Market Structure, Concentration Indices and Welfare Cost

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This edition of this paper has benefited from useful comments and suggestions by Drs. C. Mupimpila, S. Kapunda, M. S. R. Nair, I. B. Ikpe and A. Akinkugbe of the University of Botswana and David de Meza. The usual caveats are, of course, inserted.

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ABSTRACT This paper revisited the analytics of the welfare significance of market imperfections using the industry concentration index. It reopened the issue of how best to measure the concentration index. Specifically, it developed a new market concentration index based on the Hirschman-Herfindahl concentration index that preserves all its known advantages as a full information industry concentration index. It also improved on its usefulness and applicability. In developing the new index the paper reviewed the development of the analytical principles and methodologies for the empirical measurement of the welfare or social cost of monopoly (market imperfections). In particular, it reviewed Cowling-Mueller (1981) extensively because the analytical framework they prescribed for the measurement of the welfare cost of oligopoly is misconceived and misleading. The new index is of great usefulness and wide applicability and generalizes the welfare loss function to the entire market structure spectrum.

Key Words: market power, market imperfections, industry concentration indices, Hirschman-Herfindahl concentration index, Agiobenebo-Hirschman-Herfindahl index and welfare cost of market imperfections. **JEL:** L1

Introduction

The implications of market structure (power) for profitability and welfare had long attracted the attention of microeconomic analysis and industrial economics in particular. But, while microeconomics admits perfect markets into the analysis, industrial economics takes for granted that (at least industrial markets) are less than perfect, Clarke (2000). In some markets, a monopolist (a single seller) may operate protected by high barriers to entry to which the standard pure monopoly analysis can be applied. In most industrial markets, however, barriers to entry are insufficient to exclude all new competition and/or a number of firms operate in the market. In all these cases some degree of competition (actual or potential) will exist so that the intermediate imperfect competitive outcomes are most likely.[1]

The question, therefore arises, what are the results of the mixture of imperfect market structures, competition, firm behaviour, barriers to entry, etc with respect to profits and welfare? A corollary of this question is, is there a summary index that could mirror the exercise of market power arising from market imperfections? The answer to this question is

[1] Actually this portion of the paper is based on Roger Clarke (2000: 13-15) .

found in the concept of industry (market) concentration index. A follow up question is, how best could this index be measured? Unfortunately, for this question several suggestions litter the field ranging from the Lerner (1934) index of monopoly power; the N-firm concentration ratios; the Hirschman-Herfindahl concentration index; concentration curve ranking criterion; and reciprocal of firm numbers among others. All these measures have their intuitive appeals but possess varied strengths and weaknesses, hence are not appropriate in all circumstances and for all purposes. This has resulted in varied methodologies in applied work.

The purpose of this paper is to derive a full-information industry (market) concentration index based on the Hirschman-Herfindahl concentration index, which is cardinal and universal that can be used for the empirical measurement of the welfare cost of market imperfections. The paper concentrates on the development of this new index called Hirschman-Herfindahl-Agiobenebo (HHA) index and how it could be used. But, in doing this, the paper reviewed the development of the analytical principles and the suggested application of the Hirschman-Herfindahl concentration index in the literature.

The Hirschman-Herfindahl Concentration Index

Currently, there are three formulations or definitions of the Hirschman-Herfindahl concentration index (H). The weakest of the definitions for the purposes of its construction is that used in standard principles texts (see R. J. Ruffin and P. R. Gregory, 1983), which Cowling and Muller (1981) has suggested for empirical work in the measurement of the welfare cost of oligopoly. The three definitions of the Hirschman-Herfindahl index are discussed here under beginning with the weakest definition.

The Percentage Market Share Definition of the Hirschman-Herfindahl Concentration Index

In this definition

$$H = \sum_{i=1}^{N} S_i^2 , \qquad (1)$$

where S_1 through S_N are the percentage market shares of firms 1 through N, respectively.

