Applying the Index Family concept in practise - Tracing price changes through the retail sector

The retail and wholesale sector plays a unique role in a national system of price statistics as it applies several distinct sets of prices to items that are physically identical. This makes it an ideal test case for the application of the Index Family concept. The present paper is an attempt to fit ONS' available data for values and prices of retailers sales, stocks, and purchases -including imports- into an appropriate analytical framework, explain the theoretical and practical implications and show the gaps in the existing system.

Keywords : Prices, Retailing, Margins, PPI, CPI, Inventories

1. Introduction

One of the most fundamental facts of economics is that one pound, dollar, euro or yen is no different from another and so values can be directly compared and added in a way that quantities cannot. It is this "aggregatability" that has allowed and encouraged National Accountants to develop a grand synthesis, the SNA, that is fully integrated but covers every transaction in the economy, often with information aggregated by the transactors themselves. Price statisticians face a much more difficult task. They must observe the values of a few selected potential transactions for which they judge the quantities offered to be equivalent and aggregate them to form indices, and they must do this in such a way that these indices are "representative" for their target users. Naturally they have taken a less universlist approach. Each group of analysts work on their own set of indices and attempts to use estimates from one area to improve those in another are rare.

Despite the relative isolation in which we work all of us who compile and analyse price statistics are aware that prices behaviour in different parts of the economy are linked. The bank of England for instance talks of a prices 'pipeline'[1] in which *"For retailers, the price of an item will have to cover the cost of buying the goods from the producer, paying staff their wages and paying for other services required such as delivery, rents and electricity. A similar breakdown applies to producers. This will include the cost of materials and components that they purchase from other firms."* Similar considerations are apparent in the Bureau of Labour Statistics' stage of processing analysis. A recent paper by Fenwick[2] advocates the use of frameworks derived from the SNA to integrate different price indices. This paper is an attempt to investigate these ideas more deeply and apply them to the main price indices relevant to retail trade margins. These margins are of great and increasing interest in their own rite for estimating and explaining economic growth[3] and are also of particular interest to consumer price statisticians because the sector is the source of most consumer prices. Finally the application of two sets of prices are to the same set of physical objects presents a particular challenge to analysis.

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[1] See the reference at **http://www.bankofengland.co.uk/education/targettwopointzero/economy/costs_prices.htm**

[2] Fenwick UNECE May 2006 Systems of Price Indices and Supporting Frameworks

[3] See Timmer Inklaar and Van Ark "Productivity differences in US and EU retailing, statistical myth or reality"

The paper as it stands is almost entirely devoted to a preliminary exploration of concepts with only a smattering of initial estimation included in a final Annex. The first of the remaining sections looks in more detail at what retail trade margins are; it is followed by a theoretical discussion of their measurement and an assessment of what constant retail margins might imply for the link between retail prices and supply prices. The penultimate section considers actual data available for measuring replacement prices and outlines the advantages of analysing it within the sort of framework proposed in Fenwick 2006. The insights gained are not particularly deep but writing them down has been extremely useful for me and will, I hope, be useful for others as well

2. What are Trade Margins?

The SNA defines a trade margin a trade margin as *"the difference between the actual or imputed price realized on a good purchased for resale and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of." (SNA 1993).* Note that it is the replacement price that is relevant rather than the cost at which the goods were purchased. The difference between the replacement price and the original price is a holding gain made up of a nominal gain due to the movement of the general price level and a real holding gain due to the rise in the relative price of the item being held.

