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MANUFACTURING PROFITABILITY, MONOPOLY POWER AND EFFICIENCY IN A SMALL OPEN ECONOMY: IMPLICATIONS ON COMPETITION POLICIES

RAVI RATNAYAKE*

The past studies which identified a positive association between concentration (an indicator of market power) and profitability supported the view that the level and changes in industry concentration is an important guide to the formulation of anti-trust policies. Most of these studies were conducted for large industrial countries such as the U.S and U.K. The present study considers this view in the context of a small open economy. The majority of firms in these economies are typically characterised by sub-optimal scale of production. Generally, the results confirm the previous findings and support well-established hypothesises. However, the paper argues that the other determinants of profitability such as efficiency, entry barriers and international influences are important as much as concentration in determining such policies. The analysis is carried out on a sample of 109 New Zealand manufacturing industries.

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I. INTRODUCTION

Following the classic study of Bain in 1951, a large number of empirical studies have focused on the relationship between concentration and profitability and found that higher the industry concentration the greater is the profitability of that industry (see Schmalensee, 1988 for an excellent review of these studies). This means that more concentrated industries are capable of charging prices above marginal costs and earning of super normal profits. The elevation of prices above marginal costs has important implications on competition policy as

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* Department of Economics, The University of Auckland, Private Bag, Auckland, New Zealand.

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it creates inefficiencies in resource allocation and distortions in the income distribution. The identification of such positive association between concentration and profits suggests that the levels of and changes in industry concentration would be an important guide to the formulation of appropriate anti-trust policies. This means that preventing or minimizing mergers leading to higher concentration and market power would help to maintain competition in the industry concerned. This presumption, however, is subject two caveats (Geroski, 1991). The first arises from the argument that the association between concentration and profits reflects a superior cost efficiency of large firms which in turn brings about both market power and high profits. This seems to justify the argument for trade-off between efficiency and market power in dealing with competition policies. This argument states that some degree of market power should be allowed in return of cost efficiency. The second is related to the question that to what extent the profits acquired from market power are spent on research and development which would result in new products and lower prices to consumers in the near future. However, if these resources are used to maintain or increase monopoly position in the market, consumers are likely to be affected adversely. It should also be noted that the association between profits and concentration says nothing about collusion on which market power is based in many instances.

The empirical studies on the relationship between concentration and profitability have focused mainly on large economies including the U.S and U.K. The research in the same line are scarce in the context of small economies such as New Zealand. The majority of firms in these economies are typically characterised by sub-optimal level scale of production or sub-MES (minimum efficient scale) size and high concentration, perhaps due to lack of opportunities for economies of scale resulting from small domestic market. In particular, it has been shown elsewhere that New Zealand manufacturing industries are more concentrated than those of many other countries (Ratnayake, 1998). Moreover, these small economies are opened to international competition which has some important policy implications on the domestic competition. The purpose of this study is to examine this relationship between market structure and profitability in the context of a small open economy, New Zealand, by analysing the data of 109 manufacturing industries.

Section 2 examines the theoretical relationship between profitability and various aspects of market structure including the basic structuralist hypothesis involving positive association between average industry profits and levels of industry concentration. It also considers the efficiency based argument on the link between profits and concentration. Section 3 describes the measurement of profitability and data sources. The empirically observed relationship between profitability and various aspects of industry structure is analysed in section 4. A model incorporating a variety of explanations to variations in levels of average profits across industries is developed in section 5. Final section presents

the regression results and concluding remarks.

Ⅱ. THEORETICAL CONSIDERATIONS

2.1. Concentration and Profitability

The basic 'structure-performance' paradigm isolates market or industry concentration as the major exogenous variable in explaining the differences in profitability across industries (e.g. Cowling and Waterson, 1976; Clarke and Davies, 1982; Dixit and Stern, 1982). Denoting profitability in industry j by π_j and the level of industry concentration by C_j, the structural relationship between π and C has been shown in the form:

$$\pi_j = \alpha + \beta C_j + U_j$$

where α is a constant and U_j is a residual summarising all other factors affecting profitability. If $\beta > 0$, it is concluded that enterprises in highly concentrated industries are relatively more profitable than other industries.

