Structural Change in the U.S. Food Manufacturing Sector

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Abstract

This study examines the market structure-conduct-performance relationship for 48 four-digit SIC Food and Tobacco Processing Industries during the 1970s, 1980s and 1990s. The simultaneous-equation analyses are used to explore the relationship among price-cost margin (PCM), market concentration, advertising outlay, and various control variables. With an intertemporal setting, our findings provide evidence of structural changes over time in the U.S. food manufacturing sector and support some of the conventional SCP wisdoms, but challenge others.

Keywords: structure-conduct-performance (SCP).

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1 Introduction

Average market concentration in the Food and Kindred Product Industries (FKPIs) increased significantly over the past 50 years. As a result, about 40% of the FKPIs are highly concentrated (four firms control over 60% of sales) and enjoy substantial advertising-created barriers to entry. Those FKPIs that do not lend themselves to advertising-created product differentiation tend to be moderately concentrated and generally have not experienced large increases in concentration.[1] Furthermore, the food processing industries are among the most profitable industries in the United States. Profits are highest in those industries that are most concentrated and sell highly differentiated products.

A number of studies have examined market structure-performance relationships in the food and kindred products manufacturing industries, e. g., Collins and Preston (1966, 1969), and Rogers (2001). These studies have used various measures of profits and/or industry price-cost margins (PCMs) to measure profit performance. Most of these studies were for years before 1980. No studies have examined whether the profit performance of these industries has changed over time.

This study examines the market structure-conduct-performance relationship for 48 four-digit Standard Industrial Classification (SIC) Food and Related Product Industries during the 1970s, 1980s and 1990s. Using cross sectional multiple regressions and other appropriate analyses, we investigate the relationship among Price-Cost Margins (PCMs), market concentration, advertising outlays, and various control variables.

The traditional structure-conduct-performance (SCP) model consists of three equations for structure (S), conduct (C) and performance (P). It is assumed that

[1]These concentration trends are documented in Mueller and Rogers (1980, 1984), Rogers and Tokle (1995), and Rogers (2001).

each variable is a function of the others and can be given by $S = f(C, P)$, $C = f(S, P)$, and $P = f(S, C)$. Following conventional notions, the four-firm concentration ratio[2] (CR4), advertising, and operating profit (or price-cost margin, PCM) are used as the dependent variables respectively for structure, conduct, and performance.

Most studies dealing with SCP focus on contemporaneous interrelations of structure-conduct-performance, for example, Gupta (1983), Schmalensee (1989), and Weiss (1991). However, Kambhampati (1996) and Delorme et al (2002) [DKKV] admit that each variable influences the other variables over time. Kambhampati (1996) argues that (1) structure is affected by lagged conduct, and both lagged and current performance. Past behavior of conduct represents a barrier to entry. Moreover, the better past and current performance, the more concentrated structure. (2) Previous year's performance will influence the current conduct. That is, the more profits in the past, the more current advertising outlays. (3) The performance determinants remain contemporaneous as the profits are computed in the current period.

In this study, we explore the intertemporal interrelations among dependent variables of structure-conduct-performance similar to the settings in Kambhampati (1996) and DKKV. However, the differences between the current paper and a closely related study, DKKV are at least four-fold:

(1) Investigated industries: we use food and tobacco industries from Census data while DKKV uses firms available in the Compustat database. The major problem facing DKKV is that the potential biases might exist as the Compustat database only consists of publicly traded firms.

(2) Lagged terms: our data set spans five census years (1972, 1977, 1982, 1987,

[2] The Herfindahl-Hirschman index (HHI) is an alternative for structure.

and 1992) and lagged variables are contained in the census years whereas using data from 1982, 1987, and 1992, DKKV adopts lagged variables outside these three census years.

(3) Concentration on advertising: following Greer (1971), Cable (1972), and Strickland and Weiss (1976), we examine whether the effect of concentration on advertising takes an inverted U shape while the effect is assumed to be linear in DKKV.