The point is simple but appears to be widely ignored in the literature. The idea of a prices 'pipeline' or of producer prices as a leading indicator of consumer prices implies a model of price formation in which retailers agree to purchase an item at a certain price and set a markup and the item is then sold to a consumer after a certain stable period[4]. If this markup were achieved it would include both the trade margin and a holding gain. However this model does not only ignore SNA definitions but the way large retailers actually behave. Large UK retailers commonly send out revised price lists to all their stores every night. These are applied to the prices on their shelves regardless of their original cost except for perishable goods where the lag between purchase and sales is likely to be small anyway. This behaviour is perfectly rational. It makes no sense to sell an item that costs twenty pound to replace for ten pounds even if you originally bought it at two and hoped to sell it for three. An explanation for retailers behaving in this way would have to contain some assertion that the transactions costs of changing price tickets were prohibitively high, that retailers lacked information about replacement prices an had to estimate them using past purchase prices, that there was some sort of implicit contract with consumers about the markup, or that retailers could predict movements in purchase prices and had target holding gains. In short the use of producer prices as a leading indicator of retail prices, like any other leading indicator, requires some departure from fully rational behaviour and there is no evidence that retailers are particularly irrational in their price setting[5].

The other important point about trade margins is that they are a payment for actual services such as gathering a particular range of goods together in the same place and

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[4] The idea of PPIs as a leading indicator also underlies past ONS work on price comparisons eg *Richardson and Baxter - PPI/RPI comparisons, economic trends August 1998*

[5]Strictly speaking intermediate consumption is also valued at replacement cost and should not be a leading indicator either. It would be easier to make a case for a link between producer prices because wages are subject to long term contracts and in any case nominal wages are notoriously sticky

providing a convenient place to shop with friendly, knowledgeable staff (see Eurostat manual on Prices and Volumes[6]). Unlike a flow actually *defined* as a residual such as operating surplus, retail services could in principal be measured directly. In theory an identical item could be sold in the same outlet in two different periods with two different quantities of trade services, perhaps due to the presence of better trained or friendlier staff. It is difficult, however, to see how this quantity change could be measured in practise.

3. Measuring Trade Margins

The Eurostat handbook states that; "Statistical offices have so far used data on the volume of sales as indicators of the volume of trade services". That is margins per unit of sales on a given type of transaction in a given outlet are assumed constant but differences in the average trade margin caused by moving sales from one outlet or product to another are allowed for. This can be done directly by constructing an index of sales volumes weighted by base period margin values or indirectly by subtracting current sales deflated to the base period sales prices from current replacement costs deflated to the base period replacement prices and making an index of the result. That the two approaches are identical with total coverage can be seen by simply setting out the algebra.

Let $p^t_{r,i}$, p^t_i and q^t_i be sales prices, replacement prices and quantities and define; values $v_i \equiv p_i q_i$ margins $m_i^t = q_i^t(p_{r,i}^t - p_i^t)$ shares $s_i^{m,t} = q_i^t(p_{r,i}^t - p_i^t) \Big/ \sum_{i=1}^N q_i^t(p_{r,i}^t - p_i^t)$, $s_i^{r,t} = q_i^t p_{r,i}^t \Big/ \sum_{i=1}^N q_i^t p_{r,i}^t$, and $s_i^t = q_i^t p_i^t \Big/ \sum_{i=1}^N q_i^t p_i^t$ and totals, $M_i^t = \sum_{i=1}^N m_i^t$, $R_i^t = \sum_{i=1}^N q_i^t p_{r,i}^t$, and $B_i^t = \sum_{i=1}^N q_i^t p_i^t$

The direct measure of the current margin volume is

$$\text{(1)} \qquad M_i^0 \sum_{i=1}^N s_i^{m,0} q_i^t / q_i^0 = \sum_{i=1}^N q_i^t (p_{r,i}^0 - p_i^0) = \sum_{i=1}^N q_i^t p_{r,i}^0 - \sum_{i=1}^N q_i^t p_i^0$$

while the indirect measure is

$$\text{(2)} \qquad R_i^t \sum_{i=1}^N s_i^{r,t} p_i^0 / p_i^t - B_i^t \sum_{i=1}^N s_i^t p_i^0 / p_i^t = R_i^0 \sum_{i=1}^N s_i^{r,0} q_i^t / q_i^0 - B_i^0 \sum_{i=1}^N s_i^0 p_i^t / p_i^0 = \sum_{i=1}^N q_i^t p_{r,i}^0 - \sum_{i=1}^N q_i^t p_i^0$$

Note that whereas (1) requires us to measure the change in quantity for goods for outlets with each different base period margin rate separately (2) only requires the correct current sales and supply shares.

