BARRIERS TO ENTRY, MARKET CONCENTRATION, AND WAGES IN THE PHILIPPINE MANUFACTURING SECTOR, 1987

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Market structure represents an important aspect of industries because a particular structure predetermines a set of assumptions in the analysis of markets. Market models used in policymaking should therefore reflect the actual level of competition in the industries. This characteristic becomes more important in the context of less developed economies, where perfectly competitive markets are more the exception than the rule.

This paper examines the nature and the determinants of the market structure, as measured by concentration, in the Philippine manufacturing sector. It tries to verify the extent to which technological barriers to entry and foreign trade induce higher levels of concentration. It then extends the analysis to focus on the effects of concentration on the wage level in manufacturing industries. Cross-section data are used to test the hypothesis that higher concentration increases profits and thus leads to higher wages.

1. Introduction

The manufacturing sector plays a key role in developing economies. Economies experiencing growth place increasing importance on the manufacturing sector for production and employment. Industrial promotion involves identifying and choosing industries with the highest potential for growth and giving them the necessary incentives. "Picking the winners" therefore requires a thorough understanding of all relevant aspects of these industries in order for choices to be accurate.

One such aspect is the structure of these industries. Market structure is an important aspect in that a particular structure predetermines a set of assumptions in the analysis of markets. Hence, the analysis of competitive markets differs significantly from

that of markets with imperfect competition. Market models currently being used as tools for policymaking by the government commonly assume perfectly competitive markets, which may be inappropriate in the context of a less developed economy.

A greater cause for concern is the possibility that market concentration itself may have been brought about by industrial promotion policies in LDCs (De Dios, 1985). Market concentration is defined as the number and size distribution of firms in an industry (Utton, 1970). Market structure as measured by concentration, its determinants, and its concurrent effects on economic variables thus become areas worth paying attention to. These areas are what the present study aims to explore.

The specific aim of the study is to measure the extent of concentration in the manufacturing industry. A second aim is to examine the determinants of the level of concentration itself. The effects of such variables as industry size, capital intensity, scale economies, and international trade will be explored.

The study further aims to test the effects of concentration on the wage level in different industries. It has been hypothesized that higher levels of concentration tend to influence the amount of profits of leading firms, which in turn affects the wages of their workers. Other possible reasons why wages in concentrated industries might rise more rapidly include the unionization of workers, higher productivity growth, greater capital intensity or its more rapid growth, and a greater ability of firms to pass on cost increases in the form of increases in price (Scherer, 1980). Higher wages in concentrated industries might result in a flow of workers into those industries. Widening wage gaps between industries might result in a disequilibrium in the labor market, or, in time, a dual labor market structure common in LDCs.

We hope to reveal areas where competitive behavior can be enhanced, and thus present relevant conclusions that will contribute to the formulation of appropriate government policy.

2. Conceptual Framework

2.1 Determinants of Market Concentration

The field of industrial organization is currently divided over the economic factors that influence the magnitude of market concentration

in industries. Economists using the structure-conduct-performance framework believe that market concentration reflects the underlying technological conditions and strategic behavior of established firms. The ability of firms to influence the conditions of entry of potential competitors through strategic behavior influences the level of market concentration in that industry. The magnitude of market concentration, in turn, partly determines the behavior and performance of the firms in the industry. However, economists belonging to the Chicago school of thought (Brozen, 1982; Demsetz, 1973) believe that market structure reflects efficiency. The existence of concentrated industries implies that it is more efficient to organize production in units that are large relative to the market. Brozen (1982, p. 12) asserts that the "continuing existence of a dominant firm, or group of dominant firms — the persistence of dominance in the absence of governmentally granted franchises — is evidence of lower costs and better customer service in those firms than can be provided by new entrants or expansion of small firms." The prolonged exercise of monopoly power is theorized to be possible only with government intervention.

Bain (1956, p. 3) defines barriers to entry as the "advantages of established sellers in an industry over potential entrant sellers, those advantages being reflected in the extent to which established sellers can persistently raise price above a competitive level, without attracting new firms to enter the industry." We discuss below the several sources of barriers to entry:

1. *Minimum Efficient Scale (MES)*. The presence of economies of scale in an industry enables relatively large firms to operate at a lower average cost compared with smaller firms. The desire of firms to operate on a scale which minimizes average cost may lead to higher concentration levels. This occurrence depends on the size of the optimal plant and the size of the industry. The larger the plant of minimum efficient scale, given the size of the industry, the smaller will be the number of of firms that can efficiently supply the market, and market concentration will be higher.

2. *Industry Size*. The effect of the efficient scale of output on concentration depends not only on its absolute value but also on its value relative to industry size. Some studies express these two factors in just one variable but in this research the effects of both forces are separated.

The size of an industry tends to have a negative effect on market concentration. As industry size increases, all other things constant, a larger number of firms can exist to supply the market and thus enhance competition.

3. *Capital Intensity.* The requirement of large initial capital outlays in order to successfully enter an industry would tend to discourage potential entrants. Therefore, as a barrier to entry, it would have a positive association with market concentration.

Also, large firms usually face lower costs of acquiring capital due to lower risks associated with them by financial institutions. This lower capital cost, *ceteris paribus,* would enable them to set lower prices than small firms and thus increase their market share. Capital intensity combined with a large minimum efficient scale of production raises the absolute-capital-cost barrier to entry.