2.2. Market Power vs. Efficiency

The most important criticism against this positive relationship between concentration and profit margins was made by Demsetz (1973) who gave an efficiency-based interpretation to it. Demsetz argued that inter-industry differences in accounting rates of returns are due to the fact that these products are more efficiently produced by firms with a larger share of market. These firms are able to produce at lower cost as either due to scale economies or they invest in production techniques and sales promotion activities and attract consumers before other firms. Therefore, the higher rates of returns earned by large firms with such cost advantages reflect efficiency rather than market power. In this situation it is possible that efficiency will result in both high rates of returns and high concentration in some industries.

2.3. Entry Barriers and Profitability

Even though concentration is a necessary condition for higher rates of returns, these higher profits may be competed away by new firms if there are no barriers to entry. Following Bain (1953), profitability has been shown to be dependent upon those elements of market structure which affect entry into a market. Bain considered 3 types of barriers: advertising, economies of scale and absolute cost disadvantages. Advertising acting as a barrier to entry, provides an opportunity to the existing firms to earn high profits (e.g. Scherer, 1970).

Advertising may reduce market competition in a number of ways. Most important of these from public point of view is the role of advertising in differentiated products. The ability of firms to differentiate tends to increase their monopoly power in the market so that they can enjoy supernormal profits. With regard to the other two forms of barriers to entry, Bain has pointed out that a new entrant with less than optimal size will face cost disadvantages **vis-a-vis** exiting firms. Therefore the existence of substantial economies of scale enables established firms to earn higher profits without any fear from new entrants. Similarly, if the industry concerned requires a large amount of fixed capital, it may be difficult for new firms to enter into the industry. In other words, factors which cause the industry to be non-contestable are hypothesized to permit excess profits.

Ⅲ. MEASUREMENT OF PROFITABILITY AND DATA SOURCES

In the empirical literature, profitability is usually represented either by accounting rates of return (measured as current profits divided by equity or total assets) or by rates of returns on sales (price-cost margins). A number of authors (e.g. Fisher and McGowan, 1983; Hay and Morris, 1991) have pointed out that the accounting rates of return is a poor and potentially misleading measure of the economic rate of return. They argue that assets are not properly valued on the balance sheet by conventional accounting procedures. For example, advertising expenditure and research and development expenditure are classified under current expenses on the balance sheet although these can be treated as assets as they may generate income to the firm for a long period of time. Next question is how assets are valued. Some firms may use 'historic cost' which is the initial cost of assets adjusted for depreciation. Apart from the problems associated with different depreciation methods used by different firms, this historic value of assets does not say anything about the value of the assets to the firm now. Some other firms may use the present value of assets and this will create comparability problems across firms and industries.

Because of the difficulties involved in obtaining accounting rate of return, most researchers have used price-cost margins (PCM) as a measure of the economic rate of return. PCM can be treated as an approximation to the Learner's index of market power. One of the major limitation of price-cost margins as a measure of economic rate of return is that it is not equal to Learner index in the presence of increasing or decreasing returns to scale. There are also difficulties in defining and measuring the cost component of the index across firms and industries.

Mindful of these limitations, in the econometric analysis (section 6) we use the following 4 measures based on PCM to represent the profitability of an industry. This will enable us to examine the sensitivity of results to the use of

different measures of profitability. We use

(a) P = Net profit/Sales
(b) PAT = (Net profit-tax)/Sales
(c) PVA = Net profit/Value added
(d) PVAT = (Net profit-tax)/Value added

The Department of Statistics provides data on net profits before tax. They are derived by deducting all costs including depreciation and working proprietors/ partners' salaries and wages. The information required for estimating all 4 measures except the data on tax are available at 5-digit level of NZSIC from the manufacturing census conducted by the Department of Statistics. Information on tax comes from Statistics of Income and Income Tax of Companies, 1986-87 published by the Department of Statistics.