Practical estimators for (1) and (2) are given by

$$\text{(1a)} \qquad \sum_{j=1}^J m_j^0 \left(v_j^t / v_j^0 \right) * \left(P_{ki \in j, Lo, x}^0 \Big/ P_{ki \in j, Lo, x}^t \right)$$

where the i transactions are divided into J groups each containing K_j transactions for which we assume that sales weighted Laspeyres quantity indices are equal to margin

[6] Eurostat Handbook on Price and Volume Measurement in National Accounts

weighted Laspeyres quantity indices and $P^{b,t}_{k\in j,B,Lo}$ is the estimated Lowe price index for group j at time t calculated using weights x and a set of prices ji that fall in group J.

and

$$\text{(2a)}\quad \sum_{l=1}^{L} v_j^{r,t}\left(P^0_{li\in l,r,Lo,y}\Big/P^0_{li\in l,r,Lo,y}\right)-\sum_{0=1}^{O} v_l^t\left(P^0_{oi\in o,Lo,z}\Big/P^0_{oi\in o,Lo,z}\right)$$

where sales and supply prices are grouped into L and O groups respectively.

We can get an indication of the formula biases by using the standard result that a price index weighted using base quantities q_b is equal to one calculated using base quantities q_a plus the term

$$\text{(3)}\qquad \sum_{i=1}^{N} s_i^a\left(r_i-r^*\right)\left(t_i-t^*\right)\Big/Q^L_{a,b}\left(p_0,q_a,q_b\right)$$

Where r_i are price relatives, t_i quantity relatives q_i^b / q_i^a, s_i^a are value shares using the base prices and $Q^L_{a,b}\left(p_0,q_a,q_b\right)$ is the p_0 based quantity index from q_a to q_b, and r* and t* are price and quantity indices. A symmetrical result applies to quantity indices weighted using different sets of prices.[7]

Applying (3) to (1a) tells us that for each of the J groups of transactions the margin weighted quantity index is equal to the sales weighted quantity index plus

$$\text{(1b)}\quad \sum_{k=1}^{K_j} s^0_{j,k}\left(\left(\left(p^0_{r,k,j}-p^0_{k,j}\right)\Big/p^0_{k,j}\right)-\left(\left(p^0_{r,j}-p^0_{j}\right)\Big/p^0_{j}\right)^*\right)\left(\left(q^t_{k,j}\Big/q^0_{k,j}\right)-\left(q^t_{j}\Big/q^0_{j}\right)^*\right)\Big/P^L_{r,}\left(q^0_{j,k},p^0_{j,k},p^0_{r,j,k}\right)$$

While the sales weighted quantity index is equal to the value index times the Lowe price index between the base period and p^0 divided by the Lowe price index between the base period and p^t plus

$$\text{(1c)}\qquad v_j^{0,t}\sum_{k=1}^{K_j} s_j^t\left(\left(p^0_{r,k,j}\Big/p^t_{r,k,j}\right)-\left(p^0_{r,k,j}\Big/p^t_{r,k,j}\right)^*\right)\left(\left(q^b_{k,j}\Big/q^t_{k,j}\right)-\left(q^b_{j}\Big/q^t_{j}\right)^*\right)\Big/Q^L_{t,b}\left(p_t,q_t,q_b\right)$$

While for (2a) there is only one formula bias term and it is net.

