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# Trends in the Malaysian Industrial Market Structures

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ABSTRAK

*Kini sektor pembuatan menyumbang lebih daripada satu pertiga keluaran negara dan melebihi separuh daripada jumlah eksport. Malangnya, amat sedikit yang diketahui tentang arah aliran jangka panjang angkubah-angkubah struktur pasaran sektor ini, sungguhpun mengikut teori ekonomi, angkubah-angkubah tersebut dapat banyak menerangkan tentang keadaaan saingan dan kecekapan industri dalam jangka pendek dan jangka panjang. Pengetahuan tentang bidang ini juga membolehkan seseorang menilai prospeks masa depan industri pembuatan di Malaysia dalam menghadapi liberalisasi dan globalisasi pasaran yang semakin mencabar. Kertas ini menunjukkan bahawa berlakunya perubahan struktur pasaran perindustrian di Malaysia dan sememangnya menampakkan arah aliran yang signifikan bagi sesetengah angkubah struktur pasaran.*

ABSTRACT

*The manufacturing sector currently accounts for more than one third of the nation's output and more than one half of total exports. Unfortunately, little is known about the long run trends in market structure variables in this sector even though, according to economic theory, these variables do say a lot about the short and long run competitive and efficiency conditions of an industry. Knowledge in this area will also enable one to assess the future prospect of Malaysian manufacturing industry in facing greater market liberalization and globalization. This paper shows that the Malaysian industrial market structure had been evolving and that there were indeed some significant trends in several market structure variables.*

## INTRODUCTION

A central question in the field of industrial organization is how firms and markets should be organized to produce optimal economic performance. There are theoretical arguments as well as empirical evidences suggesting that market structure does exert static as well as dynamic influences on market conduct and performance. Market conduct and performance may, in turn, generate significant short run and long run welfare implications.

The efficiency properties of the perfectly competitive model, though admittedly unrealistic, provide a theoretical testimony to the implication of market structure on static efficiency. From the theoretical standpoint, countervailing market power, or a complete absence of it as in the case of a perfectly competitive market, ensures static efficiency that maximizes society's welfare. Monopoly models, on the other hand, provide theoretical argument from the other end of the market structure spectrum by showing how market power distorts resource allocation that eventually results in static inefficiency. Some of these theoretical predictions are indeed well supported on the empirical front. There are several Malaysian studies, that appear to lend support to the hypothesis that there exists association between structure and industrial performance. In Gan and Tham (1977) the height of entry barriers as measured by *MES* and CR8 was found to have a positive and significant effect on the price-cost margin. Gan (1978) further substantiated his earlier finding by empirically showing that market concentration and industry profits were positively correlated. In a related study, Lall (1979) confirmed that the measures for barriers to entry like economics of scale, minimum capital requirement and product differentiation were significant determinants of market concentration. Rugayah (1992) also found that there was a significant relationship between advertising intensity and minimum efficient scale on the one hand, and market concentration, on the other.

The market structure conditions could also potentially influence the rate of technical change and hence society's welfare in the longer run. There is an extensive theoretical as well as empirical literature on the impact of market structure variables on innovations (Shepherd 1997). The basic issue commonly discussed in the literature is whether a competitive market structure with many equal-sized players is more conducive for technical progress and innovations than its monopolistic counterpart. If monopolistic market favours innovation, will the long run gain more than compensate for the short run static inefficiencies? In the US, empirical estimates of the costs of static resource misallocation attributable to sub-

optimal (monopolistic) market organization range from miniscule [0.07 percent of GNP, as estimated by Harberger (1954: 85)] to substantial [4-13 percent of GNP, as estimated by Cowling and Mueller (1978: 743)]. The potential tradeoff between static and dynamic efficiency is therefore central to evaluating the performance of alternative market organization. Unfortunately, there is no empirical evidence available on the impact of market structure on innovations for Malaysia.

Liberalization and globalization of the world economy provide yet another reason for taking interest in the trends of market structure variables. Knowledge of changing market structure may help in assessing and predicting the ability of local firms to compete in an increasingly liberalized global economy. Has the Malaysian industrial market structure evolved in a manner favorable to success in the global economy? Some authors claim that "... the technological change now systematically favours (or is mainly the product of) small companies ..." while others say otherwise (Bennett 1994). Whichever way the verdict goes, tracking market structure changes is definitely a worthwhile exercise.

