PRICE-COST MARGINS AND MARKET STRUCTURE

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NUMBER 44

WARWICK ECONOMIC RESEARCH PAPERS

DEPARTMENT OF ECONOMICS

UNIVERSITY OF WARWICK
COVENTRY

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NUMBER 44

April, 1974

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relation between various market structural variables and various dimensions of performance. The most popular activity has been to relate profit rates, variously defined, to measures of concentration and barriers to entry but this activity has not been clearly based on any well-defined theoretical model. When the theoretical model is spelled out it becomes obvious that inter-industry relationships of this sort are rather meaningless because of certain strategic omitted variables. A prime example is the omission of the industry price elasticity of demand, a practice which can only be justified if for example we assume its constancy across industries within the cross-section. However if we were to shift our focus to <u>changes</u> in performance then it is reasonable to assume that the omitted variables problem will be much less severe i.e. assuming the constancy of industry price elasticities over time would seem less heroic than assuming they are constant across industries. This point may also carry over to at least some barriers to entry variables as will be discussed later.

<u>Theory</u> :

Consider an industry with N firms producing a homogeneous product. We can write down the profit equation for the ith firm as

$$\Pi_i = pX_i - c(X_i) \qquad (1)$$

where Π_i is profit, X_i is output rate, p is price and c is cost, assuming for the moment the same cost conditions for each firm. The inverse market demand function is

$$p = f(X) = f(X_1 + X_2 + \ldots + X_N) \qquad (2)$$

Assuming profit maximizing behaviour the first-order conditions for a maximum

The current debate on inflation seems to suffer from an important error of omission. The central thrust of the discussion would seem to suggest that the key to the problem, excluding exogenous forces, is the wage bargain. Moderate the rate of wage inflation and price inflation will automatically be controlled. This rather simplistic policy prescription ignores among other things the rapidly increasing market power in the product markets in the U.K. economy.* At the same time where the link between price inflation and product market power is discussed in the literature the relationship is often misspecified, or at least a relationship which has a rather solid basis in theory is ignored and a specification with a more tenuous theoretical underpinning is pursued, in many cases with predictably poor results. Of the studies which have specifically focussed on price change the aim has typically been to identify the relationship of this variable with the level or degree of market power as reflected in some measure of the size distribution of firms. A hypothesis more solidly based in oligopoly theory would suggest a relationship between the rate of change of market power and the rate of price inflation. However, there are theoretical underpinnings for the relationship of price inflation to some measure of the level of concentration and these will be examined after setting down the more obvious link.

Focussing on this specific policy problem of price inflation does in fact lead to a more satisfactory specification for testing structure-performance relationships generally. Industrial economists following from Mason and Bain have run innumerable tests (largely using U.S. data) of the

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* It may of course be the case that a part, or the whole, of the excess profits generated by firms from increased product market power may be appropriated by powerful unions in the wage bargain. This would mean that part of the increased rate of price inflation due to emerging product market power may induce an increased rate of inflation in wages and perhaps other elements of cost, which may damp down any increase in price-cost margins which would otherwise result. This aspect of the problem has obvious relevance for public anti-inflation policy which relies to some extent at least on observations on changes in price-cost margins and will be taken up again later in the paper.

are

$$\frac{d\Pi_i}{dX_i} = p + X_i f'(X_i) \frac{dX}{dX_i} - c'(X_i) = 0, \qquad (3)$$
$$i = 1, \ldots, N,$$

where $$\frac{dX}{dX_i} = 1 + \frac{d \sum_{j \neq i} X_j}{dX_i} = 1 + \lambda \qquad (4)$$

Note that under Cournot assumptions $\lambda = 0$ i.e. each firm maximizes under the assumption that the output of other firms is invariant to its own output decisions.

If we now sum over the N firms in the market we get

$$Np + \sum_{i=1}^{N} X_i f'(X_i)(1 + \lambda) - N c'(X_i) = 0 \qquad (5)$$

Dividing through by p yields

$$N + \frac{1 + \lambda}{\eta} - \frac{N c'(X_i)}{p} = 0 \qquad (6)$$

Where η is the industry price elasticity of demand.

We can rewrite (6) to give us

$$\frac{p - c'(x_i)}{p} = - \frac{1 + \lambda}{N\eta} \qquad (7)$$

Thus we have the prediction that the markup of price over marginal cost is inversely related to the number of firms in the industry and to the industry price elasticity of demand.