$$\text{(2b)}\quad \begin{aligned}&\sum_{l=1}^{L} v_L^{r,t}\sum_{k=1}^{K_l} s_l^{r,t}\left(\left(p^0_{r,k,l}\Big/p^t_{r,k,l}\right)-\left(p^0_{r,l}\Big/p^t_{r,l}\right)^*\right)\left(\left(q^b_{k,l}\Big/q^t_{k,l}\right)-\left(q^b_{l}\Big/q^t_{l}\right)^*\right)\Big/Q^L_{t,b}\left(p_{r,t},q_t,q_b\right)\\&-\sum_{l=1}^{O} v_0^t\sum_{k=1}^{K_o} s_0^t\left(\left(p^0_{k,0}\Big/p^t_{k,0}\right)-\left(p^0_{0}\Big/p^t_{0}\right)^*\right)\left(\left(q^b_{k,0}\Big/q^t_{k,0}\right)-\left(q^b_{0}\Big/q^t_{0}\right)^*\right)\Big/Q^L_{t,b}\left(p_t,q_t,q_b\right)\end{aligned}$$

We know that the ratio of two sample Lowe price indices with pps sampling is equal to the ratio of the population Lowes plus a sampling error with an asymptotic expectation of 0 but a bias in small samples[8]. The variance of this error will of course

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[7] See annex A for a derivation

[8] See Balk *Price Indices for Elementary Aggregates: The Sampling Approach*

depend on the sample size but may well be significant. If it is the mean square error of the biased single deflated estimate of a net variable may well be smaller than less biased double deflated estimate if the net variable is a small proportion of the gross as we know from Hill's classic discussion[9]

4. Linking price indices using a Constant Margins assumption

As the works cited above clearly demonstrate analyst's main reason for caring about the trade margin is the wish to use information on producer and import prices to improve estimates of consumer prices. However the assumption that the volume of trade services grows in line with the volume of sales does not in itself allow us to do this as the price of trade services may still vary. In order say anything at all we must add the additional assumption that the price of trade services varies with the price of sales, i.e. assume that sales and replacement prices are equal.

If we are prepared to do this we have

(4) $$\text{Sale price change } = \frac{\sum_{i=1}^{N} p_i^t m_i^t q_i^0}{\sum_{i=1}^{N} p_i^0 m_i^0 q_i^0} = \sum_{i=1}^{N} s_i^m \left(p_i^t m_i^t / p_i^0 m_i^0 \right) = \sum_{i=1}^{N} s_i^m r_i \, \mu_i$$

$$= \text{replacement price change} + \sum_{i=1}^{N} s_i^m \left(r_i - r^*\right)\left(\mu_i - \mu^*\right) + \mu^* \sum_{i=1}^{N} \left(s_i^m - s_i\right)\left(r_i - r^*\right)$$

(see Annex 2)

$$\text{Where } r_i \equiv \frac{p_i^t}{p_i^0} \; \mu_i \equiv \frac{m_i^t}{m_i^0}, r^* \equiv \sum_{i=1}^{N} s_i r_i \;, \mu^* \equiv \sum_{i=1}^{N} s_i^m \mu_i$$

If margins are fixed μ_i is always equal to 1.The difference between the indices is then exactly equal to the effect of using sales value weights as opposed to replacement value weights to measure price changes. If margin prices are changing the effect of the sales price index will depend on the correlation of margin increases and price relatives.

As the argument in section 2 suggests even if margins were fixed there is no obvious reason why supply prices should be informative about future retail prices. They would however provide information for estimating current retail prices or more realistically for checking them.

5. Retail and Replacement Prices in Practise, A SAM approach

While retail prices are fairly well defined replacement prices are a more difficult concept. Replacement costs will be determined by import prices, taxes and transport costs as well as producer prices, and the total return to retailers will depend on stock revaluation. Annex 3 is an attempt to show the relevant variables in a Social Accounting Matrix or SAM. SAMs are square sets of economic accounts in which

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[9] T.P. *Hill "The Measurement of Real Product" OECD February 1971*

each pair of rows and columns represents a single account. The entries in each cell show the payments made by the account at the top of the column to the account in the row. As the accounts are balanced the sum of entries for each row equals the sum for each the corresponding column[10]. Account 8[11] for instance shows the balance between retail sales and closing stocks at current cost and retail purchases, opening stocks and the trade margin for each SIC group.