In this paper changes in the Malaysian manufacturing market structure are reported for the ten-year period between 1985-1994. The structural changes were determined by analyzing several common measures of the elements of barriers to entry, product differentiation and seller concentration. It must be emphasized from the outset, however, that this paper provides no direct empirical evidence that could be used in the on going controversies over the kind of market structure that produces the most optimal economic performance.

In a related study that purported to track changes in market structure conditions, Zainal and Phang (1993) compared several market structure variables at three points in time; 1979, 1985 and 1990. The current study differs from the above-mentioned study in at least three significant ways. First, this study benefits from a richer and more current data set where annual data were available for the period between 1985 to 1994. Second, trends in six market structure variables are considered in this study compared to only four in the older study. Third, regression technique is used in the current study to determine time trends while the other study only employs casual comparisons of variables at three different points in time.

## DATA AND MEASUREMENTS

This study utilizes annual data from the *Survey of Manufacturing Industries* database of the *Department of Statistics*. Annual measures for six market structure variables for 132 industries at the 5-digit SIC (*Standard Industrial Classification*) level are computed for all years from 1985 to 1994.

Conditions of barriers to entry is measured by three economies of scale variables namely, minimum efficient scale (*MES*), minimum optimal scale (*MOS*) and minimum capital requirement; and one product differentiation variable, advertising to sales ratio. Market concentration is measured by the four-firm concentration ratio (CR4) as well as the Herfindahl index.

*MES* is defined as the minimum firm size at which all of the advantages of scale are attained. Various methods (with corresponding drawbacks) have been used to derive the *MES* (Lyons 1980). This study employs a popular statistical proxy of MES that was initially proposed by Comanor and Wilson (1967) and later used in other studies including Rugayah (1992) and Gan (1978). The proxy is calculated as the average size of the largest plants that account for at least 50% of total industry output. It is equal to $\sum_{i=1}^{m} X_i \Big/ m$ where $X_i$ is total output of firm $i$ and $m$ is minimum number of firms accounting for at least 50% of total output.

In a seminal work, Bain (1951) defined *MOS* as the scale of production where average total cost (*ATC*) is at its minimum. Various proxies have since been proposed and used as empirical measures of the *MOS*. This study adopts a proxy of *MOS* that was proposed by Shapiro and Khemani (1987). It is calculated by dividing the *MES*, found above, with total industry output.

Like many other studies, the level of seller concentration is used as a measure for market power. The four-firm concentration ratio (CR4) and the Hirschman-Herfindahl index (HHI) have been adopted as measures for seller concentration. The CR4 determines the cumulative market share of the four biggest firms and the HHI is defined as the sum of the squared market share of every firm in the market. Note that both measures are expected to be highly correlated. In addition, Bailey and Boyle (1971), after examining various measures of concentration, concluded that no one measure 'appears superior to any other'.

The minimum capital requirement to enter an industry at the scale of a single optimal plant is calculated by multiplying the *MES* to the ratio of net book value of fixed assets to output.

Finally, product differentiation is measured by the ratio of advertising expenditure to total sales. This proxy is used to approximate intensity of promotional effort to differentiate products and to encourage brand loyalty to certain products.

Having computed the six above-mentioned structural variables, the study proceeded by running ordinary least squares regressions of these variables against time. Running simple regressions should be statistically sufficient since there is only an interest in the general trends of the variables over time. A check for auto-correlation was also performed. Positive trends in CR4, HHI, *MES*, *MOS*, advertising to sales ratio and minimum capital requirement imply a less competitive environment and vice versa.

It should also be mentioned that the data used had not been adjusted for price change because of the lack of suitable deflators. However, the absence of price deflators should not pose any serious econometric problem in the regression estimates since all market structure variables appear in ratio forms except for the *MES*. For all variables other than the *MES*, changes in price level just cancels out because the price deflator would have been applied to both the numerator and the denominator. Only in the case of the *MES* that a time trend caused by rising prices could not be differentiated from a true trend resulting from increases in the minimum efficient scale of production. To that extent, although regression results for the *MES* are reported in this study, the *MOS* is arguably a better measure of the minimum plant size necessary for efficient production.