Consider an industry (we denote as 1) that has ten firms with equal market shares of 10% each, then

$$H_1 = 10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 + 10^2 = 10S_i^2 = 1000.$$

This number in itself is meaningless. If however, there are other markets (industries) with varying distribution of market shares, then, the Herfindahl concentration index can be used to rank or order the degrees of market or industry concentrations. Suppose in another industry (denote it industry 2) there are four firms with market shares of 10, 20, 30, and 40 percent, respectively, then

$$H_2 = 10^2 + 20^2 + 30^2 + 40^2 = 100 + 400 + 900 + 1600 = 3000.$$

Comparing the two industries, we can say that concentration is higher in industry 2 than in 1.

This index besides having the advantage of using all the available information on market shares reflecting the exercise of relative market power among firms in an industry also provides an important insight. That is, larger firms (i.e. firms with larger market shares) have disproportionate impact on the concentration index than small firms. This is even more graphic if we have an industry (name it industry 3), which consists of two firms with market share distribution of 70 and 30 percent. Then,

$$H_3 = (70)^2 + (30)^2 = 4900 + 900 = 5,800.$$

Which compares unfavourably with the case of two firms with equal market shares of 50% each for which $H = (50)^2 + (50)^2 = (2500 + 2500) = 5000$. Since, by squaring the market shares, the Hirschman-Herfindahl concentration index assigns disproportionately larger weights to the shares of the larger firms in the industry in the sum. The terms in the sum of H indicate the relative influences (importance) of the individual firms in the determination of the composite index. The sum itself, however, is not of much use and meaning in this definition and can only be used in the ordinal sense. For example, to say that market concentration in Industry 3 is worse than that in Industry 2, which in turn is worse than that in Industry 1 given that $H_3 > H_2 > H_1$. It cannot, however, answer the follow up question; by how much is the market concentration in Industry 2 worse than that in Industry 1? Since, we cannot say that it is 3 times or by 300 percent simply because $\frac{H_2}{H_1}$ = 3, which is meaningless.

Indeed, the sum in this definition, i.e. H itself is difficult to interpret relative to even what it is supposed to measure (market concentration) beyond saying that the higher the index the greater the market (industrial) concentration. Furthermore, market concentration at most can only be 100 percent as exemplified by the pure monopoly case and the N-firm concentration ratios.

The Proportion of Market Share Definition of the Hirschman-Herfindahl Concentration Index

In this definition

$$H = \sum_{i=1}^{N} (x_i / x)^2 = \sum_{i=1}^{N} s_i^2 , \qquad (2)$$

where s_i is the proportion of industry output produced or supplied by firm i. Under this definition of the index, the above examples become

$H_1 = (.1)^2 + (.1)^2 + (.1)^2 + (.1)^2 + (.1)^2 + (.1)^2 + (.1)^2 + (.1)^2 + (.1)^2 + (.1)^2 = 10(.1)_i^2 = .1$

$H_2 = (.1)^2 + (.2)^2 + (.3)^2 + (.4)^2 = .01 + .04 + .09 + .16 = .3$

$H_3 = (70)^2 + (30)^2 = .49 + .09 = .58$

These results are different from the indices computed using the percentage share definition above is more meaningful for the purposes for which it is constructed. Yet, this definition underestimates the actual market concentration index through the uncorrected effects of squaring the market shares. The two sets of measures of the concentration index are equalized when the indices computed using (1) are divided by 10,000, which is the square of 100. The properties of H, however, remain the same under the two definitions. But, the measures are subject to different interpretations and are useful only for different purposes.