(4) Minimum efficient scale (MES): we incorporate MES to model the effect of scale of economies in the analysis (Connor et al., 1985; Sutton, 1991), but it is lack of MES data in DKKV.

To consider the relationship among price-cost margin, market concentration, and advertising, a simultaneous-equation model is needed to produce consistent and unbiased estimates when the interrelations exist. We will estimate the simultaneous-equation system by the two-stage least squares (2SLS) method.

Our findings from the current study support some of the conventional SCP wisdoms but challenge others. First, results suggest that industry structure is not dependent of current and past performances. Specifically, the lagged and current industry price-cost margins do not have statistically significant impacts on four-firm concentration ratios, after controlling for past advertising, past capital-output ratio, past and current minimum efficient scales. However, all other variables are significantly positive and consist with the view that product differentiation and scale of economies can create entry barriers and help industry concentrations.

Second, unlike an inverted U shape effect of concentration on advertising suggested by Greer (1971), Cable (1972), and Strickland and Weiss (1976), we find that the industry conduct (advertising) is affected positively and linearly by industry structure (concentration). Moreover, advertising depends on past price-cost margins and may create future barriers to entry while the industry growth does not affect advertising.

Third, while industry concentration has a positive impact on price-cost margin, advertising does not effect on the price-cost margin, controlling for capital expenditure and scale of economies. In addition, capital expenditure and scale of economies inversely affect the price-cost margin, consistent with the findings in Delorme et al (2002), but not with others in the literature, for example, Strickland and Weiss (1976).

The rest of this paper is organized as follows. The simultaneous-equation framework is presented and discussed in section 2. The data used in this study and empirical results are in section 3. Finally, section 4 provides concluding remarks and suggestions for further research.

2 Simultaneous-Equation System

In this section we first discuss a detail model of simultaneous equations used in this study.

2.1 Determinants of Concentration

An important determinant of concentration is the ratio of optimal firm scale (minimum efficient scale, MES) to market size. There are three different approaches for estimating an MES for an industry, including economic-engineering studies, midpoint plant size as a proxy, and plant size with lowest labor costs as a proxy. Using thirteen four-digit SIC industries in the U.S. food and drink sector, Connor et al. (1985) report that median plant estimates based on the 1972 census of manufactures and engineering estimates over 1970-80 are highly correlated, where the correlation coefficient is 0.83 (pages 93-95). In this paper, we use the size of the industry's median plant to be a proxy of minimum efficient scale (MES). The median plant size is defined as the size of the plant that is at the midpoint of the industry shipments size distribution (Connor et al., 1985; Strickland and Weiss, 1976).

Together with assumptions of intertemporal interrelations among dependent variables in Kambhampati (1996) and DKKV, the determinants of concentration include current PCM, MES, lagged PCM, lagged MES, lagged advertising, and lagged capital investment. Thus the concentration equation can be written as

$$\begin{aligned} CR4_t &= \alpha_0 + \alpha_1 AD_{t-1} + \alpha_2 KO_{t-1} + \alpha_3 PCM_{t-1} + \alpha_4 PCM_t \\ &\quad + \alpha_5 MES_{t-1} + \alpha_6 MES_t + \epsilon_{1t}, \end{aligned} \tag{1}$$

where $CR4$ is the four-firm concentration ratio, AD is advertising intensity calculated by the ratio of advertising expenditure to value of shipments, KO is gross fixed assets relative to value of shipments, PCM is the price-cost margin defined by the operating return divided by value of shipments, and MES is minimum efficient scale given by the median plant size from the census plant distribution table divided by value of shipments. Moreover, subscript t represents the current period while $t-1$ is the lagged one period. All of the coefficients are expected to be positive. In addition, $\alpha_3 \leq \alpha_4$, and $\alpha_5 \geq \alpha_6$ because the impacts of PCM on $CR4$ may diminish over time, but MES represents setup costs which might take time to be effective and have positive influences on $CR4$.