A sample of industries for the analysis was drawn from 132 industries at the 5-digit level of New Zealand Standard Industrial Classification (NZSIC). Although both trade data and industry data are obtained from the Department of Statistics, there were important gaps between the two series of data. In order to match the two series, we had to combine or delete some industries leaving 109 industries in the sample.[1]

The measurement and sources of data given in Appendix 1. However, a special note must be made with regard to the measurement of economies of scale which is usually represented by the minimum efficient scale (MES) of an industry. The MES is defined as the average size of largest plants accounting for 50 per cent of industry's output. The plant size is usually measured using value added or sales or employment. Weiss (1963) used the 50th percentile of an industry's cumulative distribution of output as the MES. It has been argued that these measures formulated for large industrial countries such as the U.S are not suitable for small economies (Phillips, 1978). The main reason is that majority of firms of these countries are of sub-optimal scale or sub-MES size. In order to eliminate this problem, following Phillips (1978) we first calculated the 'reasonably efficient scale (RES)' as the value added per person of the class containing the 50th percentile of industry value added. This value added per person was then expressed as a percentage of total value added per person of the industry to obtain an estimate of the proportion of industry supplied by a RES plant.

Ⅳ. RELATIONSHIP BETWEEN MARKET STRUCTURE AND PROFITABILITY

As discussed in section 2, profitability is hypothesized to be influenced by various aspects of market structure. We below (Tables 1-4) examine the empirically observed relationship between profitability and some aspects of

[1] See Ratnayake (1998) for details of data sources.

market structure which include concentration and barriers to entry. The average profits reported in these tables are estimated using most widely used measure of profitability (i.e. PAT = net profit-tax/sales).

The most crucial hypothesis on the link between industry structure and performance states that on average higher the concentration the greater is the profit rate (see section 2). In Table 1, average rates of profits are presented in the form of a frequency distribution of 4-firm concentration ratios[2] of 109 New Zealand manufacturing industries. One can see a weak association between concentration and profitability. When industry concentration ratio is below 40 per cent, average rate of profit is 2.7 per cent while it is just above 3 per cent for more concentrated industries. The highest rate of profit is recorded for industries with the concentration ratio between 70 and 80 per cent. The average rate of profit for the whole sample is 3.5 per cent.

In Tables 2 and 3, average rates of profits are presented in the form of frequency distributions of economies of scale and advertising intensity respectively. Profit rates are expected to be high in the industries with greater barriers to entry. However, we can not find any closely observed link between profits and these two important aspects of market structure.

[Table 1] Concentration and Industry Average Profitability

Industry Concentration Ratio	Number of Industries	Average Rate of Profit
0 - 9.9	-	-
10 - 19.9	3	2.7
20 - 29.9	11	2.7
30 - 39.9	12	2.7
40 - 49.9	10	3.4
50 - 50.9	6	2.4
60 - 69.9	11	3.9
70 - 79.9	16	4.1
80 - 89.9	18	3.3
90 - 100	22	3.6
All	109	3.5

[2] We used both concentration ratio and Herfindahl index at the initial stage and found that results are not sensitive to the choice of the measure. We used concentration ratio in the analysis as it is more easily obtained and widely used.

[Table 2] Economies of Scale and Industry Average Profitability

Economies of Scale	Number of Industries	Average Rate of Profit
Below .010	25	3.2
.011 - .050	35	4.1
.051 - .100	23	3.7
.101 - .200	13	4.5
.201 - .300	2	1.8
.301 - .500	3	3.3
.501 - .750	3	3.2
.751 - 1.00	1	4.3
Above 1.00	4	1.1
All	109	3.5

The observed relationship between rate of profits and efficiency is given in Table 4. We used the average productivity of labour, computed as value added per employee (VAE), to represent efficiency of manufacturing industries. Our choice is mainly guided by the availability of data. The average productivity of labour has been used as a measure of efficiency by many researchers (e.g. Gisser, 1984; Merrett, 1971; Van Dalen, 1991) in both cross sectional and time series studies involving industries as well as enterprises. The major attraction of this measure is that it can be computed without much difficulty using some estimates of output and labour force size. This measure can also be easily compared with other studies. The major limitation of VAE as a measure of efficiency is that large firms could have higher value added per head just because they are capital intensive. However, the simple correlation coefficient of VAE and PCI representing value added per head and physical capital intensity respectively is -46 indicating that there is no positive relationship between these the two variables. In any case our data is at industry level rather than firm level and therefore VAE and PCI are average values for industries.