More generally we may wish to accommodate the existence of unequal size firms as dictated by their different marginal cost functions. We can then re-write (3) as

$$\frac{d\Pi_i}{dX_i} = p + X_i\, f'(X_i)\, \frac{dX}{dX_i} - c'_i(X_i) = 0 \qquad (8)$$

Then multiplying by X_i, and summing over the N firms we have

$$\Sigma\, pX_i + \Sigma\, \frac{X_i^2}{X^2}\, f'\,(1 + \lambda)\, X^2 - \Sigma\, c'_i\,(X_i)X_i = 0 \qquad (9)$$

$$\therefore \quad \frac{\Sigma\, pX_i - \Sigma\, c'_i(X_i)X_i}{pX} = -\Sigma\left(\frac{X_i}{X}\right)^2 \cdot \frac{f'\, X^2}{pX} \cdot (1 + \lambda) \qquad (10)^*$$

If we assume constant cost firms (i.e. marginal cost equal to average cost) then the L.H.S. of the equation is the ratio of profit (Π) to revenue (R). On the right-hand side the first term is the Herfindahl index of concentration (H), so the equation can be rewritten as

$$\frac{\Pi}{R} = -\frac{H}{\eta}(1 + \lambda) \qquad (11)$$

In the case of differentiated products the profit equation may be written

$$\Pi_i = p_i\, X_i - c_i\,(X_i) \qquad (12)$$

and the inverse-demand function facing the ith firm is

$$p_i = f_i\,(X_1, \ldots, X_N) \qquad (13)$$

in which case the first-order conditions for profit maximization become

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* We are indebted to David Morris for pointing this out to us.

$$\frac{\partial \Pi_i}{\partial X_i} = p_i + X_i \frac{\partial p_i}{\partial X_i} - c'_i (X_i) = 0 \qquad (14)$$

$i, j = 1, \ldots, N : j \neq i$

Multiplying by X_i we will then have

$$p_i X_i + \frac{X_i^2}{X^2} \cdot X^2 \frac{\partial p_i}{\partial X_i} - c'_i (X_i) \cdot X_i = 0 \qquad (15)$$

Now we have to establish a link between the firm's demand function and the market demand function - we will take a pragmatic view and talk about the market elasticity of demand for a product which is heterogeneous. We can then rewrite equation (15) :

$$p_i X_i - c'_i (X_i) \cdot X_i = - \frac{X_i^2}{X^2} \cdot X^2 \cdot \frac{\partial p_i}{\partial p} \cdot \frac{\partial p}{\partial X} \cdot \frac{\partial X}{\partial X_i} \qquad (16)$$

Then summing over i and dividing through by industry revenue yields:

$$\frac{\Sigma p_i X_i - \Sigma c'_i (X_i) \cdot X_i}{pX} = - \frac{\partial p}{\partial X} \cdot \frac{X}{p} \Sigma \left(\frac{X_i^2}{X^2} \cdot \frac{\partial p_i}{\partial p} \cdot \frac{\partial X}{\partial X_i} \right) \qquad (17)$$

The relation of this equilibrium condition to the one previously established for the homogeneous product case depends on the value of $\partial p_i / \partial p$. Its reciprocal is obviously less than one and is equal to the market share of the ith firm. Thus in the case of differentiated products we would predict the price-cost margin to be greater than in the homogeneous case, a result which seems intuitively plausible.*

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* We may note that the definition of the Herfindahl in terms of quantities has limited relevance in the differentiated products case. However, in terms of the way we have set up the model for testing this would appear to be less of an objection than might otherwise be the case.

At this stage we should make a general point about the approach we have followed in examining behaviour under oligopoly structures. In a situation with a high degree of interdependence among firms in a specific product market we may note some inconsistency in the model relating to the objectives of the firm and the behaviour so implied. Thus profit maximization implies an exploration of the costs and benefits arising from collusive behaviour. However we may also note that when the determinants of these costs are explored it has been found that the Herfindahl index is the relevant measure of concentration thrown up by the analysis {See Stigler {13}}*. This analysis by Stigler does not however provide a complete specification suited to inter-industry analysis. Thus although it can be readily seen that the industry price elasticity of demand will determine the prize for successful collusion this does not enter directly in the Stigler analysis. We have therefore adopted an approach which does provide a well-defined specification suitable for testing against inter-industry data while recognizing that models of collusion throw up similar specifications.