4. *Growth Rate of the Industry.* The growth rate of an industry has an ambiguous effect on concentration. Assuming that the growth of an industry is due to increased demand,

   a. new entrants will take advantage of the increased demand rather than directly compete with established producers for the latter's customers, or

   b. leading firms may be in a better position to take advantage of the expanding market.

The resulting effect depends on who (i.e., the leading or smaller firms) would capture the new demand.

5. *International Trade.* The presence of foreign competitors and foreign trade opportunities affects the industrial structure of a country. Import competition represents additional potential and actual competition within domestic industries. Lindsey (1978) hypothesizes that in industries where imports contribute a large proportion of sales in the domestic market, the import prices, import capability to advertise, among other things, constitute an effective deterrent to the entry of competitors. Jacquemin, et al. (1980, p. 135) add that "sectors characterized by a systematic high share of imports are expected to be also characterized by a high degree of defensive concentration of domestic producers, as long as imports are close substitutes for domestic products." It is therefore expected that the higher the degree of import competition, as represented by a higher

share of imports in domestic consumption, the higher the level of market concentration.

The existence of foreign markets presents an opportunity for domestic producers to sell their products abroad. These foreign markets relax the constraint of a small domestic market and allow for a larger number of efficient firms to operate. The opportunity to export locally-made goods in an industry, represented by a high proportion of its output being exported, gives establishments in that industry a way of expanding their effective market. An industry characterized by a high proportion of its output being exported will tend to be less concentrated.

2.2 Wages and Concentration

Perhaps a more important aspect of concentration is its impact on economic variables such as prices, the profitability of firms, and wages. Here we attempt to determine the nature of the wage-concentration relationship.

The factors affecting the level of wages that a firm pays in an industry may be classified into two types: those internal to the firm and those external to it. Factors internal to the firm are mostly related to technology, says Phlips (1971, p. 89). Examples of these are increases in productivity and capital intensity, both of which are hypothesized to be positively related to wages. External factors consist of the product and factor markets, represented in the study by concentration and unionization, respectively. The interaction of internal and external influences induces the observed behavior of wages. Our concern is to examine the relationship between industry wages and concentration.

Some authors speak of a positive wage-concentration relationship. This is simply because oligopolistic (i.e., highly concentrated) industries enjoy higher profits due to market power; their workers thus receive a higher share of profits than those in concentrated industries due to unionism, the desire of firms to become wage leaders, or through government intervention (Phlips, 1971, p. 90).

An alternative view is offered by Qualls (1981), who explains that less concentrated industries require more pricing coordination than do concentrated industries. Since pricing coordination that jointly maximizes profits in turn necessitates wage stability, less

concentrated industries favor wages that move steadily upward so that there will be pricing coordination in the long run. Hence, in the short run, we might observe higher wages in less concentrated industries.

We now discuss the independent variables to be used in the study.

1. *Concentration*. The level of concentration is expected to have a positive association with the wage level. Higher seller concentration implies a greater ability of firms to pass on costs through higher prices and a greater amount of profits at the disposal of dominant firms (Scherer, 1980). Hence, wages are expected to rise more rapidly in highly concentrated industries. However, Qualls' alternative hypothesis suggests a negative association between wages and concentration, at least in the short run.

2. *Capital Intensity*. Capital-intensive firms employ more capital in order to take advantage of scale economies, but doing so also raises their demand for workers with the necessary training and skills to operate more complicated equipment (Brozen, 1982). To attract better-skilled workers, capital-intensive firms raise their wage rates; hence, capital intensity affects wages positively. This might also result in a net inflow of higher-quality workers into capital-intensive industries.

Brozen (1982), however, observes that concentrated industries are also capital-intensive compared with dispersed industries. Capital intensity and concentration may thus turn out to be highly collinear. It is possible to say that capital intensity works indirectly on wages through higher concentration, thus the impact of the former is smaller in concentrated industries.

4. *Unionization*. Unions naturally press for higher wages in the bargaining process in an attempt to secure more benefits for their members. Scherer (1980) mentions that wages might be higher due to unionism in more concentrated industries possibly due to the large size of firms in these industries. Unions might be able to exert more pressure on management by virtue of their own size.

Weiss (1966) notes a potential positive interaction between the concentration and unionization variables. This fact is carefully considered in the estimation.

5. *Productivity.* Productivity is one of the internal influences on wage rates, most of which are technological in nature. Increases in productivity mean higher output and lower costs for leading firms. This, of course, leads to higher profits and higher wages.

We might also hypothesize that large firms invest more in training their workers, and the resulting increase in productivity due to investment in human capital leads to higher wages (Brozen, 1982).

3. Review of Related Literature

Currently, there is a sizeable body of literature on market concentration, especially in foreign economies. The results of some of these studies are discussed below.

3.1 Determinants of Concentration

3.1.1 Foreign Researches

Caves and Uekusa (1976) analyze the similarity between concentration ratios in Japan and in the US and verify the determinants of concentration across Japanese manufacturing industries. They use the four-firm concentration ratio and marginal concentration ratio as measures of concentration and regress them against measures of scale economies, plant size, and capital intensity. Their findings show that: (1) there is a similarity between industry concentration in Japan and in the US; (2) market size is negatively related to concentration; (3) capital intensity is positively related to market concentration but its effects prevail only at the top end of the concentration curve; and (4) plant size as a measure of MES is positively related to concentration at a significant level.