## RESULTS

More than 700 equations were estimated using simple regressions of various structural variables against time. The number of industries showing statistically significant trends in the structural variables are given in Table 1. Industries showing positive or negative trends according to the variables concerned are given in Table 2.

Many industries had indeed experienced some changes in the market structure over the ten-year period from 1985 to 1994. Of those that did change, most reported trends towards a more competitive environment. Only several industries had moved in the opposite direction.

TABLE 1. Number of industries showing trends in various structural variables

| Variables | Significant upward | Significant downward | Insignificant |
|---|---|---|---|
| CR4 | 12 | 53 | 59 |
| HHI | 8 | 50 | 70 |
| MES | 69 | 2 | 55 |
| MOS | 9 | 50 | 66 |
| MCR | 4 | 11 | 111 |
| ASR | 11 | 21 | 89 |

Further analysis also reveals that 41 out of 128 industries exhibit significant trends in at least 4 of the 6 measures tested while 11 industries displayed significant trends in at least 5 of the 6 measures tested.

The analysis also gives a fairly consistent picture in terms of relative trends among variables such that when the concentration ratio and the Herfindahl index show a downward trend, other measures like minimum capital requirement, advertising to sales ratio and the *MOS* also move in the same direction. The reverse occurs when concentration ratio and Herfindahl index show an upward trend. In other words, those industries displaying trends towards a more competitive environment usually have most of their market structure variables confirming the pattern and vice versa. This pattern is consistently observed in 33 out of 41 (80.1%) industries that had displayed significant positive or negative trends in 4 of the 6 measures.

The four-firm concentration (CR4) measures show significant upward trends for 12 industries, significant downward trends for 53 industries and insignificant trends for 59 industries. Of the 12 industries that show significant upward trend, 4 are observed in food manufacturing. Industries showing downward trends include manufacture of wearing apparel, manufacture of industrial chemicals and other chemical products, manufacture of non-metallic mineral products, manufacture of electrical machinery, apparatus, appliances and supplies industry, manufacture of transport equipment industry and manufacture of professional and scientific equipment and manufacture of measuring and controlling equipment.

As expected, the time trend found for the Herfindahl index for various industries is generally consistent with that for the CR4. A total of 8 industries show significant upward trends compared to 50 industries that report significant downward trends. The rest do not show either positive or

TABLE 2. Trends in CR4, HHI, MES, MCR and ASR

| Industries showing upward trends | Industries showing downward trends |
|---|---|
| CR4 | |
| 31131, 31151, 31169, 31171, 31212, 31215, 31340, 32119, 35592, 38111, 38130, 38449 | 31121, 31139, 31163, 31190, 31219, 31220, 32112, 32113, 32120, 32140, 32150, 32201, 32209, 32400, 33112, 33190, 33200, 35111, 35119, 35120, 35130, 35210, 35231, 35239, 35290, 35599, 35600, 36100, 36200, 36921, 36922, 36991, 37101, 37109, 38191, 38192, 38250, 83100, 38321, 38322, 38329, 38391, 38392, 38393, 38439, 38441, 38490, 38510, 38520, 38530, 39030, 39092, 39099 |
| HHI | |
| 31151, 31152, 31171, 31212, 31215, 31330, 35592, 38432 | 31129, 31190, 31219, 31220, 32112, 32113, 32120, 32140, 32150, 32201, 32209, 32310, 32400, 33112, 33190, 33200, 35130, 35210, 35231, 35290, 35510, 35593, 35599, 35600, 36100, 36200, 36922, 36991, 37101, 37109, 38191, 38192, 38199, 38250, 38321, 38329, 38391, 38392, 38393, 38431, 38439, 38441, 38490, 38510, 38520, 38530, 39020, 39030, 39092, 39099 |
| MES | |
| 31151, 31152, 31171, 31215, 31330, 32119, 35592, 38111, 38432 | 31129, 31131, 31139, 31190, 31219, 31220, 32112, 32113, 32120, 32140, 32150, 32201, 32209, 32400, 33111, 33112, 33190, 34120, 35119, 35120, 35130, 35210, 35231, 35290, 35510, 35599, 35600, 36100, 36922, 36991, 37101, 37109, 37209, 38191, 38199, 38250, 38310, 38321, 38329, 38391, 38392, 38393, 38439, 38441, 38490, 38510, 38520, 38530, 39092, 39099 |
| MCR | |
| 31212, 31330, 32115, 36922 | 32150, 35119, 35120, 35599, 36100, 36200, 36921, 37101, 37209, 38410, 39030 |
| ASR | |
| 31140, 31171, 31172, 31215, 32112, 32113, 35510, 35591, 38432, 38441, 38490 | 31110, 31211, 31220, 31330, 31340, 32111, 32209, 33113, 36991, 36999, 37209, 38111, 38130, 38193, 38199, 38250, 38310, 38393, 38510, 39010, 39092 |