The Coefficient of Variation Approach to the Hirschman-Herfindahl Concentration Index

H as defined in (2) can be written differently interpreting the mean output as average firm size, which is defined as

$$\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \, .$$

Its variance is

$$\sigma^2 = \frac{1}{N}\sum (x_i^2 - \bar{x}^2) \, .$$

From this a unit-free measure of the inequality in firm market shares is derived as

$$c = \frac{\sigma}{\bar{x}} ,$$

which is called the coefficient of variation of firm size. Since

$$c^2 = \frac{1}{N}\sum_{i=1}^{N}\left(x_i^2 \big/ \bar{x}^2 \right) - 1 ,$$

by arrangement

$$H = \frac{c^2 + 1}{N} . \qquad (3)$$

This formulation show explicitly that the H index depends both on market share inequality (as measured by c^2) and on firm numbers, N. H takes on a maximum value of 1 for monopoly ($c^2 = 0$, N = 1) and a minimum value of $\frac{1}{N} \rightarrow 0$ for the case of many small firms ($c^2 = 0$, $N \rightarrow \infty$). Admittedly, the definition of H in (3) seemingly makes it a universal index in the sense that it can describe the entire spectrum of market concentration from perfect competition to pure monopoly. Yet, it is difficult to interpret as a concentration index in the orthodox sense. Furthermore, this property of the index can be preserved without the difficulty in interpretation.

Hirschman-Herfindahl-Agiobenebo (HHA) Concentration Index

The definition of Hirschman-Herfindahl concentration index in (1) makes it an ordinal index. But, it can be transformed into a cardinal index without the loss of any of its known advantages. The definition given to it by (2) underestimates the market concentration given the squaring of the firm market shares. This too can be corrected. These two weaknesses inherent in the definitions given by (1) and (2) are not only taken care of by the transformation but also reconcile the two definitions. In the case of definition (1) the transformation involves taking the square root of the Hirschman-Herfindahl index and dividing it by 100, the number by which it was inflated in the first instance, which now enters the equation as a correction factor and for the definition in (2), we simply take the square root of H also as a correction factor such that

$$\text{HHA} = \frac{\sqrt{\text{H}}}{100} = \frac{1}{100}\text{H}^{1/2} = \sqrt{\sum_{i=1}^{N} s_i^2}\ . \qquad (4)$$

So that, for our earlier examples, we have

$$\text{HHA}_1 = \frac{\sqrt{1000}}{100} = \sqrt{.1} \approx .32$$

$$\text{HHA}_2 = \frac{\sqrt{3000}}{100} = \sqrt{.3} \approx .55$$

$$\text{HHA}_3 = \frac{\sqrt{5800}}{100} = \sqrt{.58} \approx .76.$$

This new index is tagged Hirschman-Herfindahl-Agiobenebo industry concentration index for want of better terminology. Clearly it can be interpreted relative to 100 per cent, which is the natural limiting value of the concentration index. To lighten the notation, let HHA = A. Then as A gets closer to 1 the higher is the concentration in a given industry. Thus, $\text{A}_i > \text{A}_j$, $i \neq j$, means that concentration is greater in industry i than in j. More than that, it also implies that dominant firms are more concentrated in industry i than in j. As defined in (4) A is a function of both the inequality of firm market shares and the number of firms in the industry as clearly illustrated by the experimental examples used above. This a product of the logic of the summation over the N number of firms and the squaring of the firm market shares, which weighs the larger firm market shares disproportionately that define the sum. In this sense, it is in perfect agreement with the definition in (3) but offers a more direct and meaningful interpretation of the index. As N, the number of firms in the industry tends to infinity (increases) competition intensifies and both absolute and relative market shares (firm sizes) diminish while output approach the competitive optimum. The logic of this argument leads to and suggests that as $N \to \infty$, $A \to 0$.