One feature of a SAM framework is that it allows for multiple sectoring to accommodate any classification. Cell 8,7 for example shows a matrix of retail sales classified by the standard industrial classification of the retailer and COICOP while cell 7,1 shows the same data classified by coicop and the RPI item classification. By showing the links back to the elementary index level for each flow we can use the framework to analyse the relationship between the different price indices and identify the contradictions inherent in the assumptions used to compile them. These assumptions are inevitable due to the lack of detailed data to fill the body of each matrix as opposed to the border totals is never available on a timely basis. The see how this works in practise consider 8,7 . The body of the cell is is determined by the retail price index team's assumption that current the proportion of each sic classification's sales by different Coicop groups is fixed. Given the current values of sales by SIC and the coicop price changes this fixes the relative quantities in each Coicop group. However the RPI assumes that the relative quantities of each coicop group are fixed.

6. Concluding remarks and future work

Writing this paper has been a rather negative experience that has suggested the problems with using supply prices as a leading indicator, the difficulties of identifying the best way to measure constant price margins, and the difficulties of comparing consumer and producer prices in any way other than through balancing deflated accounts. Despite this the simplest comparison of Consumer and producer prices immediately suggests discrepancies that warrant investigating. I will therefore close by suggesting how to take investigations forward.

- The choice between single and double deflation is clearly an empirical issue that can be answered by looking at price and quantity correlations

- The fact that sales and prices are available for commodities but purchases and margins are measured by industry is a serious limit on the measurement and analysis of trade volumes. The only way forward is to look at micro data to try to estimate separate industry and product margins.

- Microdata is also needed to reconcile movements in consumer and producer analysis with changes to the Value of trade margins.

[10] more details on SAMs can be found in the 1993 SNA or Pyat and Round, 1980, Social Accounting Matrices for Development Planning.
[11] For simplicities sake we assume all retail sales are made to consumers.

Annex 1 Difference between two Lowe price indices with different base weights (derived from CPI manual Section 15.2)

Consider two Lowe price indices with different with different bases. Let q^a indicate quantities in period **a** and q^b quantities in period **b**. define

$$r_i \equiv \frac{p_i^t}{p_i^0}, t_i \equiv \frac{q_i^b}{q_i^a}, \; P_{0,t}^{aLo}\left(p_0, p_t, q_a\right) = r^* = \sum_{i=1}^{N} r_i s_i^a \; \text{ and } \; Q_{a,b}^{0Lo}\left(p_0, q_a, q_b\right) = t^* = \sum_{i=1}^{N} t_i s_i^a$$

where $s_i^a = p_i^0 q_i^a \Big/ \sum_{i=1}^{N} p_i^0 q_i^a$ or the quantity shares of period a valued at the prices of period 0.

The Lowe price Index of price change from p^0 to p^t with base quantities b is given by

$$P_{0,t}^{bLo}\left(p_0, p_t, q_b\right) = \frac{\sum_{i=1}^{N} p_i^t q_i^b}{\sum_{i=1}^{N} p_i^0 q_i^b} = \frac{\sum_{i=1}^{N} p_i^t t_i\, q_i^a}{\sum_{i=1}^{N} p_i^0 t_i\, q_i^a} =$$

$$\left[\frac{\sum_{i=1}^{N} p_i^t t_i\, q_i^a}{\sum_{i=1}^{N} p_i^0 q_i^a}\right]\left[\frac{\sum_{i=1}^{N} p_i^0 t_i\, q_i^a}{\sum_{i=1}^{N} p_i^0 q_i^a}\right]^{-1} = \left[\frac{\sum_{i=1}^{N}\left(p_i^t / p_i^0\right) t_i\, p_i^0 q_i^a}{\sum_{i=1}^{N} p_i^0 q_i^a}\right]\Bigg/ t^* = \left[\frac{\sum_{i=1}^{N} r_i\, t_i\, p_i^0 q_i^a}{\sum_{i=1}^{N} p_i^0 q_i^a}\right]\Bigg/ t^*$$

$$= \frac{\sum_{i=1}^{N} r_i\, t_i\, s_i^a}{t^*} = \frac{\sum_{i=1}^{N}\left(r_i - r^*\right) t_i\, s_i^a}{t^*} + \frac{r^* \sum_{i=1}^{N} t_i\, s_i^a}{t^*} = \frac{\sum_{i=1}^{N}\left(r_i - r^*\right) t_i\, s_i^a}{t^*} + \frac{r^* t^*}{t^*}$$