The effects of international linkages on domestic market concentration has often been ignored by previous studies. Jacquemin et al. (1980) analyze the determinants of concentration and profitability in Belgian manufacturing industries. They hypothesize that the rate of import is positively related to market concentration because industries characterized by a high share of imports will induce a high level of "defensive concentration" by domestic producers. A high rate of export will increase the market faced by the domestic producers, allowing a larger number of efficient firms to enter the market.

The results confirm that the export-sales ratio is negatively related to market concentration. Exposure to foreign markets enhances competition and production efficiency in the domestic industry. The ratio of imports to output is, however, insignificant. The study also shows that domestic industry sales (DMS) and minimum optimal scale (MOS) are significant determinants of market concentration, and their effects are similar in magnitude, but are opposite in direction.

Brozen (1982) provides a comprehensive review of important empirical research on concentration. Using tabular and regression analysis, he relates profitability, capital intensity, and entry barriers to concentration, while also citing historical evidence. He concludes that "exceptional performance and competitive conduct lead to a concentrated structure. Structure is a result, not a cause" (1982, p. 118).

3.1.2 Philippine Researches

The existence of alleged monopolies in Philippine industries is partly attributed to the prevalent imported large-scale technology combined with a limited domestic market. Lindsey (1976) tests this hypothesis in his study on the "extent to which monopoly is technologically inevitable" in the Philippine manufacturing sector. A summary of his findings follows.

a. Total employment and total value-added and average value-added per establishment are significantly related to market concentration. The coefficients of the last two variables are almost the same but are of opposite signs.

b. Market concentration and value-added per employee move in the same direction.

c. The growth rate of industries and the import ratio which are positively related to market concentration are significant only at the 20 percent level.

d. The capital-labor ratio is significant but not positively related to concentration due to the widespread excess capacity in manufacturing industries.

The main factors responsible for the movements of market concentration over time are industry size and establishment size.

Initial levels of concentration and industry size are associated with decreasing concentration while growth in establishment size is correlated with increasing concentration.

The effects of past protection policies on the current structure of manufacturing industries are investigated by De Dios (1985). He tests two hypotheses: that tariff protection policies in the past caused higher concentration in Philippine manufacturing, and that concentration induced the inflow of foreign investments. He examines the relationship between the effective protection rate, value-added for an industry, the capital-labor ratio, the growth of value-added per industry, and the dependent variable, value-added concentration. He argues that higher concentration and protection will encourage foreign investments to come in, citing opportunities for rent-seeking. He concludes that for the period of analysis, the EPR did encourage higher concentration, and that there is a "significant degree of association" between concentrated industries and industries with an inflow of foreign capital. The paper also notes that the relationship between tariff protection and concentration means that part of the present industrial organization is policy-induced and that the negative effects of policy can be reduced by reversing it.

3.2 Concentration and Wages

One of the earliest studies is by Lewis (1963), who focuses on the wage-unionism relationship. He provides the model below:

$$\log W = a0 + a1 \log PR + a2 \log RR + a3\ CR + a5\ U \\ + a6\ (CR \times U)$$

where PR denotes productivity, RR the rates of return, CR the concentration ratio, and U unionization. He finds that unionized workers earn wages that are 25 percent higher than those of non-unionized workers.

A more prominent contribution to the wage-concentration literature is a study by Weiss (1966). He tests a similar regression equation:

$$W = b0 + b1\ CR4 + b2\ U + b3\ (CR4 \times U),$$

where W is the annual earnings, CR is the concentration ratio, and U is the extent of the coverage of collective bargaining.

Weiss's study tests two different hypotheses: (a) that for a given job, more concentrated industries pay higher wages, or what Weiss calls "monopoly wages", and (b) that these wages are higher even if one considers the wage earner's personal characteristics (e.g., his training and age). The latter hypothesis is tested on a sample of individual wage-earners.

He verifies the first hypothesis, but not the second. A given increase in concentration will lead to a wage increase of 33 percent when trade unions are weak (or U is low), but only 13 percent when trade unions enjoy a strong position (or U is high). The coefficients remain significant but are reduced when other variables such as employment growth, the percentage of male employment, and the size of establishments are introduced. CR itself becomes insignificant when variables denoting personal characteristics are added, indicating that individual workers do not receive a higher wage than they would elsewhere, given their qualifications.

Phlips (1971) examines the effects of market concentration on profits, inflation, and the wages of production workers in some EC countries. In his analysis of the wage-concentration problem, he uses the following variables: concentration ratio, percentage of male employment (as males generally enjoy higher wages), size of production units, unionization, and employment growth, which is a measure of productivity. His study includes two sets of results, following two approaches, and finds a significant and positive coefficient for the concentration ratio when regressed on wages.

Scherer (1980) briefly examines the wage-concentration hypothesis and uses the methodology employed by Lewis and Weiss. Citing literature on the movement of wages since the 1920s in the US, he shows that the rate of increase in wages is generally higher in concentrated industries for periods of recession.

