IMPLICIT BELIEFS
AND NORMATIVE JUDGMENTS
IN THE USE OF CONCENTRATION INDICES

Marie-Paule DONSIMONI *, Paul A. GEROSKI * *
and Alexis JACQUEMIN *

Working Paper n° 8214

* C.R.I.D.E., Université Catholique de Louvain
* * C.R.I.D.E., Université Catholique de Louvain and University of Southampton.

Institut des Sciences Economiques
Centre de Recherches Interdisciplinaires Droit-Economie
3, Place Montesquieu, B-1348 LOUVAIN-LA-NEUVE (Belgique)
October 1982
D/1982/3082/18

1. There appear to be two rather different types of index which industrial organization economists have used to signal market power. They are often distinguished as indicators of the *actual* exercise and indicators of the *potential* exercise of the power to raise market price. Measures of the actual exercise of power seek to reflect directly the distortion of prices from marginal costs which actually occurs; while not exact measures of consumers surplus (or better, equivalent variations), the most popular of these -- the Lerner index or price-cost margin (Lerner, 1934; Bain, 1941) -- are related to such welfare indices, and are certainly easier to empirically observe. Measures of the potential exercise of market power are most frequently one of an almost endless variety of concentration measures. They are potential measures in that it is widely thought that more highly concentrated industries have a higher probability of collusion, which would create more welfare loss. The great virtue of such potential measures is that they are usually even easier to accurately observe than price-cost margins.

Recent work has suggested what the exact link is between these two types of measure, and has both strengthened and weakened the case for using potential measures and, in particular, concentration indices (Saving, 1970; Cowling and Waterson, 1976; Encaoua and Jacquemin, 1980). Given the assumption that firms profit maximize with well defined beliefs about rivals actions, then each firm's price-cost margin and its market share are simultaneously determined at equilibrium by the exogenous variables of cost, demand, and conduct[1]. The same must evidentally apply to any aggregation of these individual firm level Lerner indices into an overall industry performance measure, and the corresponding aggregation of market shares into some particular concentration index. As they are both endogenous variables, market structure and performance obviously bear no causal relation[2] to each other and since both equally contain the same information (i.e. that contained in the exogenous variables), the two aforementioned traditions are reconciled; that is, as overall industry performance indices contain exactly the same information about conduct and other exogenous variables as concentration indices, one can simply use whichever index happens to be closer at hand to reflect market power. Since the latter are usually easier to observe, a powerful case in support of using concentration indices appears to have been made.

It is, however, subject to two important caveats. First, the concentration index which one ought to use to reflect performance depends on industry conduct (Dansby and Willig, 1979; Geroski, 1983), and, since it appears to matter empirically which concentration index one uses (Schmalensee, 1977; Kwoka, 1980; Geroski, 1983), one must first be explicit about the beliefs concerning the existing industry conduct before selecting an appropriate concentration index to signal performance. As long as it is granted that conduct varies across industries[3], within industries, and over time, then it follows that no single index of sellers concentration will always be appropriate. Second, the use of such a concentration index not only involves *implicit beliefs* about industry conduct, but it also involves *normative judgments* implicit in the definition of "industry performance" (which is an aggregation of individual firm performance indices) that the concentration index is supposed to reflect.

It follows then that choice of any particular concentration index as an indicator of industry performance has *both* a positive and a normative basis. The purpose of this paper is to investigate the consequences for choice of concentration indices of normative judgments about industry performance and of beliefs about market conduct.

2. Suppose that there are N firms indexed by subscript i in a homogeneous goods industry who profit maximize. The first order conditions determining the N individual outputs and industry price at equilibrium can be rearranged as

$$(1) \qquad \ell_i = s_i \beta_i / -\eta \qquad i = 1, \ldots, N,$$

where ℓ_i is the i-th firm's Lerner index or price-cost margin, s_i its market share, β_i equals unity plus the sum of its conjectures about the responses of rivals to a change in its own output, and $-\eta$ is the industry elasticity of demand. While ℓ_i is a direct measure of the *actual exercise* of power over market price *by firm* i[4], it is less clear what the *aggregate* exercise of power *by the industry* is. For example, consider two duopolies for which the price-cost margins are (.2,.2) and (.4,0), respectively. While the distribution of power within each industry is clear, what is not clear is in which of the two industries more power overall is being exercised. This problem is nothing more than the appropriate aggregation of individual Lerner indices into an overall index of industry performance. In what follows, we shall work with a fairly general[5] definition of overall industry performance, P