(take r* away then add it, split summation, and use $t^* = \sum_{i=1}^{N} t_i s_i^a$)

$$= \frac{\sum_{i=1}^{N}\left(r_i - r^*\right)\left(t_i - t^*\right) s_i^a}{t^*} + \frac{\sum_{i=1}^{N}\left(r_i - r^*\right) t_i^* s_i^a}{t^*} + r^*$$

(same trick with t rather than r)

$$= \frac{\sum_{i=1}^{N}\left(r_i - r^*\right)\left(t_i - t^*\right) s_i^a}{t^*} + \frac{t_i^*\left[\sum_{i=1}^{N}\left(r_i\, s_i^a\right) - r^* \sum_{i=1}^{N}\left(s_i^a\right)\right]}{t^*} + r^*$$

but sum of $s_i^a = 1$ and $P_{0,t}^{aLo}\left(p_0, p_t, q_a\right) = r^* = \sum_{i=1}^{N} r_i s_i^a$ so [] term =0

$$= r^* + \frac{\sum_{i=1}^{N}\left(r_i^0 - r^*\right)\left(t_i^0 - t^*\right) s_i^a}{t^*} = P_{0,t}^{aL}\left(p_0, p_t, q_a\right) + \frac{\sum_{i=1}^{N}\left(r_i^0 - r^*\right)\left(t_i^0 - t^*\right) s_i^a}{Q_{0,b}^{L}\left(p_0, q_a, q_b\right)}$$

Or the Lowe Index of price changes from time 0 to time t with base quantities **a** plus the weighted covariance of the relative price between p^0 and p^t and the relative quantity changes between q^a and q^b divided by the Lowe index of changes between quantities a and quantities b with the base prices of time 0.

Annex 2 Difference between CPI and PPI with changing margin (derived from CPI manual Section 15.2)

Consider two price indices with different with different bases. Let q^a indicate quantities in period **a** and q^b quantities in period **b**. define retail price = margin times supply price = $m^t_n * p^t_n$

$$r_i \equiv \frac{p_i^t}{p_i^0} t_i \equiv \frac{q_i^t}{q_i^0}, \mu_i \equiv \frac{m_i^t}{m_i^0}, v_i \equiv p_i\, q_i\,, s_i \; = v_i^0 \Big/ \sum_{i=1}^N v_i^0\,, s_i^m = m_i^0 v_i^0 \Big/ \sum_{i=1}^N m_i^0 v_i^0\,, r^* \equiv \sum_{i=1}^N s_i\, r_i\;, \mu^* \equiv \sum_{i=1}^N s_i^m \mu_i$$

The price Index of price change from p^0 to p^t with base quantities b is given by

Or CPI $= \dfrac{\sum_{i=1}^N p_i^t m_i^t q_i^0}{\sum_{i=1}^N p_i^0 m_i^0 q_i^0} = \sum_{i=1}^N s_i^m \left(p_i^t m_i^t / p_i^0 m_i^0\right) = \sum_{i=1}^N s_i^m r_i\; \mu_i$

$$= \sum_{i=1}^N s_i^m \left(r_i \; - r^*\right)\mu_i \; + r^* \sum_{i=1}^N s_i^m \mu_i$$

$$= \sum_{i=1}^N s_i^m \left(r_i \; - r^*\right)\left(\mu_i \; - \mu^*\right) + \mu^* \sum_{i=1}^N s_i^m \left(r_i \; - r^*\right) + r^* \mu^*$$

