IJMS 11 (2), 63-72 (2004)

# ADVERTIZING, CONCENTRATION AND PROFITABILITY IN MALAYSIAN MANUFACTURING REVISITED: A SIMULTANEOUS EQUATION APPROACH

SHRI DEWI SUBRAMANIAM
*Fakulti Ekonomi*
*Universiti Utara Malaysia*

NOR GHANI MD. NOR
*Fakulti Ekonomi*
*Universiti Kebangsaan Malaysia*

AHMAD ZAINUDDIN ABDULLAH
*Fakulti Ekonomi dan Pengurusan*
*Universiti Putra Malaysia*

## ABSTRACT

*The original Structure-Conduct-Performance (SCP) paradigm that postulates a unidirectional relationship between concentration, advertizing and profitability had been used as the theoretical framework for many empirical works in industrial organizations before the mid seventies. Thereafter, doubts had begun to surface over the unidirectional postulate and there is new theory suggesting simultaneous interdependence. Unfortunately, not only are Malaysian studies in this area few and far between (exhaustive literature review yields only three published studies namely, Gan and Tham, 1977; Gan, 1978; and Rugayah, 1992), they also failed to incorporate the more recent theoretical development on the simultaneity of effects. This paper revisits the SCP paradigm as applied to the relationship among concentration, advertizing and profitability by conducting an empirical test that allows for simultaneous interdependence among variables. A set of three equations was estimated using three stage least squares (3SLS). The results provide considerable support to the feedforward and feedback effects between the three variables. Advertizing intensity exerts a significant influence on profit and concentration in the industry and there exists a feedback effect running from concentration to advertizing intensity. This finding suggests that advertizing does have an anti-competitive impact on the industry and therefore has a direct bearing on competition policy analysis.*

**ABSTRAK**

*Sebelum pertengahan tahun 1970-an, kebanyakan kajian empirikal dalam organisasi perindustrian menggunakan model Structure-Conduct-Performance (SCP) sebagai rangka kerja teoritikal yang memperlihatkan hubungan satu arah di antara penumpuan, pengiklanan dan keuntungan. Namun begitu, wujud keraguan bagi penggunaan hubungan satu arah ini, maka teori baru mencadangkan wujudnya hubungan serentak di antara pembolehubah-pembolehubah tersebut. Kajian sebegini sangat kurang dilakukan (kecuali Gan & Tham, 1977; Gan, 1978; dan Rugayah, 1992) dan malang sekali tiada satu kajian pun di Malaysia yang mengambil kira hubungan sebab akibat serta saling kebergantungan yang wujud secara serentak di antara elemen-elemen industri ini. Oleh itu, kajian ini akan menyemak kembali model SCP yang diaplikasikan dalam hubungan di antara penumpuan, pengiklanan dan keuntungan seperti yang dibincangkan di atas dengan menjalankan ujian empirikal yang menggambarkan kebergantungan di antara pembolehubah-pembolehubah tersebut. Untuk mencapai objektif kajian ini, satu set tiga persamaan serentak dianggarkan dengan menggunakan Three Stage Least Square (3SLS). Hasil keputusan memperlihatkan wujudnya hubungan sebab akibat di antara ketiga-tiga pembolehubah ini khususnya intensiti pengiklanan mempengaruhi keuntungan dan penumpuan secara signifikan dalam industri. Kajian ini mencadangkan pengiklanan mempunyai pengaruh anti persaingan dalam industri dan merupakan alat penting bagi menganalisis polisi persaingan.*

## INTRODUCTION

Prior to the mid seventies, a number of empirical studies conducted using data from the developed countries validated the structure-conduct-performance (SCP) paradigm by employing single equation model on various measures of market. Three Malaysian studies that employed similar methodology, could also be found in the literature namely, Gan and Tham (1977), Gan (1978) and Rugayah (1992). These studies have however, been criticized for the failure to account for the simultaneity of inter-relations among elements of industry structure, conduct and performance. To illustrate, it has generally been argued that advertizing creates brand loyalty and combined with economies of scale in advertizing generate product differentiation barriers to entry which enable established firms to obtain and maintain higher profit (Comanor & Wilson, 1974). However, according to the theoretical model on optimal advertizing strategy (Schmalensee, 1972; & Strickland and Weiss, 1976) there is a feedback effect running from profitability to advertizing intensity since the higher profit rate per demand unit, the greater is the impact of advertizing on profits. Empirical estimation

using single equation model is incapable of providing consistent parameter estimates. The underlying theory therefore suggests that these variables are more properly considered as simultaneously determined in a system of equations (Pagoulatos & Sorensen, 1981).