He offers several possible reasons why wages would rise more rapidly with higher concentration: higher productivity growth, higher profit (so that wage increases may be accommodated), greater market power to accommodate cost increases, greater capital intensity or its more rapid growth, and a higher degree of unionization.

Brozen (1982) also focuses on the association between wage rates and concentration. The wage rate is inferred to be higher where the capital employed per worker is higher. He notes that since concentrated industries are capital-intensive, i.e., employing more

equipment and capital per worker, these industries require more better-skilled workers and thus offer higher compensation to reduce the quit rate and attract more workers.

Brozen's work is part of the literature on the "new industrial organization" which provides a link between theory and actual antitrust cases.

Qualls (1981) disagrees with the hypothesis that wages in concentrated industries move upward in a stable manner, unaffected by labor market conditions, while wages in unconcentrated industries lag during recessions and ratchet upwards to catch up during expansions. He argues that highly concentrated industries have better pricing coordination than less concentrated industries, and have good information flows and a mutual trust that allows them as an industry to set prices that jointly maximize their individual profits. Less concentrated industries, therefore, require more pricing coordination. And since oligopolistic pricing coordination requires that wages move in a stable manner, less concentrated industries will seek cyclical wage stability to better maintain and control their prices in turn. Qualls thus proposes that less concentrated industries will have wages that move steadily upward to achieve output price stability in the short run and pave the way for long-run oligopolistic pricing coordination. His results verify his hypothesis, finding evidence contrary to the view that concentrated industries foster a wage-inflationary bias by seeking cyclical wage stability.

Hannah and Kay (1977) list down several alternative explanations of the relationship between firm size and labor costs. No rigorous empirical support is offered, save for tabular analysis of data on the UK manufacturing industry. They reason that large firms that are also more capital-intensive need more skilled workers so that the wage differential becomes a skill differential reflected by differences in pay. Other explanations include monopoly power, market concentration, and union pressure. The latter explanation seems to agree with evidence in Britain. A fifth explanation points to scale economies that allow large firms to provide higher wages and more employee benefits.

4. Data Measurement and Methodology

4.1 Data and Data Sources

Most of the data used in this study are taken from the 1987 Annual Survey of Establishments conducted by the National Statistics Office. Cross-section data on the 4-digit PSIC industries will be

used. This level of aggregation best approximates Needham's definition of a market. Needham (1969) argues that the most important factors to consider in classifying firms, when studying market structure, are the degree to which firms are affected by each other's pricing policies and the extent to which they take each other into account when formulating corporate strategies. Previous studies on market structures in the Philippines use the more aggregated 2-digit and 3-digit PSIC industries, due to data limitations and the small size of the manufacturing sector. The expansion of the manufacturing sector in recent years and the need for more accurate information warrants the use of the less aggregated 4-digit PSIC industries. A total of 98 PSIC industries are selected for use in this study. To conform with the criteria of homogeneous industries, those industries that are lumped together, labelled "not elsewhere classified," and miscellaneous categories, are not included in the analysis.

4.2. Measurement of Variables

Determinants of Concentration

Market Concentration. The most widely used measure of market concentration is the concentration ratio which reflects the proportion of value-added, sales, assets, or employment in an industry that is accounted for by the N largest plants in the industry. This measure is being criticized as taking into account only one point in the distribution function of an industry's value added. Also, Curry and George (1981) point out that the choice of n in n-firm concentration ratios is somewhat arbitrary. However, comparative studies of different concentration indices have found them very correlated with each other. Moreover, concentration ratios are easy to construct and their interpretation is relatively easy. Value-added $CR4$ is used for reasons of comparability. Since the data are in terms of establishments or plants, values of concentration ratios are interpreted as the lower bound of firm concentration in industries. The measure of concentration that this study will use is the four-firm value-added concentration ratios at the 4-digit PSIC level which are computed as follows:

a.
$$CR4 = \frac{\sum_{n=1}^{4} X_n}{\sum_{n=1}^{N} X_n}$$

where N = number of establishments in the industry

X_n = value-added of industry n.

Industry Size. There are many possible measures of industry size. The study utilizes the following two indices used by Jacquemin et al. (1980) and Caves and Uekusa (1976), respectively:

$SALES$ = the total sales of the industry;

$CVA87$ = total value-added of the industry in 1987;

$CVA86$ = total value-added of the industry in 1986.

Minimum Efficient Scale. Previous studies have used various variables to represent the minimum efficient scale. Due to problems of measuring and defining the scale of output that minimizes the average cost, proxies that are thought to be highly correlated with the minimum efficient scale are used. The two proxies that will be used are the average plant size (Caves and Uekusa, 1976) and Comanor's and Wilson's (1967) proxy which are respectively computed as follows:

a. $MES1 = \dfrac{\text{Value-added of the industry}}{\text{No. of establishments in the industry}}$

b. $MES2$ = average size of the largest plants accounting for 50% of industry value added.

Growth Rate of the Industry. The growth rate of the industry is measured as the percentage growth in industry size between two survey years. Since the industry size is measured by the total value-added, the two proxies of growth rate of the industry are computed as follows:

$RVAGR1 \quad = \quad (\,(CVA87 - CVA86) \,/\, CVA86) \times 100$

$RVAGR2 \quad = \quad (\sqrt{\dfrac{CVA87}{CVA85}} - 1) \times 100.$

The second measure represents the geometric average of the growth of the industry in a span of two years. To discount the effects of inflation, the industry sizes are deflated by the wholesale price index.