negative significant trends. Parallel with the finding for the CR4 variable, 5 out of 8 industries showing upward trends are in food manufacturing. Of the 50 industries that show downward trends, most come from manufacture of textiles, manufacture of wearing apparel, manufacture of other chemical products, manufacture of rubber products, manufacture of iron and steel, manufacture of electrical machinery, apparatus, appliances and supplies. Others are found in manufacture of transport equipment, manufacture of professional and scientific equipment and manufacture of measuring and controlling equipment.

In the case of minimum efficient scale (*MES*) variable, 69 industries exhibit significant upward trends and only 2 show significant downward trends while 55 show insignificant trends. Most industries which show upward trends are observed in food manufacturing, manufacture of textiles, manufacture of leather and products of leather, leather substitutes and fur, manufacture of paper and paper products, manufacture of other chemical products, manufacture of fabricated metal products, manufacture of electrical machinery, apparatus, appliances and supplies and manufacture of transport equipment. Since the *MES* measure is not free from the effect of changing price level, unlike the other variables as discussed earlier, the estimated trends are deemed unreliable. Notice that a large number of industries appear to exhibit upward trends for this variable and this is consistent with a positive influence exerted by a general rise in the price level over time. The trends in *MOS*, as discussed below, are more reliable in representing the evolution of the minimum efficient plant size over time.

The minimum optimal scale (*MOS*) variable shows significant upward trends for 9 industries while 50 industries display significant downward trends. A total of 66 industries show insignificant trends within the study period. Again, significant upward trends are observed in four food manufacturing industries while most of the downward trends are observed in manufacture of industrial chemical industry, manufacture of electrical machinery, apparatus, appliances and supplies industry and manufacture of professional and scientific, and measuring and controlling equipment industry.

Relatively little structural change as measured by the minimum capital requirement, occurred during the study period where only 4 industries display significant upward trends while 11 show downward trends. The overwhelming majority (111 industries) in this study does not show any significant trends.

In the case of advertising to sales ratio, 11 industries display significant upward trends while 21 industries show significant downward trends.

Most (89 industries) show insignificant trends. About half of the industries displaying upward trends are observed in the food manufacturing.

This study also looks at trends for groups of industries at the 3-digit SIC code. The aim is to identify industry groupings that exhibit trends for most of the within-group industries at the 5-digit level. Another reason for selecting these industry groupings is to find any divergence (if any) in within-group trends. A group is selected for further analysis if at least fifty percent of the industries at the 5-digit level within the group show significant trends in at least 4 of the 6 measures tested. Four industry groups satisfy the criterion mentioned above, namely manufacture of industrial chemicals (351), manufacture of other chemical products (352), manufacture of electrical machinery, apparatus, appliances and supplies industry (383) and manufacture of professional and scientific and measuring and controlling equipment industry (385). Discussion on industries 351 and 352 are combined because the products are closely related. Regression results for the four industries are given in Tables 3, 4, 5, 6, 7 and 8.

Out of the 9 industries in both 351 (manufacture of industrial chemicals) and 352 (manufacture of other chemical products) groups, 5 industries show significant trends in at least 4 of the 6 measures tested. These industries are manufacture of basic industrial chemicals (35119), manufacture of synthetic resins, plastic and materials and man-made fibres (35130), manufacture of paints, varnishes and lacquers (35210), manufacture of soap and cleaning preparations (35231) and manufacture of other chemical products (35290). Ignoring the *MES* variable, there is definitely a consistent within-group trend. All industry groupings evidently move towards a more competitive environment by all measures. Notice that even though some variables exhibit upward trends, the regression coefficients are not statistically significant.