2.2 Determinants of Advertising Intensity

As investigated in Greer (1971), Cable (1972), and Strickland and Weiss (1976), the effect of concentration on advertising takes an inverted U shape. Advertising is expected to be increasing in concentration when concentration ratio is low

(Dorfman and Steiner, 1954), but decreasing at very high levels of concentration because it becomes easier for firms to collude to avoid mutually offsetting advertising in a highly concentrated industry. Therefore, in the advertising equation we add a quadratic term $CR4^2$ to capture the nonlinearity and expect the coefficient of $CR4$ is positive and that of $CR4^2$ is negative.

Following Sutton's two-stage approach (1991, Chapters 2 and 3), Kambhampati (1996), and DKKV, previous year's profits have impacts on current advertising expenditure; i.e., the more past profits, the more current advertising outlays.

In Greer (1971), Cable (1972), Comanor and Wilson (1974), and DKKV, the growth of sales is incorporated to control for product differentiability or the introduction of new products. As a result, we have advertising intensity equation

$$AD_t = \beta_0 + \beta_1 PCM_{t-1} + \beta_2 GR_t + \beta_3 CR4_t + \beta_4 CR4_t^2 + \epsilon_{2t}, \tag{2}$$

where GR is the growth in industrial production given by the ratio of shipments in the current and previous years. Coefficients β_1, β_2, and β_3 are expected to be positive and β_4 to be negative.

2.3 Determinants of Price-Cost Margins

In the literature many empirical studies explain price-cost margins by concentration, advertising, and other variables, for example, Collins and Preston (1966, 1969), Rhoades and Cleaver (1973), Ornstein (1975), Kwoka (1979), Liebowitz (1982), and Weiss (1991). Following their settings and from the prediction of economic theory, market structure is expected to influence price-cost margins positively.

The quality of Census PCMs as a proxy for profits depends on whether appropriate adjustments can be made to reflect critical elements of cost not included in the Census PCMs of particular industries. In the food manufacturing industries, the two most important costs associated with Census-derived PCMs are the cost of advertising and promotion and the cost of capital. We address these concerns by adding advertising intensity AD and capital intensity KO to the equation. While AD serves as a proxy for the production differentiation barrier, MES represents the scale barrier. In addition, unanticipated increases in demand or unanticipated decrease in costs might result in high margins. Output growth GR is incorporated to reflect the effects.

The census concentration ratios do not characterize market concentration correctly where markets are local or regional in nature because the ratios generally refer to national industries. Following Rogers (2001), we add a dummy (NL) for a local or regional industry, for example, milk or bread, to correct possible biases. Therefore, the price-cost margin equation is given by

$$\begin{aligned} PCM_t &= \gamma_0 + \gamma_1 GR_t + \gamma_2 KO_t + \gamma_3 CR4_t + \gamma_4 AD_t \\ &\quad + \gamma_5 MES_t + \gamma_6 NL + \epsilon_{3t}. \end{aligned} \tag{3}$$

Finally, to account for the different census years, we also incorporate time trend variables in each equation to capture possible structural changes over time.

3 Empirical Analysis

3.1 Estimation of Simultaneous-Equation Model

To estimate the proposed simultaneous-equation system, we use the two-stage least squares (2SLS) method. In the first stage, each endogenous variable (concentration, advertising, and price-cost margin) is regressed on all exogenous variables, including MES, lagged MES, capital-output ratio (KO), lagged KO, lagged advertising, lagged PCM, lagged growth, non-national market dummy, and time trends.

In the second stage, the fitted values of endogenous variables from the first stage are used as instruments to estimate the three structural equations.