Capital Intensity. The study utilizes the ratio of gross book value of fixed assets to the number of employees as a proxy for capital intensity. The two measures that are used are computed as follows:

$$KPL1 = \frac{\text{Total Value of Fixed Assets}}{\text{Total Number of Production Workers}}$$

$$KPL2 = \frac{\text{Total Value of Fixed Assets}}{\text{Total Compensation}}$$

International Trade Variables. Foreign trade statistics are not compatible with the data on PSIC industries. The classification system used in the statistics is based on the Philippine Standard Commodity Classification. The concentration ratios on the other hand are classified into industries under the PSIC code. The researchers had to disaggregate the PSCC code and reclassify them to conform with the PSIC industries. In Turner's (1980) study on the effects of import competition on the profitability of the UK manufacturing industries, he presents several criteria in reclassifying foreign trade and forestry data. These are adapted in this study as follows:

a)   the industry should have a fair degree of homogeneity so that "miscellaneous," "not elsewhere classified" categories and suppressed categories are not used;

b)   it should be possible to construct rough "world" trade indices; and

c)   the PSIC and PSCC groupings should be highly correlated.

As a proxy for import competition, the share of imports in the sales in the domestic market is used. This is computed as follows:

$$MSHR = \frac{\text{Value of Imports CIF}}{[\text{Domestic Sales - Value of Exports FOB +}\\ \text{Value of Imports CIF}]}$$

To measure the perceived foreign market, the share of the industry's output that is exported is used. This is computed as follows:

$$XSHR = (\text{Value of Exports FOB/Domestic Sales});$$

Wages and Concentration

1.   *Wages.* The dependent variable, denoted by *WG*, is defined as the average gross hourly earnings of production workers in an industry. This is the same measure a number of authors (e.g., Phlips 1971 and Brozen, 1982) use. Scherer (1980), on the other hand, uses the percentage change in wages, which he computes for three extended time periods. For the purposes of the study the former measure is used. Thus,

$$WG = \frac{\text{Total Wages of Production Workers}}{\text{Total Production Worker Hours}}$$

2.   *Capital intensity.* Capital intensity, denoted by *KPL1*, is measured by the total value of fixed assets divided by the number of production workers. Brozen uses a similar measure, namely, the ratio of total capital to total employment.

$$KPL1 = \frac{\text{Total Value of Fixed Assets}}{\text{Total Number of Production Workers}}$$

An alternative measure is the ratio of total fixed assets to total compensation.

$$KPL2 = \frac{\text{Total Value of Fixed Assets}}{\text{Total Compensation}}$$

3.   *Unionization.* The common measure of unionization is the percentage of unionized workers in an industry (Phlips, 1971). Since no such data are available for 4-digit PSIC industries, the study turns to proxies suggested by Phlips, specifically the percentage of male employment in an industry which is denoted by *M*, since males have a greater tendency to unionize, and total employment, denoted by *TE*, which stems from the fact that the bargaining position of unions is stronger in industries with a large labor force. But as data on male employment are also unavailable, the study is left with *TE* and *NPW*, which is the total number of production workers employed in an industry.

TE   = Total Employment

NPW   = Total Number of Production Workers

Phlips (1971) suggests a third measure of the degree of unionization, namely, the size of production units. He points out that in Belgium, average earnings per employee increase rapidly with size, based on a study by the *Institut National de Statistique* of Belgium. This is true in particular, according to the study, for wages of male employees. Earnings increase with size because of a higher level of productivity which in turn might justify claims for higher compensation. And, as Phlips observes, these claims for more pay are stronger in larger units, where workers tend to unionize more as a result of the friction that occurs between workers and the management. Thus the size of production units is expected to influence wage levels positively.

He computes the size of production units as "the percentage of persons employed in establishment divisions of 200 persons or more," which is the level of employment above which wages are observed to rise rapidly with size in France. For some Common Market countries, which do not have data on "divisions," the average size of establishments is used instead. It is computed as

$$SIZE = \frac{Total\ Employment}{Total\ Number\ of\ Establishments}$$

4. *Productivity.* Productivity, denoted by *PR1*, is defined as the value-added per production worker hour, which Lindsey (1976) refers to as the "degree of fabrication." Alternatively, it may be measured by the census value-added divided by the number of production workers, denoted by *PR2*.

$$PR1 = \frac{Census\ Value\text{-}Added}{Total\ Number\ of\ Hours\ Worked\ by\ Production\ Workers}$$

$$PR2 = \frac{Census\ Value\text{-}Added}{Number\ of\ Production\ Workers\ per\ Industry}$$

These measures are suggested by Brozen (1982) who in turn cites the work of Bock and Farkas (1969). The latter argue that value-added per employee and per production worker hour also reflect the monopoly power of firms in concentrated industries.

Phlips (1971), on the other hand, uses the growth of employment as a proxy, indicating that industries characterized by increasing productivity are also industries with increasing employment. But

this might be collinear with total employment, and is not used in the study.