On the Relative Influence of Firms on the Concentration Index

The relative influence of each firm on the industry concentration index can be measured as

$$A_i = \frac{s_i}{A} \qquad (5)$$

which is more than proportional, the higher s_i. s_i is the proportion of output produced by firm i as defined before. Thus, A_i like H attributes disproportionate impact on the industry concentration index to firms with larger market shares than small firms. That is, it also shows that the influence exercised by the dominant firms is more than proportional to their size. Thus, it can be used for intra-industry comparison of the relative influence of dominant firms and the inter-industry comparison of the distribution of dominant firms, since

$$T_i = \sum_{i=1}^{m} A_i \geq T_j = \sum_{j=1}^{n} A_j, \ m \leq n, \ i \neq j, \qquad (6)$$

Given (6), m = n means that for an equal number of firms in any two industries i and j, concentration is higher in i than in j. This can only arise, if and only if, there is at least one dominant firm in i than in j; i.e. $s_i > s_j$ for at least one i. While (m < n) implies that concentration is not only higher in industry i than in j but also that the dominant firms are more concentrated in i than in j, given that a smaller number of firms control, at least as large a market share in industry i as in j. This holds, if and if only $s_i > s_j$ for some i. Thus, (m = n) is the weak condition while (m < n) is the strong condition for dominant firms concentration in an industry.

Other advantages and uses of this new index are discernible but this place is adjudged not to be the arena for the full expansion of this subject. For example, it is capable of accounting for international competition among other potential uses.

The Welfare Costs of Market Imperfections

The profession has already established the limits of the welfare costs of market imperfections assuming linearity as shown in Figure 1.[2] As the diagram clearly shows the lower limit of the welfare loss is zero, when markets are perfect (i.e. P_c = MC) and the upper limit is one half of the monopoly profit (i.e. $-\Delta W = -\frac{1}{2}\pi_m$ = area cab), when there is zero

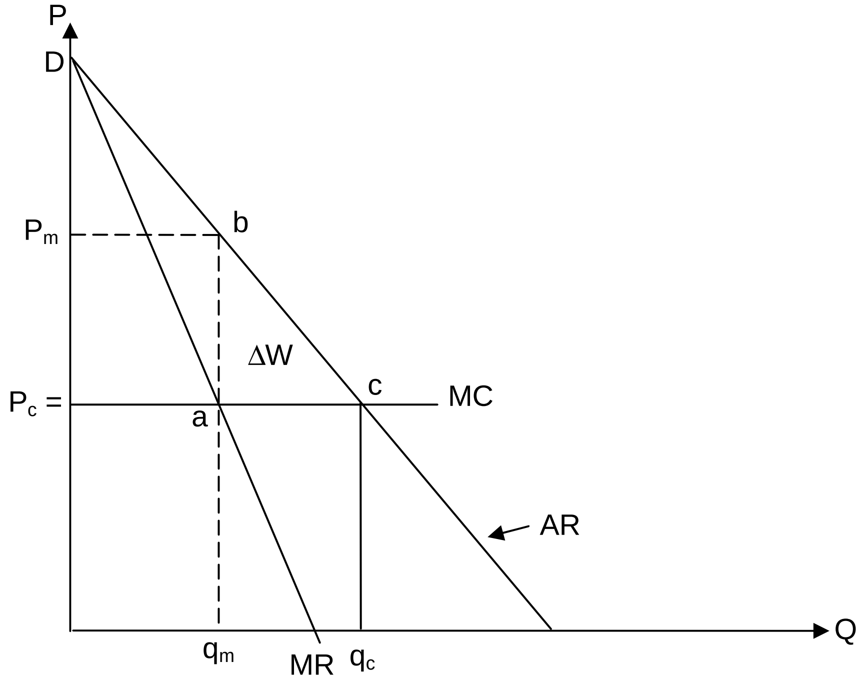

Figure 1: Market Imperfections and the Welfare Loss

competition (i.e. when P_m > MC = MR). The minus sign denotes loss, so that $-\Delta W$ denotes the loss in welfare and π_m is monopoly profit. Using absolute values, it follows that the welfare loss of oligopoly would be within the closed interval

$$0 \leq \Delta W \leq \frac{1}{2}\pi_m = \frac{1}{2}\Delta P \Delta q = \frac{1}{2}\Delta P q_m, \ \Delta q = q_m = \frac{1}{2} q_c. \tag{7}$$