Testing the Model:

The simple oligopoly model we have constructed may be tested with observations from a cross-section of industries, in which case, equation (11), which is defined for industries with undifferentiated products and may be used as an approximation for industries with differentiated products, may be written

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* The Stigler approach consists of inferring from the observed behaviour of buyers the pricing behaviour of sellers. Thus for a group of new buyers one may expect that they will distribute themselves across sellers according to the existing market shares of sellers. Thus the expected number of new buyers going to the ith seller is $S_i n$, where S_i is the existing market share of the ith seller and n is the total number of new buyers. The variance of $S_i n$ is then $nS_i(1 - S_i)$ and summing over the number of sellers we get a total variance of $n(1 - \Sigma S_i^2) = n(1 - H)$. Thus the variance, which determines the cost of detection of price cutting by rivals, is inversely related to the Herfindahl measure of concentration.

$$\left(\frac{\Pi}{R}\right)_k = \frac{H_k}{\eta_k} (1 + \lambda_k) \quad k = 1, \ldots, M \text{ industries} \qquad (18)$$

The problem with this specification is that while profits, revenue and some measure of concentration are potentially observable at a reasonable level of disaggregation the same cannot be said for the industry price elasticity of demand. There are various possible resolutions to this dilemma. First one may assume the problem away as in fact most studies in structure - performance relationships have. In general this would seem a very dubious thing to do. At the quite disaggregated level at which market structure measures are meaningful it is likely that the variation in industry price elasticities is quite considerable. Of course it may be possible to restrict the sample to a group of industries in which the demand characteristics are relatively homogeneous. This procedure will generally pose severe degrees of freedom problems unless the analysis is respecified at the firm level. This is the approach adopted by Kelly and Cowling {7} where the sample is restricted to firms in the food industry, but in that case the main thrust of the analysis was concerned with the effect of advertising.

Another possible approach, and the one adopted here, is to change the focus of analysis away from explaining inter-industry differences and toward explaining intra-industry changes over time. This in fact is highly relevant in the current situation in the U.K. and the rest of Europe where we are observing very significant changes in concentration over time. This contrasts with the situation in the U.S. where concentration in product markets has remained relatively constant over recent history. This may of course help to explain some of the behaviour of previous analysts of structure-performance relationships.

If we shift our focus to the change in concentration and the resultant change in price-cost margins we can reformulate equation (18) in a suitable way so as to eliminate η_k on the assumption that it remains constant over the relevant time-period of analysis.* This can be achieved by taking ratios of variables over time.

$$\frac{\left(\frac{\Pi}{R}\right)k(t)}{\left(\frac{\Pi}{R}\right)k(t-1)} = \frac{H_{k(t-\theta)}}{H_{k(t-\theta-1}} , \qquad (19)$$

assuming $\eta_{kt} = \eta_{kt-1}$. Note also that the conjectural variations term falls out so long as it is assumed constant over time. θ may take on a value of zero, although more realistically we might expect it to be greater than zero since it is likely that there will be a considerable lag before an industry which has experienced a change in structure will settle down to a new equilibrium. Case studies of specific mergers would suggest that in many cases up to five years can elapse before the fruits of merger are realised {See Singh {12}}.

Other Determinants of Price-Cost Margins

We have constructed a very simple model by which changes in price-cost margins may be explained. We must now consider the effect of other variables which may be changing in the real world and which may need to be taken account of in our empirical work. These include variables determining barriers to the entry of firms into the industries in question;

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* In fact η_k may vary through the business cycle as suggested by Harrod {6} and thus we will experiment with various control variables in order to try and account for these cyclical changes both on a macro and on an industrial level.

variables measuring the changing power of buyers of output and sellers of inputs; and variables picking up differential cyclical effects on the array of industries. It will also be useful to examine competing hypotheses concerning the relationship between structure and price inflation.