$$(2)\qquad P \equiv \sum_{i=1}^{N} \alpha_i \ell_i .$$

Given equation (1), it is clearly the case that an appropriate structural index, S, to reflect this performance ought to be

$$(3)\qquad S \equiv \sum_{i=1}^{N} \alpha_i \beta_i s_i ,$$

that is, it ought to be a weighted sum of market shares, with weights equal to $(\alpha_i\beta_i)$; if such weights were chosen, then S would be proportional to P (with a factor of proportionality of $-\eta$).

Evidentally from (3) it follows that the selection and use of any one particular concentration index (such as the Concentration Ratio, the Herfindahl Index, and so on) to reflect performance involves the prior *implicit beliefs* that the industry has some particular pattern of behavior or conduct and the prior *normative judgment* that overall industry performance ought to involve some particular weighting of the individual ℓ_i's. Thus, for example, suppose that one were persuaded that industry conduct was Cournot ($\beta_i = 1$ for all i), and that the ℓ_i of larger firms caused more loss than that of smaller firms, so that one elected to adopt weights $\alpha_i = s_i$. Then, from (3), the appropriate structural index to use to signal the performance of this industry is the Herfindahl, and it reflects performance as defined by the share weighted average of the ℓ_i and only that. Suppose now that one felt that loss could only arise from the largest K firms, and that their contribution to overall industry malperformance was roughly equal. This second case, implicitly involves weights $\alpha_i = 1/K$ for $i = 1,\ldots,K$ when firms are indexed by decreasing size, and $\alpha_i = 0$ otherwise. Given exactly the same beliefs about conduct, the K-firm Concentration Ratio is now the appropriate structural index to signal performance (this example is from Encaoua and Jacquemin, 1980).

It follows that use of any one particular concentration index is as much a normative decision as a positive one. Consider the two overall industry performance measures introduced in the last example : $P_1 = \Sigma_{i=1}^{N} s_i \ell_i$, and $P_2 = \Sigma_{i=1}^{K} \ell_i/K$. There is clearly no reason to expect P_1 and P_2 to be correlated. Obviously the use of a Concentration Ratio involves a very clear, and very clearly different normative judgment than use of the Herfindahl. Somewhat more subtly, it also implies a rather different intervention rule within the industry, since with P_2 one can gain as much performance improvement by reducing the ℓ_i of the K-th firm as by reducing that of the first by the same amount, whereas with P_1 the same reduction in ℓ_i always improves overall industry performance when it occurs for firms with larger rather than smaller market shares. That is, when some particular normative judgment about how P is derived from the ℓ_i's has been made, then that *same* judgment also determines a presumption about the ideal distribution of market power within the industry. It follows that choice of the weights in (2) determines at the same time : *if, when,* and *in what industry* intervene might be called for, and also *which firms* within that industry one might concentrate on first in such an intervention policy.

3. Choice of the α_i is clearly of some importance[6]. The usual course of affairs is to take : $\alpha_i = s_i$, so that one's overall industry performance index is simply the market share weighted average of individual firm price-cost margins. The main reason for the popularity of this performance indicator is that it can be proxied by the ratio of industry profits to revenues which is usually fairly easy to observe, but clearly

such a measure of overall industry performance will rarely need to be signalled by a concentration index, being directly observable. Rather than choosing a performance indicator on the grounds of easy direct observability, one might go to the other extreme and carefully specify a Social Welfare function (Dansby and Willig, 1979; Bailey and Willig, 1979). While this automatically settles the weights, it requires a good deal of information not frequently available to implement. We shall adopt a middle course here, and will restrict our analysis to the level of the empirical worker who must select his/her overall industry performance measure (and signal it by a simple structural index) using only his/her knowledge of industry conduct, and his/her observation of market shares. In this case, clearly the weights will need to be based on the only observables[7], the s_i.