$$= \sum_{i=1}^N s_i^m \left(r_i \; - r^*\right)\left(\mu_i \; - \mu^*\right) + \mu^* \sum_{i=1}^N \left(s_i^m - s_i\;\right)\left(r_i \; - r^*\right) + \mu^* \left[\sum_{i=1}^N r_i\, s_i \; - r^* \sum_{i=1}^N s_i \;\right] + r^* \mu^*$$

$$= r^* \mu^* + \sum_{i=1}^N s_i^m \left(r_i \; - r^*\right)\left(\mu_i \; - \mu^*\right) + \mu^* \sum_{i=1}^N \left(s_i^m - s_i\;\right)\left(r_i \; - r^*\right)$$

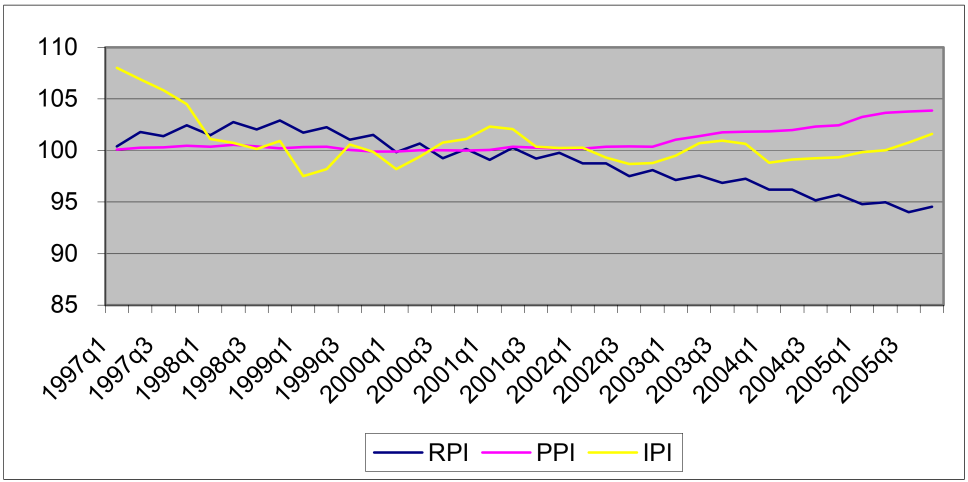
Or the PPI Index * the change in the margin weighted by base period sales at consumer prices plus the weighted correlation between price relatives at supply prices and margin relatives plus another term that depends on the difference in the base period margins.

Annex 3 Social Accounting Matrix Structure for Retail Sector

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			CPI	PPI	IPI	PPI	PPI	Inv * SIC	COICOP	SIC	COICOP	CPA	CPA	Inv * SIC	Inv * SIC			
Sales by CPI elementary Item	1	cpi															financing of purchases	
Domestic Purchases by PPI elementary Item	2	ppi										Domestic Purchasers CPA * PPI						*PPI elementary Items*
Imported Purchases by IPI elementary Item	3	IPI											Import Purchases CPA*IPI					*IPI elementary Items*
Inventories by PPI opening cp	4	ppi												opening stocks at current cost PPI*Inv*SIC				*PPI elementary Items*
Inventories by PPI closing cp	5	ppi						Closing stocks historic PPI * Inv *SIC									revaluation of closing stocks	*ppi lagged to close*
Inventories at historic cost	6	Inv * SIC				Opening stocks historic Inv *SIC* PPI												
Sales (coicop)	7	COICOP	Retail Sales Coicop *CPI															
Retailers Trading Accounts (SIC)	8	sic							Retail Sales SIC*COICOP						Stocks at current cost SIC*Inv*SIC			
Purchases (Coicop)	9	COICOP								Purchases Coicop*SIC								
Manufacturers and wholesalers (PPIs)	10	CPA									Domestic Purchases CPA*Coicop							
Rest of the World (Import PPIs)	11	CPA									Purchases from Imports CPA*Coicop							
Inventories Opening by Inventories Classification	12	Inv * SIC								Opening stocks at current cost Inv*SIC*SIC								
Inventories Closing by Inventories Classification	13	Inv * SIC					closing stocks at current cost Inv*SIC*PPI											
Indirect Tax	14								Taxes on Margins			Taxes on Production	Taxes on Imports					
Institutions	15			return to domestic suppliers	return to overseas suppliers	revaluation of openstocks		Stock Change (historic)		Retailers Trade Margin						Total Tax		
			CPI item deflators			*ppi lagged to opening*	*PPI*											

Annex 4 – Selected information on UK Retail and Supply Prices.