It is clear that in the long-run if entry is costless, and with no major indivisibility problems, then price will converge on marginal cost. In terms of our model, we would have to reformulate the measure of concentration to include potential entrants as well as actual participants. At the same time it seems reasonable to assume that significant barriers to the entry of new firms do exist across the industrial spectrum. However they are not likely to be of the same height and this raises very real problems of measurement when one is concerned with explaining the level of price-cost margins. Measures which have been widely used in previous structure-performance studies have generally been either subjective or poorly specified. In our specification we are again able to circumvent some of these problems since it would seem much more likely that barriers have not changed significantly within specific industries than that barriers were of the same height across a wide array of industries. Where changes are felt likely it is also, in some cases, much easier to measure the change rather than the level of the barrier. Thus in the case of advertising the barrier has to do with the capital good nature of advertising and yet in some previous studies {e.g. Comanor and Wilson {2}} the variable used has been current advertising investment rather that the advertising capital stock which is theoretically required for studies of <u>level</u> of performance and which was in fact used by Kelly and Cowling {7}. The obvious reason for this misspecification is that advertising capital stock figures are difficult to come by whereas some measure of current gross investment may

be available. In our model explaining changes in performance the investment measure may give a reasonable approximation to the change in the barrier. We will assume , for barriers like minimum efficient plant size (if indeed it can be so categorised) and capital requirements, that they are increasing no faster than the capacity of potential entrants to overcome them. Indeed if they are effective then much of their effect will be reflected in the changing concentration which results. Thus if, as seems likely, minimum efficient plant size is increasing over time, then of course entry at such a rate of output will have increasingly depressive effects on post-entry price {See Modigliani {8}}. However markets are also expanding over time and this would tend to mitigate such effects. Similarly, increasing capital requirements would be mitigated by increasing firm size.*

We now turn to the question of the possible growth of countervailing power. First, the increasing product market power derived from increasing concentration may be moderated by the increasing concentration among buyers of the product in question. The construction of an index of buyer concentration for each industry is conceptually possible, with the input-output matrices providing relevant weights, but it is a major undertaking and is currently being pursued by Waterson. Similarly any increased market power among sellers of inputs may allow them to appropriate part of the gain incident to increased product market power on the part of firms in the industry. In the case of industrial inputs we are not yet able to provide a suitable index of concentration but in the case of labour we have experimented with a variable measuring the change in unionization, although the data available

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* In explaining the level of price-cost margins some recognition would also have to be made of the varying levels of barriers to the entry of imports across industries. However in the case of changes in price-cost margins this would seem less important since changes in tariffs and transportation costs have tended to be across the board affecting all industries to the same extent. We reject the solution whereby the current level of imports is included as an explanatory variable since this may be interpreted as the result rather than the cause of the price cost-margin.

is rather sparse.

There remains the problem of allowing for inter-industry changes in price-cost margins due to cyclical effects. In terms of our model these results would work through the industry price elasticity of demand, or through the divergence of marginal cost from average cost, if we consider the industries to be in equilibrium. There is the associated real possibility that the extent to which equilibrium is attained will be determined by the severity of the cyclical fluctuations in demand and the related factor of the frequency of purchasing. We have experimented with various measures of cyclical variability such as change in revenue, change in unemployment and also by dividing the sample into durable and non-durable goods industries on the assumption that durable goods show much more pronounced cyclical fluctuations in demand, and are less frequently purchased.* We will also experiment with including a constant term in the equation to allow for a general upward or downward movement in price-cost margins between the two periods which may refer to different stages of the business cycle.

As mentioned earlier previous studies of the relationship between price inflation and concentration have specified the level of concentration as being the relevant variable (see eg{11}). At the same time the theoretical underpinning for such an empirical relation was generally lacking. However a combined version of the Sweezy {14} and Efroymson {4} kinked demand curve may provide such a theoretical underpinning. Efroymson suggested that in times of expansion prices would be flexible upward in all cases whereas Sweezy had previously put forward the hypothesis that in times of recession prices of oligopolistic industries would be inflexible downward. Joining

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* Ideally we would prefer a long period of relative stability with which to test our model but such observations are not readily available.

these hypotheses together we get a ratchet effect over time leading to higher rates of price-inflation for oligopolistic structures. Thus we have a competing hypothesis but one which has some complementary aspects. It may help to explain the disequilibrium we observe through the business cycle since it suggests that the extent to which equilibrium is reached during periods of recession is related to the index of concentration.