It can be seen (Table 4) that higher the industry efficiency the greater is the average rate of profit. When value added per employee is between $10,000 and $20,000, average rate of profitability is 1.1 per cent while it is 10.8 per cent for the industries with value added per employee above $90,000.

Table 4 provides substantial support to the proposition that efficiency is instrumental in making industries more concentrated and more profitable. The level of concentration as well as the level of average profits increase when efficiency (in terms of value added per employee) increases. For example, when value added per employee is in the lowest range ($10,000 - $20,000), the rate

[Table 3] Advertising Intensity and Average Profitability

Advertising to Sales Ratio (%)	Number of Industries	Average Rate of Profits
Below 1.0	32	2.7
1.1 - 2.0	39	3.1
2.1 - 3.0	23	5.8
3.1 - 4.0	2	4.0
4.1 - 5.0	3	3.9
5.1 - 6.0	3	1.5
6.1 - 7.0	2	1.5
7.1 - 8.0	2	4.9
8.1 - 9.0	1	3.4
Above 9.1	1	2.3
All	109	3.5

of average profit is 1.1 per cent and industry concentration ratio is 58.7 per cent while they are 10.8 per cent and 93.3 per cent respectively in the highest range of value added (above $90,001). The high efficiency appears to be correlated with both high concentration and high profitability. Next we turn to specify a model to analyse the determinants of inter-industry differences in profits.

V. DETERMINANTS OF PROFITABILITY

In terms of the theoretical considerations in section 2, we specify the following model:

$$\pi_j = \alpha + \beta_i C_j + \Sigma \gamma_i X_{ij} + \Sigma \delta_i Y_{ij} \tag{8}$$

where π_j is rate of profit of industry j; C_j is level industry concentration; X_{ij} is a vector of barriers to entry; Y_{ij} is a vector of other influences.

The theoretical links between profitability and concentration and entry barriers have already been explained. There are a number of other variables included in the profitability equation. Most commonly used variables in the previous studies are industry growth, foreign direct investment and foreign trade. Industry growth (IG) is expected to exert a positive influence on profits mainly for 2 reasons. First, rapidly growing industries are less likely to be affected by competitive

[Table 4] Efficiency, Concentration and Average Profitability

Value Added per Employee	Numberof Industries	Average Concentration Ratio	Average Rate of Profitability
10,000 - 20,000	10	58.7	1.1
20,001 - 30,000	36	52.2	2.3
30,001 - 40,000	32	66.7	3.2
40,001 - 50,000	16	70.9	5.9
50,000 - 60,000	7	75.7	5.3
60,001 - 70,000	2	86.6	5.0
70,001 - 80,000	3	90.7	8.1
80,001 - 90,000	1	100	6.3
Above 90,001	2	93.3	10.8
All	109	63.5	3.5

pressures than those industries experiencing slower growth and therefore the growing industries can enjoy temporary windfall profits. Second, in oligopolistic industries collusive joint-profit-maximizing pricing behaviour is stronger if the growth of demand is rapid. There are two conflicting views with regard to the influence of foreign direct investment (FDI) on profits (Pagoulatos and Sorensen, 1976). One view is that entry of multinational enterprises (MNEs) increases the degree of competition in host countries. This is because MNEs are capable of overcoming the existing entry barriers such as product differentiation, economies of scale and technology in host county industries, thereby breaking down the local monopolies. If MNEs provide these competitive pressures, a measure of FDI (FO) may be inversely related to profitability. The opposite argument suggests that MNEs may create additional barriers or compound existing barriers, thereby reducing competitive pressures in the domestic industries. Further more, the entry of MNEs could result in defensive mergers among firms and strengthen oligopolistic collusion. Finally, in open economies such as New Zealand, trade is substantial in relation to industrial production. Imports are considered as the most immediate source of new entry threat in the domestic market, originated from foreign firms who already have established their dominance in their home markets (Hay and Morris, 1991). Therefore, import penetration will be influential in increasing competition and reducing domestic profit margins.