5. Empirical Results and Analysis

5.1 *Data Characteristics*

The distribution of manufacturing industries by concentration is shown in Table 1. The value of the concentration ratios vary from a low 20 percent to as high as 100 percent. Although the ratios have a broad range of values the distribution is not widely dispersed. As the data show, half of the manufacturing sector consists of industries that are characterized by the top 4 establishments accounting for 80 percent of the industries' value added. A total of 62 industries (or 63% of the industries included in the analysis) have a 4-establishment concentration ratio of 70 percent or higher, and 79 industries, (or 80% of the sample,) have a concentration ratio of at least 50 percent. Using the classification of Caves and Uekusa (1976), 29 industries can be classified as "partial monopolies," that is, the largest 4 plants contribute 90 percent of the value-added in those industries. Some 33 industries can be classified as "highly concentrated oligopolies," that is, the concentration ratios are between 70 and 90 percent.

With the weighted average of the concentration ratios at 73 percent, it is safe to say that in general, the Philippine manufacturing sector can be described as highly concentrated.

Table 1 — Distribution of Industries in Philippine Manufacturing Sector, 1987

Concentration Ratio	Industries	
	Number	Percentage of Total
0 to 19	0	.00%
20 to 29	5	5.10%
30 to 39	8	8.10%
40 to 49	6	6.10%
50 to 59	5	5.10%
60 to 69	12	12.20%
70 to 79	13	13.30%
80 to 89	20	20.40%
90 to 100	29	29.60%
Total	98	100.00%

5.2 *Determinants of Concentration*

The selected regression results with concentration ratio as the dependent variable and measures of barriers to entry as the independent variables are shown in Table 2. All of the variables display the expected signs. The industry size, as measured by total sales of the industry, and the growth rate of the industry are negatively related to market concentration. This confirms the earlier hypothesis that a larger market allows for a larger number of firms and thus

Table 2 — Selected Regression Results Relating Market Concentration to Barriers to Entry, 1987

Equation	(1)	(2)	(3)	(4)	(5)
Constant	0.399^c	0.242^a	0.318^a	0.352^a	0.497^a
	(1.790)	(1.358)	(2.555)	(2.911)	(3.525)
Industry Size	LSALES	LCVA87	LCVA87	LCVA87	LCVA86
	-0.238^a	-0.281^a	-0.437^a	-0.446^a	-0.461^a
	(-8.775)	(11.214)	(-19.2)	(-19.8)	(-17.4)
Minimum Efficient Scale	LMES1	LMES1	LMES2	LMES2	LMES2
	0.241^a	0.292^a	0.405^a	0.410^a	0.407^a
	(8.225)	(10.57)	(18.01)	(17.96)	(15.88)
Capital Intensity	LKPL1	LKPL1	LKPL1	LKPL1	LKPL1
	0.057^c	0.039^a	0.060^a	0.061^a	0.082^a
	(1.985)	(1.570)	(3.545)	(3.578)	(4.311)
Industry Growth Rate	RVAGR2	RVAGR1	RVAGR2	RVAGR1	RVAGR1
	-0.001^b	-0.008	-0.0007	-0.0005	-0.004^a
	(-2.291)	(-1.26)	(-1.591)	(-1.442)	(-8.83)
$\bar{R}2$	0.491	0.605	0.806	0.805	0.761
F-stat	24.413	38.083	101.738	101.14	79.255

*See text for definition of variables; numbers below variable names are coefficients; t-values appear in parentheses.
^{a}Significant at the 1 percent level.
^{b}Significant at the 5 percent level.
^{c}Significant at the 10 percent level.

lesser concentration for the industry. The negative sign of $RVAGR2$ implies that fringe firms are able to take advantage of the expansion over time of the domestic industry demand. On the other hand, $MES1$ and $LKPL$ have positive signs indicating that they indeed act as barriers to the entry of potential competitors. The coefficients of the variables are interpreted as elasticities except for measures of industry growth rate. The interpretation of $RVAGR2$ is more complex since $LCR4$ is in logarithms while $RVAGR2$ is in percentage. A 1-percentage point increase in $RVAGR2$ will result in a 0.00176 decrease in the logarithm of the level of concentration. To get the effects of $RVAGR2$ on $CR4$ the change in $CR4$ should be computed as follows:

$$\Delta LCR4 = -0.00176 \, \Delta RVAGR2$$

Since $\Delta \log x$ is approximately $\Delta x / x$ and given that $\Delta RVAGR2$ is equal to 1, then,

$$\Delta \log CR4 = -0.00176 \, \Delta RVAGR2$$
$$\frac{\Delta CR4}{CR4} = -0.00176 \, \Delta RVAGR2$$
$$\Delta CR4 = -0.00176 \, CR4$$

A few observations are made. The measures of industry size and minimum efficient scale remain very significant in all equations and display the largest coefficients. Also, their coefficients, representing the degree of their influence on concentration, are significantly similar in magnitude but opposite in direction. This is very apparent in the first three equations. This implies that a proportional change in the value of both variables would leave the level of market concentration unchanged. The variable $MES2$ is more powerful than $MES1$. The average plant size of the leading establishments captures better the efficient scale of output.

To investigate the effects of international linkages on market concentration, foreign trade variables are included in the previous regression model. The selected regression results are shown in Table 3.