Out of the 9 industries in the 383 classifications, 6 industries showed significant trends in at least 4 of the 6 measures tested. These industries are manufacture of electrical industrial machinery and apparatus (38310), radio and television sets, sound reproducing and recording equipment (38321), semi-conductors and other electronic components and communication equipment and apparatus (38329), cables and wires (38391), manufacture of dry cells and storage batteries (38392) and manufacture of electric lamps and tubes (38393). Similar to the earlier findings for industry groups 351 and 352, there is again a consistent within-group trend where all industries appear to move towards a more competitive environment. There are of course one or two variables that exhibit upward trends, but the regression coefficients are not statistically significant.

TABLE 3. Trends in industry groups 351 and 352 for concentration ratio, Herfindahl index and minimum optimal scale

| Industry | CR4 | | | | Herfindahl Index | | | | *MES* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW |
| 35111 | -0.0081 | -2.702 | 0.0270 | 1.695 | -0.01649 | -2.125 | 0.0663 | 2.602 | 6.43E+07 | 1.099 | 0.3038 | 3.045 |
| 35119 | -0.01512 | -2.388 | 0.0440 | 2.057 | -0.00481 | -1.707 | 0.1263 | 2.215 | 1.57E+07 | 3.624 | 0.0067 | 1.394 |
| 35120 | -0.01006 | -2.655 | 0.0290 | 1.772 | -0.00188 | -1.379 | 0.2053 | 1.931 | 2.54E+06 | 1.023 | 0.3360 | 1.843 |
| 35130 | -0.06062 | -5.847 | 0.0004 | 1.030 | -0.02253 | -3.787 | 0.0053 | 1.271 | 1.33E+07 | 4.053 | 0.0037 | 1.289 |
| 35210 | -0.01409 | -7.936 | 0.0000 | 2.234 | -0.00635 | -5.269 | 0.0008 | 1.720 | 9.60E+06 | 5.496 | 0.0006 | 2.096 |
| 35220 | -0.01859 | -1.788 | 0.1115 | 2.140 | -0.00693 | -0.758 | 0.4704 | 2.217 | -1.91E-06 | -0.311 | 0.7637 | 2.289 |
| 35231 | -0.01931 | -5.448 | 0.0006 | 2.910 | -0.02074 | -5.713 | 0.0004 | 1.924 | 1.33E+07 | 3.846 | 0.0049 | 2.521 |
| 35239 | -0.01162 | -2.779 | 0.0239 | 0.978 | -0.00772 | -1.162 | 0.2786 | 1.423 | 3.71E+06 | 2.574 | 0.0329 | 3.109 |
| 35290 | -0.01066 | -2.928 | 0.0191 | 1.944 | -0.00167 | -3.215 | 0.0123 | 2.268 | 2.66E+06 | 4.885 | 0.0012 | 2.894 |

TABLE 4. Trends in industry groups 351 and 352 for minimum efficient scale, advertising ratio and minimum capital requirement