In Section 2, the efficiency based interpretation to the positive relationship between monopoly power and profits was explained. We modify equation 8 to test efficiency-profitability hypothesis as follows:

$$\pi_j = \alpha + \beta_i C_j + \Sigma\gamma_i X_{ij} + \Sigma\delta_i Y_{ij} + \theta_i Z_j \tag{9}$$

where Z_j is a measure of efficiency of industry j.

Ⅵ. RESULTS AND POLICY IMPLICATIONS

Regression results without and with a measure of efficiency are reported in Table 5 and Table 6. All equations pass Ramsey's RESET test (functional form) and White's heteroscedasticity test at the 5 per cent level of significance or better, implying that our results are not seriously affected by functional form misspecifications and heteroscedasticity. The null hypothesis that the independent variables are exogenous is not rejected in terms of Wu-Hausman test of exogeneity.

Table 5 shows that the coefficient of CR is significant in 3 equations with the expected sign confirming the market concentration doctrine that higher levels of concentration leads to higher profits. Concentration is only marginally significant in equation 3 with PVA is the dependent variable. All 3 variables reflecting entry barriers have the expected sign and are statistically significant supporting the hypothesis that entry barriers are a major source of high profits. One exception is the coefficient of advertising intensity (A/S) which is not statistically significant in the first 2 equations (P and PAT). This result is consistent with the information given in Table 3 where advertising intensity and average profitability (PAT) do not show any consistent relationship. The coefficients of two variables representing international influences bear the expected signs and are statistically significant. These results confirm the hypothesis that import competition and the activities of foreign firms in the domestic market exert significant negative influence on profits earned by local monopolies. Industry growth (IG) is positive and highly significant indicating that profits tend to be high in the growing industries.

Next we re-estimated the model including the variable VAE to represent industry efficiency. The regression results with a measure of efficiency (VAE) in the profitability equation are given in Table 6. The coefficient of efficiency (VAE) is highly significant with the expected positive sign. The concentration variable (CR) became insignificant although the sign remains unchanged. The results of other variables are not significantly affected by the inclusion of efficiency variable in the regression. The comparison of estimates of R^2 in Table 5 and Table 6 shows that efficiency variable has significantly improved the explanatory power of the equation. Superior cost efficiency appears to be

[Table 5] Determinants of profitability - Regression Results

Independent Variable	Dependant Variable			
	P	PAT	PVA	PVAT
CR	0.005 (2.455)[b]	0.003 (2.452)[b]	0.008 (1.204)	0.005 (1.769)[b]
A/S	0.155 (0.965)	0.091 (0.961)	0.771 (1.446)[c]	0.349 (1.455)[c]
IP	−0.054 (2.461)[b]	−0.031 (2.484)[b]	−0.201 (2.782)[b]	−0.089 (2.743)[b]
PCI	0.001 (1.902)[b]	0.001 (2.301)[b]	0.002 (3.627)[a]	0.001 (3.386)[a]
ES	0.009 (1.712)[b]	0.005 (1.686)[b]	0.002 (1.674)[b]	0.001 (1.690)[b]
IG	0.005 (6.321)[a]	0.003 (6.137)[a]	0.001 (4.481)[a]	0.005 (4.340)[a]
FO	−0.003 (1.964)[b]	−0.002 (2.013)[b]	−0.008 (1.595)[c]	−0.004 (2.024)[b]
CONSTANT	0.014 (0.986)	0.008 (0.999)	0.076 (1.565)[c]	0.024 (1.126)
F	6.911[a]	6.571[a]	4.585[a]	4.606[a]
R^2	0.277	0.265	0.188	0.180
RESET[(a)]	0.793	0.137	0.935	0.639
WHITE TEST[(b)]	0.443	0.172	1.265	0.474
Exo. Test	1.062	0.951	1.312	0.998

Notes: t-ratios are given in parentheses. Significant Levels are: a=1%, b=5%, c=10%.
(a) Ramsey's regression specification test
(b) White's heteroscedasticity test.
(c) Wu-Hausman test of exogeneity (The critical value at 5% is 2.09 [F(7, 102)].

more influential in generating high profits than the level of concentration. This supports our previous finding in section 4 that efficiency makes industries more profitable.