Given beliefs about conduct, knowing market shares, and the equilibrium conditions in equation (1), then the first normative question is the choice between a weighting system $\alpha_i = f(\ell_i)$ and $\alpha_i = g(s_i)$. That there is a difference between using ℓ_i and s_i follows from noting that $\ell_i > \ell_j$ iff $(s_i/s_j) > (\beta_j/\beta_i)$, which is consistent with $s_i < s_j$. In principle, the choice between $f(\ell_i)$ and $g(s_i)$ is clear : the former penalizes firms on the basis of actual exercised market power regardless of their size, while the latter penalizes size regardless of their performance. Normative concern solely with allocative efficiency dictates choice of weights based on ℓ_i. Use of a weighting system $g(s_i)$ involves additional normative judgments defined directly on the distribution of output across firms (Blackorby et al, 1982, pp. 92-93; for a related discussion, see Hannah and Kay, 1977, Chap. 3). For instance, one may decide that having all output supplied by a monopolist is inferior to a situation where several firms supply the market even if in *both* cases price is at marginal cost. At least one good reason for such additional normative judgments is that one is almost always concerned with performance in a much broader sense than just price, and it is not obvious that the ideal market structure from the point of view of price is ideal in these other senses. Thus, to return to the example just cited, one may prefer the oligopoly structure because it seems more likely to be dynamically efficient, more equitable in providing a variety of goods, less politically powerful, and so on.

A second important normative question in the choice of the α's is how one ought to determine their relative size. There is room here for plenty of debate about whether such weights should rise or fall with size and how fast[8], but the more subtle and possibly more important question is whether (in the interests of economical data demands) one could reasonably neglect smaller firms altogether, assigning them zero weight (as in the example given in the previous section). That is, even if one knows that small firms are partly responsible for restricting output, one may still wish to neglect this and form one's performance index P (and therefore one's corresponding structural index S) using only information on the largest firms. In addition to "extra economic" judgments, one might reasonably adopt this course of action if one believed that the nature of industry conduct was determined primarily by these large firms, through price leadership, over collusion, or by other means[9].

These two basic choices -- whether the weights ought to be based on ℓ_i or s_i, and the relative size of the weights -- are fundamental normative decisions underlying concentration indices. While they seem rather familiar and indeed have entered into discussion about concentration for quite a while, they are complex choices. To show this, we offer five further observations which are bound up with one or the other of these two decisions.

(i) It is by no means clear that one would wish to use only positive weights (this point was raised by Cowling and Mueller, 1978, in a related context). The simplest example arises when the ℓ_i of one or more firms is negative (perhaps because of predatory pricing); use of a positive weight causes one to "cancel out" this lower than marginal cost price firm with another firm whose price is above marginal cost. However, both such deviations are inimical to welfare and a negative α_i attached to the firm with $\ell_i < 0$ has appeal. Note that a system of weights like $\alpha_i = \ell_i$, $i = 1,\ldots,N$, automatically deals with this problem.

(ii) Since most people have only very simple preferences defined over the distribution of outputs in the industry, and since many of these are different and frequently more subtle than the usual "the bigger the better/worse" slogans, it seems important to broaden the range of weights usually considered. Weights based on ℓ_i are one option, the zero weights option discussed earlier is another. It can be usefully generalized as follows : one assigns (positive) weight to large firms (say $i = 1,\ldots,K$), slightly lower weight to medium sized firms (say $i = K+1,\ldots,M$), and lowest weight to the smallest firms ($i = M+1,\ldots,N$). Denoting these weights as : a_1, a_2, and a_3[10] and supposing industry conduct is Cournot, the following obtains

$$S_1 = a_1 C_k + a_2 MC + a_3(1 - (C_k + MC)), \tag{4}$$

where C_k is the K-firm Concentration Ratio and MC is the Marginal Concentration Ratio (i.e. the collective share of the medium sized firms). To see what is involved with S_1, contrast it to the Herfindahl index, H, based on weights : $\alpha_i = s_i$ (or E, the Entropy index based on weights : $\alpha_i = |\log s_i|$) in which each industry member is assigned a different weight. S_1 evidentally is based on a much simpler distinction between groups of firms, rather than between individual firms. In a straight analogy with H, one could weight all firms in each group by the average market share of the group, so that S_1 becomes :

$$S_2 = \frac{C_K^2}{K} + \frac{MC^2}{(M+1-K)} + \frac{(1-(C_K+MC))^2}{(N+1-M)} \tag{5}$$

which is a modified Herfindahl. In contrast both with weights based on ℓ_i and with such discontinuous weighting schemes is a third alternative judgment frequently made by people concerning the variance of outcomes between firms at equilibrium; in particular, it is frequently felt that there must be some rough equality at least amongst the largest firms (for example, to insure adequate performance in other dimensions such as technical progressiveness). In this case, one would select weights penalizing variance directly, such as : $\alpha_i = (s_i - 1/N)^2$, so that