Data:

Most of the data used in the analysis derives from the Census of Production for the years 1958, 1963 and 1968. The observations relate to Minimum List Heading industries which defines a maximum of 119 observations. Our sample will fall below that level because of various data difficulties discussed below.

1. Concentration:

Our theory defines the Herfindahl measure of concentration as the equivalent one but unfortunately this is not published. We are grateful to Malcolm Sawyer for allowing us to use his estimates of the Herfindahl index which are based on the average firm shares for each employment size category in the Census of Production. We should note immediately that this method of estimation will understate the true level of the Herfindahl and that the extent of understatement may vary over time. Two alternative formulations of the Herfindahl were available, one excluding firms with less than twenty-five employees. Since we only have estimates of the Herfindahl index available, we also experimented with concentration ratios. Concentration ratios based on sales are provided in the Census of Production reports but unfortunately they are at a finer level of disaggregation than Minimum List Heading, which is the only appropriate level at which the profit-revenue ratio can be calculated. We therefore decided to use

Malcolm Sawyer's estimates again. His estimates are based on employment data from which he devised theoretical maximum and minimum values of the four-firm concentration ratio - we used the average of these values.* He gives concentration ratios for 117 industries (leaving out M.L.H. 384 and 385 in 1958) for 1958 and 1963.

2. Profit-Revenue Ratio:

Profit is measured as gross-output minus (i) raw materials purchases and (ii) wages and salaries and obviously this measure of profits is far too broad. Although it is possible to correct for some of the cost omissions in 1963, it was not possible to do so for 1958, nor yet for 1968. Thus we are making the implicit assumption that omitted costs as a proportion of total costs is a constant within each industry over the time-period in question. We also have to consider the related assumption of the constancy of unit costs which is implicit in our formulation of the price-cost margin variable. In the short-run unit costs obviously may be falling or rising depending on capacity utilization, so to alleviate this problem we experimented with the inclusion of cyclical variables which we may hope will pick up such movements. In terms of long-run unit costs some people may argue for the existence of scale economies. However, if we look at the actual performance of firms, rather than engineering analyses of plants of differing size, we find little evidence in the U.K. to support such conjectures. The results of Samuels and Smythe {9} show no relationship between profit-rates and firm size, although the variability of profit-rates declines with size. The positive relationship between profit-rates or profit margins and firm size reported by Kelly and Cowling {7} (and Hall and Weiss {5} for the U.S.) cannot be isolated from market power considerations since the coefficient on size was

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* For the estimates and method of calculation, see Sawyer {9}.

estimated given the concentration in the markets in which the firms operated. Thus an increase in size must imply an increase in market share and thus a possible increase in market power.

The data on $\frac{\Pi}{R}$ were collected for the census years 1958, 1963 and 1968. Because of changes in some M.L.H. descriptions, a final total of only 96 observations was possible. In collecting the data the principle of using the latest available source was used. Thus, for the 1958 data, the 1963 Census of Production was used, while for the 1963 and 1968 data, the Board of Trade Journal, December 31st 1969 was used.

Other Variables

The sources of data and the precise definition of the other variables, relating to advertising,unionization, unemployment and durable goods is detailed below the relevant results.

Results

A simplistic interpretation of the theory was tried first of all and appeared to give good results. Taking simply changes in concentration, measured by either the Herfindahl or the four-firm concentration ratio there appeared to be a significant relationship with change in the price-cost margin, where some lag in adjustment was allowed. The appropriate algebraic specification is chosen for the measure of concentration used. Thus using the Herfindahl measure a linear formulation was chosen, whereas in the case of concentration ratio a specificationlinear in logarithms was the choice.*

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* This was chosen as an approximation to the non-linear relation between the Herfindahl and the concentration ratio. Our expectation is for a parameter estimate greater than one on the concentration ratio.

The results are reported in Table 1. Comparing equations (1) and (3) the Herfindahl measure of concentration appears preferable as our theory would suggest. In equations (2) and (4) the appropriate level of concentration is added and again the Herfindahl measure performs rather better, Only in equation (4) are the parameter estimates non-significant.