| Industry | MOS | | | | Advertising Ratio | | | | Minimum Capital Requirement | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW |
| 35111 | -0.01052 | -2.004 | 0.0801 | 2.713 | 0.00000 | 0.739 | 0.4809 | 2.713 | 0.01254 | 0.311 | 0.7640 | 2.243 |
| 35119 | -0.00602 | -2.411 | 0.0424 | 2.307 | 0.00000 | 0.032 | 0.9750 | 1.273 | -0.01711 | -3.476 | 0.0084 | 0.605 |
| 35120 | -0.00415 | -2.821 | 0.0224 | 1.566 | 0.00041 | 1.131 | 0.2910 | 0.921 | -0.01083 | -2.671 | 0.0283 | 2.604 |
| 35130 | -0.02907 | -5.039 | 0.0010 | 1.219 | 0.00005 | 1.355 | 0.2123 | 1.182 | -0.00297 | -1.025 | 0.3355 | 1.911 |
| 35210 | -0.00871 | -2.921 | 0.0193 | 2.145 | -0.00096 | -2.256 | 0.0541 | 3.063 | 0.00234 | 0.268 | 0.7954 | 2.417 |
| 35220 | -0.01170 | -0.695 | 0.5065 | 2.290 | -0.00159 | -1.162 | 0.2786 | 1.881 | -0.00302 | -0.198 | 0.8478 | 2.397 |
| 35231 | -0.02034 | -2.445 | 0.0402 | 2.057 | -0.01614 | -2.091 | 0.0699 | 1.899 | 0.00320 | 0.251 | 0.8079 | 2.446 |
| 35239 | -0.01886 | -1.544 | 0.1611 | 1.887 | -0.00342 | -1.103 | 0.3022 | 1.905 | 0.00832 | 0.539 | 0.6046 | 2.423 |
| 35290 | -0.00177 | -2.390 | 0.0439 | 2.357 | -0.00001 | -0.044 | 0.9657 | 2.132 | 0.00115 | 0.434 | 0.6756 | 2.322 |

TABLE 5. Trends for industry classification 383 according to concentration ratio, Herfindahl index and minimum optimal scale

| Industry | CR4 | | | | Herfindahl Index | | | | *MES* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW |
| 38310 | -0.04062 | -3.562 | 0.0074 | 1.050 | -0.01247 | -2.008 | 0.0795 | 1.607 | 1.03E+07 | 3.915 | 0.0044 | 2.314 |
| 38321 | -0.03404 | -4.911 | 0.0012 | 2.318 | -0.00864 | -3.404 | 0.0093 | 2.331 | 1.12E+08 | 5.092 | 0.0009 | 1.738 |
| 38322 | -0.03439 | -3.894 | 0.0046 | 3.592 | -0.01539 | -0.629 | 0.5466 | 2.531 | 3.36E+06 | 0.850 | 0.4203 | 2.422 |
| 38329 | -0.02280 | -5.472 | 0.0006 | 1.587 | -0.00432 | -5.692 | 0.0005 | 1.421 | 5.65E+07 | 5.042 | 0.0010 | 1.745 |
| 38330 | -0.00262 | -0.792 | 0.4515 | 2.610 | -0.00870 | -1.838 | 0.1034 | 2.682 | 2.23E+07 | 6.503 | 0.0002 | 1.843 |
| 38391 | -0.03255 | -4.845 | 0.0013 | 1.523 | -0.01068 | -3.314 | 0.0106 | 1.613 | 1.90E+07 | 3.495 | 0.0081 | 2.440 |
| 38392 | -0.00988 | -3.179 | 0.0130 | 2.659 | -0.00610 | -4.668 | 0.0016 | 2.454 | 3.26E+06 | 4.918 | 0.0012 | 2.092 |
| 38393 | -0.02092 | -4.686 | 0.0016 | 1.899 | -0.04433 | -5.096 | 0.0009 | 1.707 | 4.68E+06 | 2.062 | 0.0731 | 2.349 |
| 38399 | -0.01487 | -1.374 | 0.2067 | 1.413 | -0.00461 | -1.183 | 0.2709 | 1.107 | 3.83E+06 | 1.698 | 0.1280 | 0.989 |

TABLE 6. Trends for industry classification 383 according to minimum efficient scale, advertising ratio and minimum capital requirement

