equations 5 & 5')
☑: AL < CL since DR > CL (equations 5 & 5')
×: AL > CL (equation 13)
✓: AL < CL (equation 13)
Source: Author's estimations

Table 3: Gross Upward Pricing Pressure Index for various combinations of white milk

Products	GUPPI (euro)	GUPPI (%)
fresh – hp*	≈ 2.5 cents	≈ 1%
hp* - fresh	≈ 1.5 euro	≈ 123%
con** - fresh	≈ 18 cents	≈ 15%
fresh – con**	≈ 1.5 cent	≈ 1.7%
hp* - con**	≈ 1.16 euro	≈ 127%
con - hp*	≈ 8 cents	≈ 6%

Notes: *high pasteurization milk, *condensed milk
Source: Author's estimations

Table 4: Buying Power Index (%) of a large buyer in one of the biggest prefectures n Greece: 2010

	η^{CF}						
	0	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
ε							
0		[230-240]	[110-120]	[70-80]	[50-60]	[40-50]	[30-40]
0.5	[100-110]	[70-80]	[50-60]	[40-50]	[30-40]	[30-40]	[20-30]
1.0	[50-60]	[40-50]	[30-40]	[30-40]	[20-30]	[20-30]	[20-30]
1.5	[30-40]	[30-40]	[20-30]	[20-30]	[20-30]	[20-30]	[10-20]
2.0	[20-30]	[20-30]	[20-30]	[20-30]	[10-20]	[10-20]	[10-20]
2.5	[20-30]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]
3.0	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]

Notes:

ε : The market elasticity of supply, η^{CF} : the own price elasticity of the competitive fringe. The numbers of ε & η^{CF} are hypothetical. The market share of the large buyer is classified.

Source: Author's estimations.