Table 1 : Price-Cost Margin Equations : All Industry Sample [Constant Term Suppressed : Dependent Variable $(\Pi/R)_{68}/(\Pi/R)_{63}$ in Equations (1) and (2) and LOG $\{(\Pi/R)_{68}/(\Pi/R)_{63}\}$ in Equations (3) and (4)]

	(1)	(2)	(3)	(4)
H_{63}/H_{58}	0.7390 (14.890)	0.6042 (9.026)		
$LOG\{CR4_{63}/CR4_{58}\}$			0.2997 (2.547)	0.2250 (1.685)
H_{63}		3.2628 (2.881)		
$LOG\ CR4_{63}$				0.0105 (1.178)
F statistic	221.720	123.437	6.488	3.951

Definitions and Sources:

Π : value added minus wages and salaries, adjusted for inventory change. Census of Production 1963 and 1968, see Board of Trade Journal, December 31st 1969.

R : sales revenue. Census of Production 1963 and 1968.

CR4 : estimate of the four-firm concentration ratio calculated from employment data by Malcolm Sawyer {10}.

H : estimate of the Herfindahl index of concentration provided by Malcolm Sawyer. This index is calculated from employment data from firms with more than twenty-five employees.

Thus, using the Herfindahl measure, we have a statistically significant relation established, provided we constrain the relation to go

through the origin. Although this is theoretically required, the theory relates to an equilibrium condition, whereas the observations on which the empirical estimation is based are snap-shots of interindustry cross-sections at instants of time. This is of course a real deficiency of the empirical work but is unavoidable. Given the problems of the observations we cannot really expect that with no change in concentration within an industry price-cost margins will not change. We may expect changes through the business cycle due to (a) disequilibrium observations; (b) changes in short-run marginal cost as capacity utilization changes and (c) changes in the elasticity of demand. Thus including a constant term allows for those macro-economic changes which affect all industries in approximately the same way and approximately to the same extent. We also need to introduce the other variables we have argued for on cyclical, barriers to entry, or countervailing power grounds. We have taken our advertising variable to be the logarithm of advertising expenditure to allow for diminishing returns to advertising expenditure. In the case of the union variable we have simply taken the ratio of union densities since we have no a priori preference for any particular specification. The results reported in Table 2 and Table 3 relate to more complete specifications but also give the parameter estimates for three samples of industries : (a) the All Industry Sample (96 observations), (b) the Non-Durable Goods Industries Sample (53 observations) and (c) the Durable Goods Industry Sample (43 observations).

Table 2 : Price-Cost Margin Equations : All Industry Sample [Dependent Variable : $LOG\{\Pi/R_{68}/(\Pi/R)_{63}\}$]

	(1)	(2)	(3)	(4)
Constant	-0.0759 (-0.415)	0.0163 (0.066)	0.0370 (1.203)	0.0405 (1.255)
$LOG\{H_{63}/H_{58}\}$	0.1914 (2.226)		0.1736 (2.122)	
$LOG\{CR4_{63}/CR4_{58}\}$		0.2315 (1.630)		0.2131 (1.566)
$LOG\ H_{63}$	-0.0155 (0.488)			
$LOG\ CR4_{63}$		-0.0276 (-0.591)		
$LOG\ ADS_{63}$	0.0034 (0.146)	0.0125 (0.543)		
TU_{63}/TU_{58}	0.4925 (1.229)	0.4411 (1.090)		
DURABLE GD	0.0152 (0.244)	0.0082 (0.129)		
F	1.354	0.983	4.505	2.452
R^2	0.069	0.051	0.045	0.025

t-values in parentheses

Definitions and Sources :

ADS : expenditure on advertising and market research based on a sample of firms, Census of Production, 1963.

TU : union density, i.e. proportion of total employees who are union members. Data provided by the Industrial Relations Research Unit, University of Warwick. The level of aggregation is chosen as the appropriate one from the point of view of the wage bargain. In some cases this involves the aggregation of MLH industries into broader groups.

DURABLE GD : is a zero-one variable taking a value of one for industries producing durable goods.

Equations (1) and (2) in Table 2 represent specifications including the other variables suggested by our previous analysis; advertising, change in union density and a variable which classified industries into two groups on the basis of the durability of the product they produce. Other cyclical variables, such as the change in percentage unemployed and change in sales, were tried without success.