A number of policy implications emerge from the empirically observed relationship between market structure and profitability (section 4) and the econometric analysis. Although high concentration (market power) exert positive influence on profitability, efficiency appears to be an outstanding factor in raising profits of industries. This means that a well-defined trade-off between market power and efficiency is required in the formulation and implementation of anti-trust policies. Policy intervention can not be linked simply to high concentration. It seems that high levels of concentration on their own are no longer indicators of inefficiencies in resource allocation. The efficiency benefits should be weighed against the costs associated with market power in formulating

[Table 6] Determinants of profitability - Results with a Measure of Efficiency

Independent Variable	Dependant Variable			
	P	PAT	PVA	PVAT
CR	0.003 (1.121)	0.001 (1.237)	0.001 (0.042)	001 (0.618)
A/S	0.188 (1.279)[c]	0.108 (1.228)	0.865 (1.717)[b]	0.390 (1.726)[b]
IP	-0.041 (2.069)[b]	-0.025 (2.112)	-0.167 (2.439)[b]	-0.074 (2.398)[b]
PCI	0.005 (4.202)[a]	0.005 (4.249)[a]	0.003 (5.275)[a]	0.001 (5.046)[a]
ES	0.009 (1.941)[b]	0.005 (1.863)[b]	0.002 (1.827)[b]	0.001 (1.843)[b]
IG	0.003 (3.669)[a]	0.002 (3.653)[a]	0.006 (2.222)[b]	0.002 (2.098)[b]
FO	-0.003 (2.217)[c]	-0.001 (2.220)[b]	-0.008 (1.747)[b]	-0.003 (2.201)[b]
VAE	0.006 (4.667)[a]	0.001 (4.116)[a]	0.001 (3.807)[a]	0.001 (3.792)[a]
CONSTANT	0.005 (0.428)	0.004 (0.497)	0.051 (1.124)	0.013 (0.066)
F	10.015[a]	8.776[a]	6.360[a]	6.163[a]
R^2	0.400	0.365	0.284	0.277
RESET[(a)]	0.149	0.023	0.312	0.141
WHITE TEST[(b)]	0.068	0.022	0.901	0.229
Exo. Test[(c)]	0.721	0.501	0.600	0.714

Notes: t-ratios are given in parentheses. Significant Levels are: $a=1\%$, $b=5\%$, $c=10\%$.

(a) Ramsey's regression specification test

(b) white's heteroscedasticity test.

(c) Wu-Hausman test of exogeneity (The critical value at 5% is 2.09 [F(8, 101)].

anti-trust policies. Alternative means of improving competition in the domestic market such as removing entry barriers and increasing import competition may be considered in conjunction with levels of concentration in policy interventions.

APPENDIX 1: DATA DEFINITIONS AND SOURCES

P Measures of profitability (P, Pat, PVA and PVAT) estimated using data from Department of Statistics, Economywide Census of manufacturing, 1987.

CR 4-firm concentration ratio (share of top 4-sales),1986-87, Department of Statistics.

CH Herfindahl index based on sales, 1986-87, Department of Statistics.

ES Economies of scale, computed as the value added per person of the class containing 50th percentile of industry value added divided by the total value added per person of the industry, 1986-87, Department of Statistics.

PCI Capital intensity computed as the book value of fixed capital divided by number of employees, 1986-87, Department of Statistics.

A/S Advertising intensity is defined as the ratio of advertising expenditure to the value of sales. In the absence of data for advertising, value given in the item No. 83 (Data processing fees, legal...advertising) of the questionnaire for economy-wide census for 1986-87 has been used to represent advertising expenditures, Department of Statistics.

IP Import penetration, computed as the ratio of value of imports to the value of domestic sales, Department of Statistics.

IG industry growth, estimated as percentage change in sales between 1984 and 1987, Department of Statistics.

VAE Value added per employee, Department of Statistics.

FO Foreign ownership of industry, estimated as percentage of sales accounted for by foreign owned firms in total sales of each industry, Department of Statistics.

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