(6) $$S_3 = \sum_{i=1}^{N} s_i^3 - \frac{2}{N}H + \frac{1}{N^2}$$

If one felt that is was important to penalize only larger than average sized firms, one could use a semi-variance : $\alpha_i = (s_i - 1/N)^2$ if $s_i > 1/N$, and $\alpha_i = 0$ otherwise[11].

(iii) While performance based measures : $\alpha_i = f(\ell_i)$ have appeal because they can automatically solve the problem of negative price cost margins, and avoid additional normative judgments made directly on the distribution of industry output, they do require more information than weights based on s_i. To illustrate this point let us assume that firms in the industry behave as Cournot-type oligopolists, and let us contrast the concentration indices that obtain with similar functional forms f and g. If $f(s_i) = s_i$, and $g(\ell_i) = \ell_i$, the appropriate structural indices become H, and $H/(-\eta)$, respectively. If $f(s_i) = \log(1/s_i)$, and $g(\ell_i) = \log(1/\ell_i)$, the structural indices become E, and $E - N\log(1/\eta)$, respectively. Finally, if $f(s_i) = (s_i - (\Sigma_{i=1}^{N} s_i/N))^2$ and $g(\ell_i) = (\ell_i - (\Sigma_{i=1}^{N} \ell_i/N))^2$, then their structural indices become S_3 and S_4, respectively, where S_3 is indicated in equation (6) and S_4 equals

(7) $$S_4 = \sum_{i=1}^{N} \frac{s_i^3}{\eta^2} - \frac{2H}{\eta^2 N} + \frac{1}{\eta^2 N^2} .$$

In all three cases, the performance based concentration indices can be reasonably approximated by the structure based ones, but exact calculation of the former also requires information on $-\eta$. It is obvious, however, that if either the weights are very non-linear, or if the conjectures, β_i, of firms are diverse (which insures that margins and shares are less closely related), then the two different types of weighting system will produce rather different appropriate concentration indices.

(iv) Expressions (4), (5), (6) and (7) all make plain that for more complex normative judgments there is no *one* appropriate index, but that *several taken together* are required to convey the various dimensions of such judgments. To see this more clearly, consider a generalization of the weights underlying S_4, and write $\alpha_i = (\ell_i - \overline{m})^v$, for some $\overline{m}$. This is a weighting system that penalizes variability (with the extent of penalty determined by v), but it also contains a belief about the level at which margins ought to be on average, i.e. $\bar{m}$. Given these weights and taking $v = 2$, one finds that

$$(8) \qquad S_5 = \frac{\sum_{i=1}^{N} s_i^3}{-\eta} - \frac{2H\bar{m}}{-\eta} + \bar{m}^2 .$$

S_5 contains a new "concentration index", $\sum_{i=1}^{N} s_i^3$, which already appeared in equations (6) and (7). It arises from concern with the higher moments of the distribution of firms sizes and is combined with the Herfindahl to reflect performance : $P = \Sigma_{i=1}^{N} \ell_i (\ell_i - \bar{m})^2$. If one wishes mean margins to be zero (i.e. if one measures performance as : $P = \Sigma_{i=1}^{N} \ell_i^2$), then S_5 reduces to just this new measure of concentration; if only inequality in margins is important, then S_5 becomes S_4 and a third concentration index, $1/N$, is added to the other two; if $v = 1$, then S_5 becomes : $(H/-\eta) - \bar{m}$; and so on. Clearly, no one concentration index can fully reflect such beliefs, and the choice of which concentration indices to use in combination can be quite sensitive to what otherwise appear to be fairly small changes in beliefs.