Table 3 — Selected Regression Results Relating Market Concentration to Barriers to Entry and International Trade, 1987

Equation	(1)	(2)
Constant	0.269	0.081
	(1.037)	(0.302)
Industry size	LSALES	LSALES
	-0.192[a]	-0.239[a]
	(-7.179)	(-7.267)
Minimum Efficient Size	LMES1	LMES2
	0.207[a]	0.246[a]
	(8.357)	(8.324)
Capital Intensity	LKPL2	LKPL2
	0.006	0.514
	(0.205)	(1.661)
Growth Rate of the Industry	RVAGR1	RVAGR2
	-0.0002	-0.0014[b]
	(-0.389)	(2.256)
Export Share	LXSHR	LXSHR
	0.0016	0.002
	(0.157)	(0.204)
Import competition	LMSHR	LMSHR
	0.028[b]	0.027[b]
	(2.078)	(1.967)
$\bar{R}^2$	0.569	0.577
F-stat	14.457	14.877

See text for definition of variables; numbers below variable names are coefficients; t-values appear in parentheses.
[a]Significant at the 1 percent level.
[b]Significant at the 5 percent level.
[c]Significant at the 10 percent level.

The positive sign of the coefficient of *LMSHR* verifies the hypothesis that the capability of foreign producers supplying the local market to advertise and to offer lower prices discourages the entry of fringe firms and thus increases the domestic concentration. The researchers believe that this result reflects government policies. Incentives given by DTI-BOI, such as duty-free importation, to some firms in prioritized industries benefitted only the large establishments causing the increase in the level of concentration. Further verification of this explanation requires a respecification of the model.

The *LXSHR* coefficient shows a positive sign and is insignificant. The T-stat is very low such that the null hypothesis of a zero coefficient for *LXSHR* is accepted. The researchers offer several explanations for the positive association of *LXSHR* with concentration. It is possible that only established firms are able to take advantage of the expansion of the market. The export of products entails, among other things, some transaction costs and resources for facilities to meet quantity and quality requirements. Big establishments are the most capable of fulfilling these requirements, so that entry into a foreign market reinforces their dominant positions in the domestic market. Again, this may also be attributed to government efforts to promote export-oriented industries. Most of the beneficiaries of government incentives are established plants. Further verification of the explanation requires the inclusion of alternative explanatory variables in the model to represent these institutional barriers to entry.

5.3 Wages and Concentration

Table 4 shows some selected results of the estimation. Various combinations of *LKPL1, LKPL2, LPR*, and *LPR1* are tried and equations presented are chosen based on the resulting t-values and the associated goodness of fit. It turns out that the combination of *LKP1*, the natural logarithm of the value of fixed assets per production worker in an industry, and *LPR1*, the natural logarithm of the ratio of industry census value-added to the total production worker hours, suits these criteria best.

In all four equations, explanatory variables turn out to have positive signs, in accordance with theory. The results tend to support the various reasons why wages might be higher, particularly in highly concentrated industries. The coefficient of *LCR4* seems to fall between the range of 0.23 to 0.28, except when the size of production

units is used in the equation, in which case the coefficient becomes insignificant. The reason for this is as yet unclear, since *LSIZE* is derived from *LE* of total employment, and is thus correlated with the latter. One might expect *LSIZE* and *LE* to behave in the same manner and have more or less the same impact on the equation. A possible explanation might be the fact that the number of establishments varies considerably from industry to industry; therefore *LSIZE* will also have a high degree of variability. But how it exerts an influence on *LCR4* is again unknown. Multicollinearity is a possibility.

Table 4 — Selected Regression Results with *LWG* as Dependent Variable

Equation	(1)	(2)	(3)	(4)
Constant	3.226[a]	3.098[a]	3.246[a]	3.108[a]
	(53.71)	(10.14)	(11.17)	(10.01)
Concentration	LCR4	LCR4	LCR4	LCR4
	0.286[b]	0.265[a]	0.232[a]	0.100
	(2.541)	(3.072)	(2.764)	(1.413)
Capital Intensity		LKPL1	LKPL1	LKPL1
		0.044	0.046	0.057[c]
		(1.353)	(1.410)	(1.787)
Productivity		LPR1	LPR1	LPR1
		0.234[a]	0.247[a]	0.219[a]
Unionization		LE	LNPW	LSIZE
		0.077[a]	0.064[b]	0.091[a]
		(2.930)	(2.536)	(2.760)
R^2	0.053	0.647	0.640	0.644
F-stat	6.455	45.53	44.07	44.93

Figures in parentheses are t-values.
[a]Significant at the 1 percent level.
[b]Significant at the 5 percent level.
[c]Significant at the 10 percent level.

LKPL1 shows higher computed t-values than its alternative measure *LKPL2*. However, it fails to become significant beyond the 6 percent level. The implication is that a higher degree of capital intensity does not induce firms to pay higher wages in order to attract workers of better-than-average quality.

There is a possible collinearity between capital intensity and concentration, as previously noted. *LKPL1* remains insignificant, however, even after *LCR4* is removed from the specification. This implies that capital intensity, as measured by *KPL1*, is a weak explanatory factor of the wage level.

Similarly, *LPR1* performs better than *LPR*, in terms of its t-values and the magnitude of its coefficients. A given 1 percent increase in value-added per production worker hour will result in a 0.21 to 0.24 percent increase in the hourly wage rate.