Where q_m = output in pure monopoly equilibrium; P_c is the profit maximizing price under perfect competition; q_c = output in the competitive equilibrium; MR and MC are, respectively

[2] We are aware of the many questions that have been raised around the linearity assumption; Littlechild (1981) criticism of Harberger (1954) and Cowling and Mueller (1978) as well as the arguments of dynamic benefits of monopoly; the weaknesses of consumer surplus measures of welfare loss in particular within the partial equilibrium paradigms; second best issues; and arguments to augment consumer surplus measures of welfare loss with distortionary business expenditures. In our thinking even if all these arguments are admitted, it still makes sense to measure the welfare cost of market imperfections, at least the static costs of the dynamic benefits of market imperfections; and even if the exact figures may never be known, the limits would be worth knowing. Some imperfect insights are probably better than none.

marginal revenue and marginal cost. The above specification of the welfare loss takes into account the extreme possibilities, namely perfect collusion among oligopolists and competitive fringe, in particular as the number of firms in the industry increases. The Cowling-Mueller's specification of the welfare loss function with the Herfindahl concentration index as weight is most likely to overestimate the deadweight loss under oligopoly.[3] The magnitude it specifies is likely to exceed the upper limit and no matter what happens to competition it would never tend toward the lower limit, since

$$0 \leq \Delta W \leq \frac{1}{2}\pi_m = \frac{1}{2}\Delta P \Delta q < \frac{\pi H}{2}, \ H > 1. \quad (8)$$

Where H is the Herfindahl market concentration index as defined in (1) above and π is probably the oligopoly profit in equilibrium. Further, by its definition in (1) H will always be greater than 1. Thus, their equation (3b), namely,

$$\Delta q = H q_0^c$$

cannot be correct, where according to them q_0^c is oligopoly output. Their definition of the change in output under the Cournot prediction, i.e.

$$\Delta q = \left(\frac{1}{N}\right) q_0^c$$

may not be correct also. With Cournot prediction assuming homogeneous product, what we expect is

$$q_i = \left(\frac{1}{N}\right) q_0^c, = q_j, \ i \neq j, \ \sum_1^N q_i = q_0 = \phi q_c \leq q_c; \ \phi = \frac{\sum_1^N q_i}{q_c} \leq 1.$$

Where q_i is the output of firm i; $q_0^c = q_0$ is the equilibrium output in oligopoly; q_c is the competitive output as defined before; and ϕ is the proportion of the competitive output achieved or produced in the oligopoly equilibrium by linear approximation. In the non-symmetric case, we expect that

$$q_i = \phi_i q_0; \ \phi_i \neq \phi_j, \ , \ i \neq j, \ \phi_i = \frac{q_i}{q_0}; \ \Sigma_1^N \phi_i = 1; \ q_0 = \phi q_c \leq q_c; \ \phi = \frac{q_0}{q_c} \leq 1,$$

[3] See their equation 4b on page 724, which is the one but last term in condition (8) in this paper reproduced to ease reference.

where all the notations are as defined before. This formulation implicitly defines the effect on industry output as (1 - ϕ) such that the lower ϕ, the higher the industry concentration and as ϕ approach 1, the oligopoly output approach the competitive output. It is suggestive that industry concentration is a decreasing function of competition. A corollary of this is that industry output is an increasing function of competition up till the competitive maximum is achieved. These implications conform to the received wisdom. The above specification also encompasses the whole range of possible collusion. But, it involves counterfactual experiments to the extent that the competitive output for the industry would have to be guessed (estimated).