(v) Let us return to the case of rather simple beliefs for a final set of observations. Clearly, for a given judgment on the weights, variations in conduct generate different appropriate indices in the same way that, for a given judgment on conduct, variations in welfare judgments produce different indices. It is unhappily not the case that any particular concentration index is *uniquely* associated with both a judgment about conduct as well as one about welfare. To see this first suppose that industry conduct is Cournot and that we are only concerned from a normative point of view with the largest K firms to whom we give equal weights. The K-firm Concentration Ratio is then clearly appropriate. Now suppose that we wish to assign the same weights to all firms in the industry and that we judge the conduct of the industry corresponds to the Dominant Firm model in which the leading K firms play leader against the remaining price-taking fringe (who therefore have $\beta_i = 0$, $i = K+1, \ldots, N$). The appropriate index to reflect this very different welfare judgment and very different pricing behavior turns out, however, to be exactly the same as before; namely the K-firm Concentration Ratio.

Since it is the product $(\alpha_i\beta_i)$ which is important in selecting the weights for the appropriate concentration index, it is worth considering the trade-offs between beliefs (the β_i) and normative judgments (the α_i) that different individuals can adopt which is consistent with their use of the same particular concentration index. This is difficult to do in general, but is revealing in the particular case where the empirical worker decides to take observed markets shares as a guide to conduct variations within the industry[12] and where we restrict attention to normative judgments based on size only. In particular, suppose that the range of beliefs and judgments considered reasonable for individuals to hold are given by

$$\text{(9)} \qquad \begin{aligned} \alpha_i &= a\, s_i^A \\ \beta_i &= b\, s_i^B \end{aligned} \qquad a, b > 0.$$

Clearly the restrictions : $A + B = 1$ produces the Herfindahl index as appropriate. Suppose some particular individual felt that welfare weights ought to rise at an increasing rate ($A > 1$); then if that individual uses the Herfindahl, it follows that he/she believes that the β_i fall with s_i ($B < 0$), i.e., believes that large firms behave more competitively. Alternatively, if one felt that conduct was more or less uniform across firms ($B = 0$), then to use the Herfindahl index is to imply that one believes that the weights one attaches to firms must rise at a constant rate. Finally, if some individual felt both that larger firms ought to attract larger weights and that smaller firms behavior is liable to be more competitive, then , for the Herfindahl to be appropriate, the elasticities of α_i and β_i must both be less than unity, i.e., that the two must both rise at decreasing rates. These conditions do not seem so obviously appealling as to justify the recent surge of interest in the Herfindahl index. Two final remarks about equation (9) can be made. First, this equation will never produce either a Concentration Ratio or an Entropy index as appropriate; however, the number of firms will suffice as an appropriate index if $A = -B$, i.e., when the fall in α_i "due to" s_i is exactly offset by the proportional increase in ℓ_i via β_i "due to" s_i. Finally, equation (9) insures that, for a given set of beliefs (b and B) and judgments (a and A), only one concentration index will ever be necessary to reflect performance.

In summary, there seems to be a genuine choice that can be made between performance and structure-based weights for constructing overall industry performance indicators, and in turn for constructing appropriate concentration indices to signal such performance when the latter cannot be directly observed. It also appears that simple indices of performance based on non-zero weights only for the largest firms (and therefore leading to the use of Concentration Ratios) have an appeal of wider justification than one based on the Dominant Firm model which usually justifies their use (Saving, 1970). Furthermore, as the examples surrounding equation (9) suggests, it is hard to see a paramount relative superiority in indices such as the Herfindahl index. Perhaps more damaging, it is clear that almost any kind of normative judgment more sophisticated than : "large firms are better/worse than small ones" (and that seems to include almost of them) will require more than one concentration index if performance so defined is to be accurately signaled from easily available data.

4. Concentration indices are terribly ad hoc and their use is subject to many uncertainties. They exist, however, because it is important to assess industry performance, and because it is frequently difficult or impossible to observe it directly. Such indices, if appropriately chosen, do the job well *not* because there is some causal association between structure and performance, but because the two are joint endogenous outcomes and the one that is observable contains information on the exogenous variables to exactly the same extent as the one not observed. It has been argued before that to appropriately choose a concentration index is to assess industry conduct. In this paper, we have added that not only is this necessary but that one must also make several important normative judgments concerning what acceptable overall industry performance is.