| Industry | *MOS* | | | | Advertising Ratio | | | | Minimum Capital Requirement | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW |
| 38310 | -0.01620 | -2.429 | 0.0413 | 1.441 | -0.00026 | -4.022 | 0.0038 | 0.968 | -0.00388 | -1.224 | 0.2558 | 2.435 |
| 38321 | -0.01137 | -3.661 | 0.0064 | 2.114 | 0.00003 | 0.263 | 0.7989 | 2.520 | -0.00072 | -0.366 | 0.7236 | 2.396 |
| 38322 | -0.00679 | -0.241 | 0.8156 | 2.195 | 0.00018 | 1.169 | 0.2760 | 0.997 | 0.04217 | 1.961 | 0.0855 | 1.361 |
| 38329 | -0.00706 | -5.520 | 0.0006 | 1.218 | 0.00000 | 0.073 | 0.9439 | 1.532 | -0.00029 | -0.207 | 0.8411 | 2.512 |
| 38330 | -0.00872 | -0.833 | 0.4291 | 1.780 | 0.00072 | 1.112 | 0.2985 | 2.458 | -0.00059 | -0.050 | 0.9613 | 2.481 |
| 38391 | -0.01190 | -2.429 | 0.0413 | 1.883 | -0.00003 | -2.299 | 0.0506 | 1.669 | -0.00796 | -2.127 | 0.0662 | 2.176 |
| 38392 | -0.00774 | -3.580 | 0.0072 | 1.826 | 0.00008 | 0.140 | 0.8921 | 1.811 | 0.00152 | 0.224 | 0.8285 | 2.231 |
| 38393 | -0.05551 | -6.885 | 0.0001 | 2.271 | -0.000167 | -2.621 | 0.0306 | 0.855 | -0.00881 | -0.685 | 0.5130 | 2.219 |
| 38399 | -0.00753 | -1.569 | 0.1553 | 1.234 | -0.00008 | -1.147 | 0.2845 | 1.045 | -0.00012 | -0.029 | 0.9778 | 2.171 |

TABLE 7. Trends for industry classification 385 according to concentration ratio, Herfindahl index and minimum optimal scale

| Industry | CR4 | | | | Herfindahl Index | | | | *MES* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW |
| 38510 | -0.03096 | -5.528 | 0.0006 | 1.139 | -0.02314 | -2.327 | 0.0484 | 0.838 | 8.16E+06 | 2.151 | 0.0637 | 2.684 |
| 38520 | -0.02275 | -7.418 | 0.0001 | 0.911 | -0.05521 | -4.673 | 0.0016 | 1.772 | 3.21E+07 | 5.576 | 0.0005 | 2.164 |
| 38530 | -0.03452 | -8.611 | 0.0000 | 0.996 | -0.02977 | -7.829 | 0.0001 | 1.208 | 1.92E+07 | 4.408 | 0.0023 | 1.360 |

TABLE 8. Trends for industry classification 385 according to minimum efficient scale, advertising ratio and minimum capital requirement

| Industry | MOS | | | | Advertising Ratio | | | | Minimum Capital Requirement | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW | Coefficient | t | Sig t | DW |
| 38510 | -0.03417 | -2.364 | 0.0457 | 1.570 | -0.00251 | -2.788 | 0.0236 | 1.693 | 0.01353 | 1.169 | 0.2760 | 1.382 |
| 38520 | -0.06758 | -4.593 | 0.0018 | 2.472 | -0.00005 | -1.352 | 0.2135 | 2.190 | -0.00113 | -0.106 | 0.9184 | 2.268 |
| 38530 | -0.03401 | -5.784 | 0.0004 | 1.005 | -0.00039 | -1.759 | 0.1166 | 2.353 | 0.00222 | 0.305 | 0.7685 | 2.163 |

Finally, all industries in the 385 classifications show significant trends in at least 4 of the 6 measures tested. The industries in this classification are manufacture of professional and scientific and measuring and controlling equipment (38510), manufacture of photographic and optical goods (38520) and manufacture of watches and clocks (38530). Yet again there is a consistent within-group trend where all industries appear to have become more competitive.

Based on the consistency in trends for all industries in the four selected groups (i.e. 351, 352, 383 and 385), it could be concluded that market structure variables tend to move in the same direction within an industry grouping that show significant overall trend. This is the case despite the possibility of upwards as well as downward trends in any industry within an industry group.

Overall both the CR4 and Herfindahl index show significant downward trends in all four selected groups implying a general move towards a more balanced distribution of firm size over the study period. The *MOS* also follows similar downward trends as the CR4 and Herfindahl index for the selected groups. However, the coefficients for the *MES* variable is generally positive and significant for all the industries in the four selected groups. In theory, both the *MOS* and *MES* should display the same trend. However, the conflicting pattern over time of the two variables is likely due to the fact that the *MES* variable suffers from measurement problem since it has not been adjusted for changing prices. It is highly probable that the positive trend in the *MES* variable is observed because the independent variable may have picked up the effect of the general rise in the price level over the study period.