The problem of simultaneous relationship is not limited to profit and advertizing alone. Simultaneous relationship is also envisaged between concentration and advertizing through the existence of externalities in advertizing on the one hand, and substantial economies of scale in advertizing, on the other. This is to say that since advertizing influences both overall industry demand and the firm's individual demand, larger firms tend to advertize more since they can internalize a bigger proportion of the external industry effects. On the other hand, it could also be argued that the direction of causality may be the reverse since there may be substantial economies of scale in advertizing and that advertizing may enhance barriers to entry. Again, the simultaneous relationship between these variables within the traditional structure-conduct-performance (SCP) paradigm should thus be considered as jointly determined endogenous variables in a system.

The main purpose of this study is to examine the simultaneous interdependence between the three important industry variables (i.e. advertizing intensity, concentration and profitability) with the potential of providing an alternative view on the inter-relationship between them to that found in the above-mentioned Malaysian studies. In doing so we revisit the issues raised in the earlier Malaysian studies and provide an update on the methodology employed to incorporate the more recent theoretical development on the simultaneous relationships among industry variables. In order to achieve this objective, we follow the broad methodology first applied by Pagoulatos and Sorensen (1981) in a study on the US food industry.

## THE MODEL

There are three equations to be simultaneously estimated.

### The Advertizing Equation

Following Strickland and Weiss (1976), the price-cost margins (PCM) is included as one of the variables in the advertizing equation. The sign of the coefficient is expected to be positive since a higher profit rate per unit sales implies greater benefits to be gained from increased sales through advertizing. Similar arguments can be found in Schmalensee (1972), Comanor and Wilson (1974) and Berndt (1991).

For the purpose of this research, we adopt Gan and Tham's (1977) method of measuring PCM where:

PCM = [ value added – payroll (inclusive of supplemental employee cost) – rentals – advertizing and other purchased services ] ÷ total value of sales

Seller concentration is also included in the advertizing equation. As argued earlier, since advertizing influences overall industry demand and the firm's individual demand, bigger firms would tend to advertize more since they are able to capture a larger proportion of industry effects. If this type of externalities really exists it is expected that advertizing intensity will increase with the level of concentration since firms with the larger market share could better internalize the external advertizing benefits. In this study we will be using the Herfindahl Index as a measure for industry concentration.

Thus the advertizing equation is;

$$AD/S = \alpha_o + \alpha_1 PCM + \alpha_2 HI + U_1 \quad (1)$$

where AD/S is advertizing to sales ratio, PCM is price-cost margin, HI is concentration and $U_1$ is the error term.

**The Concentration Equation**

Concentration is a measure of the degree to which a few large firms dominate total sales, production or capacity within an industry or market. Observed industry concentration is in turn, a function of several factors including market size, minimum efficient scale and the height of barriers to entry. Two popular measures of concentration employed in empirical works are the Herfindahl Index or Herfindahl Hirshmann Index (HI) and the four-firm concentration ratio (CR4). This index is adopted as a measure of concentration in this study and is defined as;

$$HI = \sum^{T} S_i^2$$

T = firms in the industry

$S_i$ = share of each firm weighted by itself

We have four determinants of concentration. The first is simply a measure of the size of the market (SZ). The underlying reason for including this variable in the concentration equation is that, other things being constant, larger (smaller) markets allow more (fewer) optimally

sized firms to co-exist. The coefficient of this parameter is therefore expected to be negative.

The second variable is minimum efficient scale (MES). The MES is intended to provide an approximation on the minimum viable firm size in any industry. The larger is the required minimum viable size, the more concentrated is the industry. We use the popular Comanor and Wilson's (1974) measure of the MES where it is defined as the average plant size among the largest plants that account for at least fifty percent of industry output and then further divided by total output. The coefficient for this variable is expected to be positive.

The third variable is cost disadvantage ratio (CDR). This variable is included to account for the cost penalties associated with operation of plants of less than minimum efficient size. It is calculated as the ratio of value added per employee in plants of less than minimum efficient size to that of the larger plants. The same measure was adopted by Caves, Khalizadah and Porter (1975). The expectation is that the greater the cost disadvantage of small-scale operation, (i.e. the steeper the slope of the average cost curve) the higher would be the level of concentration. It is therefore expected that the coefficient of this parameter would bear a negative sign.

The fourth variable included in the concentration equation is advertizing intensity. The inclusion of this variable is predicated upon the hypothesis that advertizing creates a barrier to entry that in turn leads to high industry concentration. The coefficient should therefore be positive if the hypothesis is correct.

Thus the concentration equation is:

$$HI = \beta_0 + \beta_1 SZ + \beta_2 MES + \beta_3 CDR + \beta_4 AD/S + U_2 \qquad (2)$$

where HI is concentration, SZ is size of firms in the industry, MES is minimum efficient scale, CDR is cost disadvantage ratio, AD/S is advertizing to sales ratio and $U_2$ is the error term in the equation.