As an illustration of what we consider to be the practical implication of this argument, consider how one ought to react when one is told that the K-firm Concentration Ratio in some industry has risen (say because of merger). If one is only concerned with the performance of the largest firms in the industry or if one believes that there is Dominant Firm leadership in that industry, then one ought to be rightfully concerned. However, if one believes any of the following, (1) that the market is "Contestable" (e.g., Baumol et al, 1982), (2) that the performance of the small firms in the industry is important to keep track of, and that they actually contribute to output restriction, (3) that the important policy option is to roughly equalize market shares (at least amongst the leading firms), or (4) that one ought to use performance based weights and that $-\eta$ is, for the industry in question, very large, then one need not feel necessarily concerned by this movement in Concentration Ratios. That is to say, while the positive fact that the Concentration Ratio has risen (and even the fact that the industry follows a Dominant Firm leadership pricing policy) is indisputable, one could still deny that overall industry performance has fallen[13]. It is exactly because reasonable individuals concerned with the individual firm deviations from marginal cost pricing can still hold very different notions of what overall industry performance is and ought to be that use of any one particular concentration index is as normative as it is positive.

NOTES

[1]A most comprehensive definition of market conduct can be found in Scherer (1980, p. 4) who includes : "... pricing policies and practices, overt and tacit interfirm cooperation, product line and advertising strategies, research and development committments, investments in production facilities, legal tactics and so on ...". In the simple static quantity choice models which are the focus of interest here, what matters is pricing behavior and this is determined by beliefs about rivals actions. To assert that conduct is exogenous is not to say that, in a dynamic model, it may not be influenced by previous equilibrium outcomes; however in such a model, each period price-quantity equilibrium is (in part) determined by the given beliefs of that period. That is, current conduct is exogenous to the current output choice of firms.

[2]See also Geroski (1982a) and Clarke and Davies (1982). Notice that this is not the same "endogeneity" of market structure characteristic of the usual flow charts (e.g. Scherer, 1980, p. 4), since in those it is always possible, in principle, to measure the two effects, the one of structure on performance and vice versa. The non-causality discussed in the text cannot be sensibly thought of in those terms, since structure and performance there are joint manifestations of the various exogenous variables at equilibrium.

[3]See Geroski (1982b), for some examples in which variations in conduct across industries produces an inverse ranking between structure and performance. It is also necessary to correct for inter-industry variations in demand elasticity which can be large (Houthaker and Taylor, 1970; Deaton, 1975; Deaton and Muellbauer, 1980), and certainly large relative to the intra-industry temporal variability of that elasticity.

[4]Two observations need to be made at this point. First, Cowling (1981) gives an interpretation of ℓ_i which has distributional implications above and beyond the usual allocative efficiency arguments. Second,

the Demsetz, 1974, "alternative system of belief" concerns the *positive* issue of what causes $\ell_i > 0$ rather than the *normative* issue of what such a departure signifies.

[5]Dansby and Willig (1979) and Hannah and Kay (1977) consider (respectively) more complicated exponentially weighted performance and structural indices (although Hannah and Kay's structural index does not signal Dansby and Willig's performance index). These can be accommodated into (2). If one's overall performance index were :

$$I = \left[\prod_{i=1}^{N} \ell_i^{\gamma_i} \right]^{\phi},$$

then, by setting : $\alpha_i = (\gamma_i \log \ell_i)/\ell_i$, then : $P = (\log I)/\phi$. Use of P rather than I seems harmless as long as ϕ is independent of the ℓ_i's.

[6]Assessing conduct (the β_i) is also important; a discussion and references can be found in Geroski (1983).

[7]With slightly more information on the identities of firms one may differentiate domestic and foreign firms (if one defines industry performance neglecting foreign profits), public and private firms, and so on. In a heterogeneous goods industry, one would wish to include product attributes explicitly in welfare judgments (in addition to information on Lerner indices) and this would also require more information than market shares and an assessment of pricing conduct.

[8]One might, for example, argue that large firms are more efficient and should therefore be given a smaller weight, such as $|\log s_i|$ which leads to an Entropy index if, for example, industry conduct is Cournot.

[9]Similarly, one could use a "critical market share" argument, as in d'Aspremont and Jacquemin (1981) who measure the power to monopolize of firm i as its contribution to inducing a shift from a competitive to a cooperative regime through coalition formation.

[10]It is likely that the desire from a normative point of view to distin-

guish amongst subsets of the industry is linked to a belief that their conduct differs. In this case the a_i, $i = 1,\dots,3$ can be thought as the product of weights α_i and conjectures β_i, $i = 1,2,3$.