Equations (3c) and (3d) of Cowling-Mueller (1981), namely

$$\Delta q = \alpha q_0 + \frac{(1-\alpha)q_0}{N}$$

and

$$\Delta q = \alpha q_m + (1 - \alpha)q_0 H,$$

which are provided to cover the whole range of possible collusion are elegant but cumbersome, if not misleading. Cumbersome because they are unwieldy and can be greatly simplified. They could be misleading because they are ambiguous, false and confusing. The more worrisome, however, is their definition of α as an elasticity of competitor's output, i.e.

$$\alpha = \frac{dq_j}{dq_i} \bullet \frac{q_i}{q_j},$$

which has no meaning in this context. Of course, the contextual meaning of α is that, it is the coefficient or an index of collusion. What Cowling and Mueller needed to ask was a separate but fundamental question of how α is related to the output reaction functions of the competitors and how this is mirrored by the output elasticity of the competitors. Even for this, if it is not the duopoly variety of oligopoly, what is needed is a composite index because the quantity under reference is an industry-wide measure. Further, the need for and the function of H (i.e. Herfindahl concentration index) in their equation (3d) reproduced above to ease reference, are not comprehensible. So, the analytical framework they advanced raised more questions than they tried to answer, and some of them answered wrongly.

The Herfindahl Concentration Index and the Welfare Cost of Oligopoly

The substitution of H as defined by (1) into Cowling and Mueller (1981) equation (4b), namely,

$$\Delta W = \frac{\pi H}{2}$$

grossly over estimates the welfare losses for any level of market concentration. Worse still, these measures are meaningless, not just simply misleading. Because, it is inconceivable that an ordinal index can meaningfully measure a cardinal magnitude.

Other comments on Cowling-Mueller (1981) are order. Admittedly, the welfare loss is an increasing function of market concentration but it is also a decreasing function of the number of firms in the industry (N) in the absence of collusion. But, collusion itself becomes increasingly more and more difficult as the number of firms in the industry increase, since as N increases the conflicts of interest increases in the powers of 2^N. Consequently, as N increases the welfare cost of oligopoly decreases. This could be seen clearly in their equation (4a) reproduced here to ease reference

$$\Delta W = \frac{\pi}{2N}.$$

This means that as the number of firms in the industry (N) tends to infinity, welfare loss tends to zero, which is consistent with the received doctrine. Evaluating their equation (4b) namely

$$\Delta W = \frac{\pi H}{2},$$

in this light, clearly indicates its fallacy.

There is no doubt that the equilibrium oligopoly output is a function of α defined as the degree of collusion but not as an elasticity of competitor's output as they defined it in their paper on page 724 already reproduced above to ease reference. Further, their conclusion that the oligopoly welfare cost or loss would be dependent on the level of profits, the degree of concentration and the degree of collusion is confusing. For, these three variables are not mutually independent. Specifically, it may be conjectured that the degree of concentration is an increasing function of the degree of collusion. The level of profits is an increasing function of the degree of concentration and hence an increasing function of the degree of collusion. Thus, what we seem to have is a composite function rather than the multivariate function they seem to be suggesting. After all, the monopoly profit and hence the welfare loss associated with it are functions of output, which is a function of absolute market concentration.

The logic of the Cournot's model and equilibrium suggests that $q_i = \left(\frac{1}{N}\right)q_0 = q_j$, $i \neq j$; $\Sigma_1^N q_i \leq q_c$ but as $N \to \infty$, $\Sigma_1^N q_i \to q_c$. Therefore, the general Cournot's solution for any number of firms in the industry is

$$\Delta W = \Delta P(1-\phi)q_c.$$

Where ϕ is as defined above. Given the definition of ϕ, it follows that as $\phi \to 1$, $\Delta W = \Delta P(1-\phi)q_c \to 0$, which is consistent with the conventional wisdom. The above results cannot be obtained from Cowling-Mueller's equations (4c) and (4d), namely

$$\Delta W = \begin{cases} \frac{\alpha}{2}\pi + \frac{(1-\alpha)}{2N}\pi \\ \\ \frac{\alpha}{2}\pi + \frac{(1-\alpha)}{2}\pi H \end{cases}.$$