Finally, the proxies for the degree of unionization, specifically *LE*, *LNPW*, and *LSIZE* all point to a strong positive wage-unionization relationship. In the Philippines, unionism represents an important factor in explaining increases in the wage level. This fact finds support in the empirical evidence. However, the associated increase in wages accounted for by unionism is still relatively small. More direct measures might yield even better results.

6. Summary, Conclusions and Policy Recommendations

The study examines the influence of technological barriers to entry and international trade on market concentration. The results indicate that among the economic factors included in the analysis, industry size and minimum efficient scale of output are the most important. The statistical analysis confirms that a strong negative relationship exists between market concentration and industry size. Similarly, the growth rate of the industry encourages the entry of potential producers or expansion of small producers. Also, the results confirm the hypothesis that the requirement of a large-scale production for the minimization of average cost enhances the market position of large establishments. Plants that invest in such technologies enjoy not only efficiency in production but also protection from fringe competition. This study confirms the previous findings of Lindsey (1976) that the market size and minimum efficient scale of output are two of the most important factors affecting concentration.

The estimation results also identify capital intensity as a significant factor that raises the level of market concentration. The combination of a large initial capital outlay, the presence of imperfect credit markets and the persistence of a high interest regime constitute a formidable barrier to the entry of potential competitors. Lenders impose a higher risk premium on small or new firms, thereby placing them at a capital cost disadvantage.

Of the two international trade variables, the import share yields a significant result. Its positive effect on market concentration is attributed to two factors: the pricing and advertising capability of foreign producers which acts as a barrier to entry and the BOI measures which benefitted mostly the established plants. The export share is insignificant and, contrary to earlier expectations, is positively related to market concentration. Two explanations are offered: the requirements needed to enter foreign markets and, again, government measures that serve to reinforce the market position of dominant firms.

The second part of the study identifies two types of influences on the wage rate, namely those internal to the firm and those external to it. The aim of the study is to quantify the effect of concentration on the level of wages. Several other variables are included in order to account for the influence of other factors.

The estimation results confirm that there is a positive relationship between wages and concentration. Firms in industries marked by a higher degree of concentration tend to pay higher wages than do firms in unconcentrated industries, all else being equal. Unionism, measured indirectly, also partly accounts for the presence of higher wages, on the assumption that the likelihood of union activity increases with employment. The evidence also reveals a strong link between productivity and wages. Productivity makes scale economies possible, thereby leading to higher levels of profits. Workers, in effect, get a bigger share of the pie simply because there is a bigger pie. Capital intensity, however, fails to explain the presence of higher wages. Capital-intensive industries do not necessarily have increased demand for better-skilled workers enough for them to raise wage rates.

The most important result is the observed positive wage-concentration relationship. It raises the possibility that market concentration affects economic variables other than prices and the profitability of firms, thereby allowing further insight into the nature

of concentration. Higher wages occur as a benefit from concentration. While the use of market power enables dominant firms to maximize monopoly profits, part of those profits accrue or trickle down to workers in the form of higher compensation. This finding should serve to change the perception regarding the welfare changes associated with the exercise of market power. While encouraging competition is thought to be optimal, increased concentration appears to offer certain gains, the dynamics of which are still imperfectly understood. The benefits accruing to production workers are part of the considerations that should be included in policymaking.

The findings of the study identify areas wherein public policies can be directed towards deconcentrating manufacturing industries. The government effort to deconcentrate manufacturing industries is one of the many reasons that justify the clamor of the immediate implementation of employment-generation and income-redistribution policies. Increases in income, especially in rural areas, will lead to an increase in the demand for manufactured goods. The perceived industry size would expand, allowing the entry of more efficient firms in the industry. Reforms in monetary policies addressing high lending rates can spur growth in investments. The government should also formulate and implement policies guaranteeing access to credit by small or new manufacturers at comparable interest rates. These two recommendations will lower the entry barriers associated with a large minimum efficient scale and capital intensity. Also, there is a need for government to encourage the use of labor-intensive production techniques. Aside from reducing barriers to entry, it also addresses the current unemployment problem.

To improve the current study, future researchers can explore the institutional variables or government policies that influence the level of market concentration in manufacturing industries. The study of specific industries would also be desirable as it can take into account industry-specific factors that influence market concentration.

It is beyond the scope of this study to ascertain the situations in which government should implement measures to deconcentrate industries. Neither a study on partial sources of concentration nor on its effects on wages, nor their combination can justify the implementation of more policies to promote less concentrated industries. To make full use of the results of this study, further investigation on the welfare effects of concentration should be made. It is only through the combination of all these studies that economists can fully comprehend and recommend policies on market structure.

The second part of the study has certain limitations that must be acknowledged. First, it is possible to construct more direct measures of the degree of unionization other than those that the study uses. The lack of data necessitates the use of indirect measures. One direct measure is the percentage of unionized workers per 4-digit PSIC industry. Another is the percentage of male employment in an industry, since it might be argued that males have a greater tendency to unionize, although this assumption appears debatable. Another limitation of the study is in the measure of wage rates used, which is the average *hourly* wage rate. The average daily wage rate might yield different results and prove more relevant.

In sum, the study of market concentration is an integral part of policymaking for industrial promotion. Effective policymaking requires a clear understanding of market conditions that comes from a close and scrupulous study of the same.

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