Changes in the Herfindahl do appear to be significantly related to changes in price-cost margins, whereas changes in the concentration ratio do not appear to perform so well. The other variables appear to be non-significant. Equations (3) and (4) simply confirm the significance of the Herfindahl and reveal that the other variables are adding nothing to the analysis. However two aspects of the Herfindahl results raise questions : a linear specification, which is theoretically appropriate, gave a non-significant coefficient associated with change in the Herfindahl and, on a related point, the coefficient in the linear in logarithms relationship is much smaller than its theoretical expectation. These two aspects suggest that the overall relationship is masking two or more quite different relationships. We hypothesized that in the case of non-durable goods we would expect our theory to work rather better than for non-durable goods because of cyclical effects and the generally greater difficulty in adjusting to equilibrium in the case of durable goods. We therefore split the sample into two, non-durables and durables, and estimated each relation separately. The results are presented in Table 3.

Table 3 : Price-Cost Margin Equations : Non-Durable and Durable Goods Industry Samples [Dependent Variable : $(\Pi/R)_{68}/(\Pi/R)_{63}$ in Equations (1), (3) and (5) and $LOG\{(\Pi/R)_{68}/(\Pi/R_{63}\}$ in Equations (2), (4) and (6).]

	NON-DURABLES :				DURABLES :	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-2.5643 (-1.941)	-0.3043 (-0.836)	-0.0914 (-0.253)	0.0198 (0.389)	0.8052 (1.661)	0.2060 (0.077)
H_{63}/H_{58}	1.1439 (3.724)		1.0915 (4.542)		0.0078 (0.182)	
LOG $\{CR4_{63}/CR4_{58}\}$		0.6081 (2.294)		0.5137 (1.922)		0.0810 (0.661)
H_{63}	-0.3857 (-0.239)				1.1474 (1.502)	
LOG $CR4_{63}$		-0.0772 (-1.143)				0.0418 (0.753)
LOG ADS_{63}	0.1168 (1.431)	0.0797 (1.866)			-0.0195 (0.644)	-0.0186 (-0.813)
TU_{63}/TU_{58}	1.5507 (1.453)	0.7590 (1.270)			0.3129 (0.532)	0.3748 (0.808)
F statistic	4.412	2.505	12.547	3.696	0.883	0.479
R^2	0.265	0.170	0.194	0.066	0.087	0.049

The results in fact turned out rather as expected. For non- durables changes in price-cost margins appeared to be significantly related to changes in concentration whereas in the case of durables our equations offered no explanation of changes in the price-cost margin. Looking more closely at the results for non-durables we again see that the Herfindahl performs much better than the concentration ratio and generates a parameter estimate very close (and not significantly different from) our theoretical expectation. The only other variable which approaches significance is the advertising variable, with a coefficient of expected sign. This may indicate that with a rather better definition of advertising expenditure one may expect to pick up a significant result. One other general point about the results is that at best the equations are only explaining about twenty-five percent of the variance in price-cost margin changes. We feel this is all one can expect given the nature of the data, referring as it does to changes in single-year observations. On the question of the link between the level of concentration and the change in price-cost margins the results would appear to question its significance. However it is quite possible that over an extended period the ratchet effect may show up. As far as unionization is concerned the lack of significance of the result may be due to problems of measurement since the problems of the allocation of general union membership to constituent industries is a very difficult one. There was in fact very little change in the measure over the period 1958 to 1963.

Conclusions :

We have attempted to set out explicitly a theoretical specification of the structure-performance relationship. In so doing we have derived an estimating equation in terms of the rate of change of price-cost margins and concentration. This specification allows us to circumvent some of the

omitted variables problems encountered in typical estimates of the structure - performance relation. In the subsequent empirical work using U.K. data a significant relationship between changes in concentration and changes in price-cost margins was established, a result which runs counter to many of the recent findings which tend to cast doubt on the significance of this link, (e.g. {1},{3}. We would conclude from this that more careful attention to the theoretical specification of the relationship may be called for. At the same time we feel that further work should be focussed on the relation between the various components of the price-cost margin and concentration. The existence of managerial discretion in a situation where managerial utility is not uniquely determined by profits would provide a reason for such an investigation.

On the policy side we are left with the implication that part of the observed inflation in the prices of manufactured goods in the sixties may be due to the increase in product market power. The data clearly show an increase in concentration in the majority of industries with big increases in. Some may argue that the result is picking up economies of scale effects but we have suggested that previous evidence does not support this contention. Any more definitive statement must await the outcome of our current investigations of the links between changes in cost and market structure.

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