**The Profit Equation**

The measure of profitability used in the profit equation is the PCM. We adopt Gan and Tham's (1977) operational definition of PCM where it is defined as the percentage gross return (before taxes, interest and depreciation) on sales for the industry. One advantage of using this measure of profitability is that under the assumption of constant long run average variable cost the PCM approximates the classic Lerner

index of monopoly power which is commonly employed as a summary indicator of the impact of market power on price.

The first right hand side variable in the profit equation is the capital output ratio (K/S). Since gross capital costs are included in the margin, it is necessary to include a variable that could control for the differences in capital intensity across industries. The capital output ratio is included for this purpose and is measured as the book value of depreciable assets divided by the value of sales.

The second variable included in the equation is concentration. There are strong theoretical grounds for believing that market structure does have an impact on PCM (Strickland & Weiss, 1976). Higher levels of concentration should increase the degree of firm interdependence and effectiveness of collusion thus the expectation is that concentration should exert a positive influence upon industry profit margins. As mentioned earlier this study uses the Herfindahl Index as a measure of industry concentration.

Advertizing intensity is also expected to have some influence on profitability. In theory, it can be seen as an element of industrial structure that operates as a barrier to entry, and thereby influencing performances. Comanor and Wilson (1976) examined the role of advertizing both in terms of an indicator of product differentiation, of raising the MES and as a general barrier to entry. They concluded that industries with high advertizing outlays earned on average profit rates that exceeded other industries by nearly four percentage points. This differential incidentally represented a fifty percent increase in profit rates.

Finally, the profit equation includes two variables to capture the impact of international trade factors on profitability. To the extent that actual or potential import competition keeps domestic firms from reaping monopoly gains, PCM will be lower in industries with a greater degree of competition from imports. Gan and Tham (1977) further argued that in an open economy, barriers to entry at the production stage alone could not sustain monopoly profits in the domestic market. The ratio of imports to industry sales (M/S) is therefore included in the profit margin equation to capture the control for the impact of import competition on profitability. Export opportunities could also affect the performance of firms in the domestic market. The relationship between export and performance (profit) is however ambiguous. It is a well known result that domestic pricing outcomes may be higher than the competitive levels if price discrimination is possible across

international markets. However, it may very well be argued that profits may in fact be lower for exporting firms that are unable to practice price discrimination.

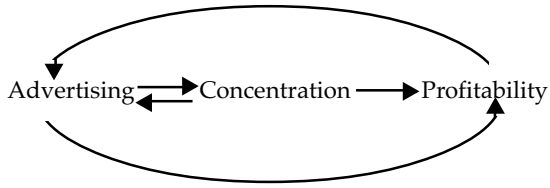
Thus the profit equation is;

$$PCM = \gamma_0 + \gamma_1 K/S + \gamma_2 HI + \gamma_3 AD/S + \gamma_4 X/S + \gamma_5 M/S + U_3 \quad (3)$$

where PCM is price-cost margin, K/S is capital to sales ratio, CR is concentration, AD/S is advertizing to sales ratio, X/S is export to sales ratio and M/S is import to sales ratio and $U_3$ is the error term in the equation.

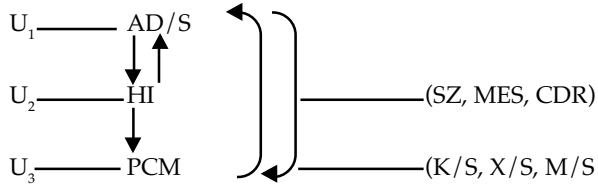
## ESTIMATION AND RESULTS

This relationships can be shown in a schematic diagram form as below;




According to the diagram, advertizing is influenced by concentration and profitability. Meanwhile concentration is only influenced by advertizing, and profitability by advertizing and concentration.

The relationship can also be represented in terms of the variables used in the three structural equations. PCM and HI appear as determinants in the advertizing equation, while advertizing appears as a determinant in concentration equation. Finally, in the PCM equation both advertizing and concentration appear as determinants. Since there are feedback and feedforward effects among these three variables, we must therefore treat these variables as endogenous whose values are jointly determined in a simultaneous equation system consisting of equation (1), (2) and (3).



This study utilizes data (year 1990) for 120 manufacturing industries at the five-digit level of MSIC. All variables were computed from both published and unpublished data obtained from Department of Statistics Malaysia. Data on imports and exports were based on Standard International Trade Classification (SITC) compiled from external trade statistics. In order to harmonize the MSIC and SITC data, systems classification from the Malaysian Customs and Excise were used.

The Hausman specification test indicates the presence of simultaneity problem while the exogeneity test could not reject that hypothesis that AD/S, CR and PCM are endogeneous variables. Note that equations (1), (2) and (3) are over-indentified using the order condition.