Chart 1 RPI, PPI, and IPI based Margin weighted Retail Sales Deflators 1997-2005 , 2000=100



but turnover per unit of output only rises slightly

Table 1 Quarterly Industry deflators by retailer using alternative price indices 1997-2005

	Correlation for Quarterly SIC Deflators 19			Average Annual Inflation		
	RPI/PPI	RPI/IPI	PPI/IPI	RPI	PPI	IPI
Confectioners, Tobacconists And Newsagents	77%	-61%	-14%	0.7%	0.9%	-0.7%
Non-Specialised Stores (Excludg Ctns) Holding an Alcohol Licence, With Food, Beverages Or Tobacco Predominating	-89%	49%	-41%	-1.3%	0.8%	-0.7%
Fruit And Vegetables	70%	-24%	21%	1.8%	0.6%	-0.3%
Meat And Meat Products	88%	-3%	10%	0.7%	0.4%	-2.0%
Fish, Crustaceans And Molluscs	70%	-75%	-48%	2.7%	2.9%	-1.4%
Bread, Cakes, Flour Confectionery And Sugar Confectionery	87%	-48%	-8%	1.4%	0.9%	-1.2%
Alcoholic And Other Beverages	93%	-57%	-44%	1.5%	1.2%	-1.1%
Tobacco Products	91%	77%	74%	3.8%	1.7%	1.0%
Other Food, Beverages And Tobacco Specialised Stores	92%	-25%	-6%	1.4%	0.3%	-0.6%
Dispensing Chemists	72%	-80%	-75%	0.8%	0.6%	-1.2%
Medical Equipment	92%	-11%	-16%	2.7%	1.6%	-0.8%
Cosmetic And Toilet Articles	-17%	-44%	-22%	0.4%	3.9%	-0.7%
Textiles	-66%	48%	-42%	-0.9%	0.8%	-1.4%
Clothing	-77%	26%	-28%	-2.5%	0.3%	-0.5%
Footwear	-69%	40%	-43%	-1.2%	1.5%	-0.6%
Furniture, Lightg Equipment And Household Articles Not Elsewhere Classified	80%	-14%	0%	1.0%	0.5%	-0.2%
Electrical Household Appliances And Radio And Television Goods	99%	88%	88%	-8.3%	-3.1%	-2.1%
Hardware, Paints And Glass	-80%	-59%	84%	-0.7%	0.8%	1.1%
Books, Newspapers And Stationery	96%	-18%	-1%	1.9%	1.2%	-0.4%
Floor Covergs	47%	-50%	-35%	1.9%	0.6%	-1.1%
Photographic, Optical And Precision Equipment, Office Supplies And Equipment (Including Computers, Etc.)	88%	70%	74%	-3.6%	-1.9%	-1.5%
Other Specialised Stores Not Elsewhere Classified	-95%	-43%	37%	-1.1%	0.9%	0.2%
Antiques, Including Antique Books	67%	61%	38%	0.6%	0.6%	0.7%
Mail Order Houses	96%	67%	67%	-4.2%	-1.2%	-1.2%
Stalls And Markets	76%	-41%	-18%	0.8%	1.1%	-0.3%
Other Non-Store	71%	-24%	39%	-0.6%	-0.8%	-0.5%
Repairers	-82%	68%	-46%	-2.3%	0.6%	-0.8%
Total (Margin Weighted)				-0.9%	0.4%	-0.7%