For the minimum capital requirement measure, only two industries: manufacture of other basic industrial chemicals (35119) and manufacture of fertilizers and pesticides (35120) show statistically significant downward trends. However, most time coefficients are negative. No upward trends are statistically significant at the 5% level. This finding implies that barriers to entry, if it ever changes, had been declining for the four selected groups of industries.

Finally, for the advertising ratio measure, one industry in each of the 351, 352 and 385 industry groupings show significant downward trend compared to three industries in 383 classification. These industries are manufacture of paints, varnishes and lacquers (35210), manufacture of electrical industrial machinery and apparatus (38310), cabels and wires (38391), manufacture of electric lamps and tubes (38393), manufacture of professional and scientific and measuring and controlling equipment

(38510). However, most time coefficients are negative even though not statistically significant. No statistically significant upward trend is observed. This finding indicates that product differentiation as measured by the advertising to sales ratio has generally been declining in these industries.

## POLICY IMPLICATIONS

The ten-year trends in the standard measures for market concentration (CR4 and HHI) suggest that a large proportion (between 40 to 45 percent) of the Malaysian industrial sector had been evolving towards a more competitive environment. From the static point of view, such a change should bring about some economic gains through greater productive, allocative as well as distributive efficiencies. Such a change is however, rather surprising considering the fact that there is clearly a total absence of any kind of competition policy in Malaysia. One natural policy implication of this observation is that any effort in encouraging greater competition through promulgation of new competition policies should be done with full recognition of the existing trends. It appears that policies that facilitate and encourage such trends should be given preference over the more drastic market intervention options for market sectors that are already evolving in the right direction. Policies that facilitate rather than intervene, are obviously less disruptive and therefore arguably more advantageous.

It is also very likely that the observed downward trends in the industrial concentration might have benefited from a relentless expansion of the market over the study period (except for the first two years) as the national economy feverishly grew by an average of about 8 percent annually. Market expansion facilitated new entrants into the market place and hence reduced the concentration measures. It is however, less certain whether the trend could be sustained if the rate of growth were to decline to a lower level in the future. It is therefore very important for policy makers to be aware that a different set of policy prescriptions maybe required for the two contrasting scenarios. This may imply that a set of less interventionist competition policies may be more suitable during a period of high growth while the opposite may be required once the economy matures into following a slower growth path.

As indicated in the early part of this paper, it is not known for certain if the more competitive trends observed in many industries are good for

the national firms from the global competition perspective. The desire for a more competitive market environment for the achievement of static efficiency gains may need to be tampered with the realization that global competition may require some tradeoff between static efficiencies and national firms' competitiveness in the global market. This is the case since the competitiveness of the local firms vis-à-vis their foreign counterparts may crucially depend on their ability to innovate. To the extent that innovation is known to be a function of the amount of resources expended in research and development, it could be argued that national competition policies may need to provide some rooms for local firms to grow and become globally competitive. Since the amount of resources that could be devoted to innovation is likely to be positively related to firm's size, as Schumpeter once proposed, the survival of local firms in the face of global competition may demand the creation of policies that tolerates higher concentration. Such policies must, however, be applied selectively through a careful determination of industries that fall into this strategic category.

## CONCLUSION

The foregoing analysis shows that there indeed had been some significant changes in several market structure variables for at least some segments of the Malaysian manufacturing sector for the period between 1985 to 1994. About one third of the industries classified at the 5-digit SIC code exhibit statistically significant trend in at least 4 of the 6 structural variables. The proportion showing significant trend in fewer than 4 structural variables is even higher.

This study also found that for each of the structural variables considered, about half of the industries show statistically significant trend except for two variables namely, minimum capital requirement and advertising to sales ratio. Changes are happening across all industries although the degree and intensity of change vary from one industry to another. For those industries that do change, the number displaying negative time trends far outweigh those showing positive time trends. For at least one of the variables, the HHI, the ratio is as high as six to one. Overall, this and other changes that had taken place appear to indicate that a sizeable proportion of the manufacturing industry had moved towards a more competitive environment. In the penultimate section of this paper several policy implications of these findings are proposed.

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