Results of the 3SLS are shown in Table 1. The model gives some support to the hypothesized simultaneous interrelationships and feedback effects among advertizing, concentration and profit margin. Particularly the results indicate that concentration and advertizing intensity simultaneously exert a significant influence on each other. However, the hypothesized simultaneous relationship between advertizing and profitability is not borne out by the result.

Estimation results for the advertizing intensity equation shows that both PCM and HI positively affect advertizing. Quite unexpectedly however, PCM is not statistically significant.

The estimated concentration equation indicates that advertizing does exert a statistically significant positive influence on concentration. A 1% increase in advertizing intensity leads to 0.14 unit increase in concentration. Concentration is positively related to the cost disadvantage ratio (CDR) and minimum efficient scale (MES). They (CDR and MES) are however not statistically significant.

The final estimated equation is the profitability equation. In contrast to the hypothesized relation, concentration shows a negative sign in the profit equation although the coefficient is not statistically significant. This result appears to contradict the findings of Strickland and Weiss (1976) and Pagoulatos and Sorensen (1981). Gan and Tham (1977) got the expected sign for the concentration variable but similar to our findings, found it insignificant. They reasoned that this could be due to multicollinearity problem. Profit margin increases in response to higher advertizing intensity thus supporting Schmalensee (1972) conjecture that high advertizing could act as an entry barrier thus allowing higher profits to incumbents. Since the PCM is measured in terms of gross return, the precise way to interpret the estimated

relationship is that for every unit increase in advertizing intensity, profitability increases by an average of RM 8.94. The results also suggest that the foreign trade variables do not exert significant influence since both of them are not statistically significant. The hypothesis that the presence of foreign competition could discipline domestic producers to behave competitively is not supported in this study. Capital to sales ratio and advertizing show the expected positive sign and is statistically significant.

**Table 1**
3SLS Results

| Dependent Variable | Intercept | PCM | HI | SZ | MES | CDR | AD/S | K/S | X/S | M/S |
|---|---|---|---|---|---|---|---|---|---|---|
| AD/S | -0.0055 | 0.019 | 0.060 | | | | | | | |
| t statistics | -0.631 | 0.462 | 3.475* | | | | | | | |
| HI | 0.0243 | | | 1.32E-10 | 1.41E-05 | 0.015 | 14.180 | | | |
| t statistics | 0.255 | | | 0.358 | 0.312 | 0.851 | 2.287* | | | |
| PCM | 0.104 | | -0.140 | | | | 8.940 | 0.092 | -0.002 | 0.0006 |
| t statistics | 2.006* | | -0.624 | | | | 3.171* | 2.868* | -1.109 | 0.545 |

Note: * - indicates significance at the 5% level

## CONCLUSION

This paper has examined the simultaneity in relationship between advertizing, concentration and profitability. The system of equations was estimated using three stage least squares based on data for 120 industries classified at the 5 digit MSIC level. The three stage least squares (as opposed to single equation estimation) method was adopted in order to take cognizance of the relatively more recent theoretical development not incorporated in the three previous Malaysian studies on this subject. The result indicates that advertizing intensity significantly influences price-cost margins and concentration in the industry thus suggesting that it may act as a barrier to entry. At the same time concentration also affects advertising intensity therefore providing support to the feedback relationships hypothesis.

## REFERENCES

Berndt, R. E. (1991). *The practice of econometrics: Classic and contemporary*. Massachusetts: Addison-Wesley Publishing Company.

Caves, R. E., Khalizadah-Shirazi, J. & Porter, M. E. (1975). Scale economies in statistical analysis of market power. *Review of Economics and Statistics*, 57, 133-140.

Comanor, S. C. & Wilson, T. A. (1976). Advertizing, market structure and performance. *Review of Economics and Statistics*, *49*.

Comanor, S. C. & Wilson, T. A. (1974). The effect of advertizing on competition: A survey. *Journal of Economic Literature*, *17*, 453-476.

Comanor, S. C & Wilson, T. A. (1974). *Advertizing and market power*. Massachussetts: Harvard University Press.

Gan, W. B. (1978). The relationship between concentration and profitability in Malaysian manufacturing. *The Malaysian Economic Review*, *23* (1), 1-13.

Gan, W. B & Tham, S. Y. (1977). Market structure and price-cost margins in manufacturing industries. *The Developing Economies*, *15* (3), 280-292.

Rugayah, Mohamed. (1992). The measurement of market concentration and profitability in Malaysian manufacturing. *The Malaysian Economic Review*, *23* (1), 1-11.

Pagoulatos, E. & Sorensen, R. (1981). A simultaneous equation analysis of advertizing, concentration and profitability. *Southern Economic Journal,* 728 -740.

Schmalensee, R. (1972). *The economies of advertizing*. New York: Oxford American Elsevier Publishing Company, Inc.

Strickland A. O. & Weiss, L. W. (1976). Advertizing, concentration and price cost margins. *Journal of Political Economy*, *84* (5), 1109-1122.