In these forms their equation (4c) converges to $\Delta W = \frac{\alpha}{2}\pi$ as $N \to \infty$. Unfortunately, they did not establish the relationship between α and N. Similarly, their equation (4d) converges to $\Delta W = \frac{\alpha}{2}\pi$ as $H \to 0$, (i.e. H decreases). So, none of their results is consistent with the received doctrine. Further, π is not given a precise definition, one can only insinuate that it denotes oligopoly profit. But, these are not the reasons why their formulations of the welfare loss functions are wrong. The constraint on their results given (7) above is

$$0 \le \Delta W = \begin{cases} \dfrac{\alpha}{2}\pi + \dfrac{(1-\alpha)}{2N}\pi \\ \\ \dfrac{\alpha}{2}\pi + \dfrac{(1-\alpha)}{2}\pi\mathrm{H} \end{cases} \le \frac{1}{2}\pi_m = \frac{1}{2}\Delta P\Delta q = \frac{1}{2}\Delta P q_m \quad .$$

It is not conceivable that this condition would be met by any of the Cowling-Mueller's welfare loss functions under oligopoly.

The general welfare loss function using the new index derived in this paper is

$$0 \le \Delta W = \frac{1}{2}\Delta P\Delta q = \frac{1}{2}\Delta P A q\,,\ \mathrm{A} \le 1. \tag{8}$$

Where A is the Hirschman-Herfindahl-Agiobenebo industry concentration index while q is the industry output. It follows that welfare loss is an increasing function of industry concentration such that when there is perfect collusion, we have the pure monopoly result. But, A is a decreasing function of competition, which is an increasing function of the number of firms in the industry such that as N $\rightarrow \infty$, (i.e. as N increases), $\mathrm{A} \rightarrow 0$, and ΔW $\rightarrow$ 0, which is the conventional wisdom. Indeed, the results of the analysis are suggestive that (1 - A) is a measure of the effect of competition on collusion and market concentration and hence on industry output.

On the Arguments for Augmentation

Because monopoly effects are multi-directional, there have been arguments for augmenting the partial equilibrium consumer surplus measures of welfare losses of monopoly pricing (the standard Harberger-type measure) with resources wasted in competition to create monopoly position, (see Posner 1975; Cowling-Mueller, 1978; and Masson-Shaanan, 1984). Cowling-Mueller (1978) methodology was severely criticized by Littlechild (1981), who argued that most profits observed arise from windfall gains or losses arising from uncertainty in the market or because creative and alert entrepreneurs have taken advantage of market opportunities implying in part that profits are rents to superior resources. It is, however, questionable if under the competitive assumptions there could be reserved opportunities in particular in the long run equilibrium? This, notwithstanding, as much as the issues of how best to measure the welfare effects of monopoly (market imperfections in general) arise from multi-directional effects, there is obvious need to investigate them properly.

Yet, this paper is of the view that perhaps the pertinent question to ask is what determines the observed outcome? The determinants of the observed quantity, which is classified endogenous, are identified into three sub-vectors of determinants of collusion; determinants of entry condition; and determinants of demand. It follows that resources appropriated to creating and maintaining monopoly position such as expenditures on advertising are already imputed into the observed quantity. These expenses are therefore incurred to buy (establish) market power. Welfare loss functions are specified to measure the effects of market power. It may therefore be asked, if there is no risk of double counting, if the costs of establishing market power are also added to the effects of market power? Perhaps, the concepts to be captured are direct and indirect effects of monopoly (market imperfections), which is consistent with what a general equilibrium framework of analysis would suggest. The question then is what are the valid indirect effects of market imperfection to considered? The answer to this question may possibly reduce the areas of debate with respect to what indeed belongs in the welfare loss function of market imperfections.