[11]Note that (6) defines an "iso-concentration" curve in the spirit of Davies (1979) giving triples $(\Sigma s_i^3, H, N)$ consistent with the same level of overall industry performance, P.

[12]One must be careful with such an approximation. Structure is endogenous, so a *description* of the β_i's in the form of $\beta_i = \beta(s_i)$ is an "inversion" of the reduced form equation determining s_i at equilibrium and amounts to saying that marginal costs are similar between firms (in a homogeneous goods industry only β_i and marginal cost variations can account for different market shares).

[13]For example, suppose the industry had five firms with market shares in $t = 0$ of : (.6,.3,.05,.025,.025) so that $C_3(0) = .95$ and $H(0) = .4537$, while in $t = 1$, market shares are (.33,.33,.33,.005,.005) so that $C_3(1) = .99 > C_3(0)$ while $H(1) = .3267 < H(0)$. Hence, the rise in C_3 is objective, but its significance to one who believes that the industry is Cournot and that $\alpha_i = s_i$ is not clear. Even if two individuals agreed that the industry is Cournot, the two different welfare judgments : $\alpha_i = s_i$ and $\alpha_i = |\log s_i|$ produce opposite welfare conclusions, since $E(0) = .9080 < E(1) = 1.142$.

REFERENCES

d'Aspremont, C. and A. Jacquemin (1981), Measuring the power to monopolize : a simple game theoretic approach. CORE Discussion Paper N°8139.

Bailey, E. and R. Willig (1979), The economic gradient method. *American Economic Review*, 69, May, 96-101.

Bain, J. (1941), The profit rate as a measure of monopoly power. *American Economic Review*, 39, September, 883-897.

Baumol, W., J. Panzar and R. Willig (1982), *Contestables markets and the theory of industry structure*. Harcourt, New York.

Blackorby, C., D. Donaldson and J. Weymark (1982), A normative approach to industrial performance evaluation and concentration indices. *European Economic Review*, 19, September, 89-122.

Cowling, K. (1981), *Monopoly capitalism*. McMillan, London.

Cowling, K. and M. Waterson (1976), Price-cost margins and market structure. *Economica*, 43, August, 267-274.

Dansby, R. and R. Willig (1979), Industry performance gradient indexes. *American Economic Review*, 69, February, 186-193.

Davies, S. (1979), Choosing between concentration indices : the iso-concentration curve. *Economica*, 46, February, 67-75.

Deaton, A. (1975), *Models and projections of demand in post-war Britain*. Chapman and Hall, London.

Deaton, A. and J. Muellbauer (1980), *Economics and consumer behavior*. Cambridge University Press, Cambridge.

Demsetz, H. (1974), Two systems of belief about monopoly, in Goldschmid, D. et al (editors), *Industrial concentration : the new learning*. Little Brown, Boston.

Encaoua, D. and A. Jacquemin (1980), Degree of monopoly, indices of concentration, and threat of entry. *International Economic Review*, 21, February, 87-105.

Geroski, P. (1982a), Interpreting a correlation between profits and concentration. *Journal of Industrial Economics*, 30, March, 305-318.

Geroski, P. (1982b), The incidence of entry in three oligopoly models. Mimeo, Université Catholique de Louvain.

Geroski, P. (1983), Some reflections on the theory and application of concentration indices. Forthcoming in *International Journal of Industrial Economics.*

Hannah, L. and J.A. Kay (1977), *Concentration in modern industry.* McMillan, London.

Houthaker, H. and L. Taylor (1970), *Consumer demand in the United States 1929-1970, analysis and projections.* 2nd edition. Harvard University Press, Cambridge.

Kwoka, J. (1980), Does the choice of concentration measure really matter ? *Journal of Industrial Economics*, 20, June, 445-453.

Lerner, A.P. (1934), The concept of monopoly and the measurement of monopoly power. *Review of Economic Studies*, 1, June, 157-175.

Saving, T. (1970), Concentration ratios and the degree of monopoly. *International Economic Review*, 11, February, 139-146.

Scherer, F.M. (1980), *Industrial market structure and economic performance.* 2nd edition. Rand McNally, Chicago.

Schmalensee, R. (1977), The use of the H-index of concentration with published data. *Review of Economics and Statistics*, 59, May, 186-193.