Summary and Concluding Remarks

This paper revisited the analytics of the welfare significance of market imperfections using the industry concentration index. It reopened the issue of how best to measure the concentration index. Specifically, it developed a new concentration index based on the Hirschman-Herfindahl concentration index that preserves all its known advantages as a full information industry concentration index. It also improved on its usefulness and applicability. In developing the new index the paper reviewed the development of the analytical principles and methodologies for the empirical measurement of the welfare or social cost of market imperfections. In particular, it reviewed Cowling-Mueller (1981) extensively because the analytical framework they prescribed for the measurement of the welfare cost of oligopoly is misconceived and misleading. It observed a number of weaknesses in some of the welfare loss functions they recommended for the computation of the welfare costs of oligopoly. The most offending welfare loss functions are those founded on the Herfindahl market concentration index defined as the sum of squared percentage market shares. This paper regards the Herfindahl market concentration index so defined as an ordinal index and as such, could not be meaningfully used to measure a cardinal quantity or magnitude such as welfare loss. Taking its cue from the literature, in particular the Harberger measure of the welfare cost of monopoly, it observed that the Herfindahl industry concentration index defined as the sum of squared percentage market shares could only exaggerate the welfare costs of oligopoly. The paper also pointed out other inconsistencies in the formulations and weaknesses of the analysis.

The new index, which for want of better terminology, is tagged Hirschman-Herfindahl-Agiobenebo industry concentration index (A), like the Herfindahl concentration index is a full information market concentration index that assigns greater blame to larger firms in an industry for causing socially Pareto-inferior outcomes. As a full information market concentration index, it does not involve any element of arbitrariness in the definition of the industry concentration index as the N-firms ratios do. Also, it is capable of capturing competition from imports and separating the roles of individual firms and their contribution to industry concentration indices. It follows that not only would the Hirschman-Herfindahl-Agiobenebo industry concentration index estimate the welfare cost of market imperfections more accurately, it can also facilitate both intra- and inter-industry as well as inter-temporal concentration comparisons more meaningfully. With the new index, the paper achieved the generalization of the welfare loss function to any market situation using index as weight or determinant of the welfare loss of market imperfections.

References

Agiobenebo, T. J. (1999), Introductory Microeconomics: Theory and Applications (2nd edition, Markowitz Centre for Research & Development, Port Harcourt, Nigeria)

Cowling, K. (1978), "Monopoly, Welfare and Distributions." In Contemporary Economic Analysis (ed. M. Artis and R. Nobay, London: Croom Helm)

_____ (1981), "Oligopoly, Distribution and the Rate of Profit." European Economic Review, pp 195-224

Cowling, K. and D. C. Mueller (1981), "The Social Cost of Monopoly Power." Economic Journal, Vol. 91 (September: 723ff)

Herfindahl**, O.** (1982), "The Herfindahl Index: Another Measure of Concentration." (Business Week, May 17, 1982 and the Wall Street Journal, June 15, 1982, p. 3 cited in Ruffin, R. J. and P. R. Gregory (1983: 273), Principles of Microeconomics (Scott, Foresman and Company, Glenview Illinois)

Hirschman, A. O. (194) "The Paternity of An Index" American Economic Review, 54: 761-2.

Koutsoyiannis, A. (1989) Modern Microeconomic (2nd edition, ELBS/Macmillan)

Littlechild, S. (1981), "Misleading Calculations of the Social Costs of Monopoly Power." Economic Journal, Vol. 91 (June): 348-63.

Masson, R. T. and J. Shaanan (1984) "Social Cost of oligopoly and the Value of Competition" Economic Journal, 94: 520-35.

Mueller, D. C. (1977), "The Persistence of Profits above the Norm." Economica Vol. 44 (November): 369-80.

Posner, R. A. (1975) "The Social Cost of Monopoly and Regulation" Journal of Political Economy, 83: 807-27

Ruffin, R. J. and P. R. Gregory (1983: 219), Principles of Microeconomics (Scott, Foresman and Company, Glenview, Illinois,)