3.2 Data

All of the variables used to estimate equations (1)-(3) are derived from the 1972, 1977, 1982, 1987, and 1992 Census of Manufactures, except for advertising intensity and local/regional dummy. The census variables are for 48 four-digit Standard Industrial Classification (SIC) Food and Related Product Industries for each census year. Thus, the data set contains 240 observations. Table 1 contains 48 four-digit SIC Industries examined in this study. The four-firm concentration ratios for three selected census years (1972, 1982, and 1992) are also presented. Though the concentration ratio may increase or decrease for each individual industry across different census years, the average CR4 increased from 44.10% in 1972 to 46.21% in 1982, and finally to 53.90% in 1992. Simple calculations of CR4 changes show the average concentration ratios increase moderately over these periods. We will discuss more details on the trend of CR4 in the estimation of simultaneous-equation system below.

The media advertising data are from Competitive Media Reporting (CMR). We match advertising data to corresponding industries to create advertising-to-sales ratios in each census year. The local/regional dummy is assigned on the basis of judgment, including industries of Ice cream and ices (2024), Fluid milk (2026), Prepared feeds (2048), Bread, cake, & related products (2051), Bottled and canned soft drinks (2086) and Manufactured ice (2097).

To explore the differences between high and low advertising intensive industries, we segmented the full sample (240 observations) into two groups by using advertising-to-sales (A/S or AD) ratio. Group 1 was high advertising industries, in which their A/S ratios were greater than 0.25% for all census years. Group 1 included 140 observations. The rest observations were classified as low advertising. Table 2 gives the means for key variables based on full sample and both groups. The mean CR4 is higher in the high advertising group than in the low advertising group as Sutton (1991) expected and Rogers (2001) indicated.

3.3 Results of Two-Stage Least Squares (2SLS)

Table 3 shows the estimation results of 2SLS. In the concentration equation (1) lagged advertising, lagged capital-output ratio, lagged MES, and MES all have positive effects on four-firm concentration ratio. However, lagged PCM and PCM are not significant and comparison of their coefficients is not feasible though we expect the current PCM influences $CR4$ more than its lagged counterpart, i.e., $\alpha_3 \leq \alpha_4$. As predicted, moreover, the lagged MES has larger impacts on $CR4$ than the current MES. The time trend for CR4 is positive but only significant at a 10% level. This finding is consistent with the fact that the average concentration ratios increase moderately over time as Table 1 indicates.

In the advertising equation (2), unlike an inverted U shape effect of concentration on advertising suggested by Greer (1971), Cable (1972), and Strickland and Weiss (1976), we find that the industry conduct (advertising) is affected positively and linearly by industry structure (concentration) because the coefficient of square term $CR4^2$ is not statistically significant. It indicates that the overall effects of concentrations on advertising is increasing even though the industries are highly concentrated and firms in these industries may not collude in their advertising decisions. Moreover, advertising depends on past price-cost margins in which advertising may create future barriers to entry and serve as a predatory instrument. Interestingly, the industry growth does not affect advertising. The result seems to suggest a life-cycle effect on advertising, that is, fluctuations in sales do not change the advertising decisions. Instead, the advertising expenditure is planned according to market shares and past profits.

The possible reason why the time trend is negative in equation (2) is as follows: The advertising intensity, defined by advertising-to-sales ratio, is used in the estimation. As market concentration increases, the advertising intensity can be mostly explained by the increasing concentration ratios (CR4) and past profits (lagged PCM). As a result, it is not unreasonable to expect the negative effect of time trend on advertising intensity after controlling for concentration ratios and past profits among other variables.

In the price-cost margin equation (3), industry concentration has a positive impact on price-cost margin; i.e., industries with more concentration ratios tend to be more profitable. On the other hand, advertising does not effect on the price-cost margin, controlling for capital expenditure and scale of economies. This is similar to Imel and Heimberger (1971), Nagle (1981), and DKKV, where no specific relationship can be inferred between advertising and price-cost margins.

In addition, while industry growth does not influence profitability, capital expenditure (KO) and scale of economies (MES) inversely affect the price-cost margin, which is consistent with the findings in DKKV, but not with others in the literature, for example, Strickland and Weiss (1976). Nevertheless, this result is not surprising because capital expenditure and setup costs may damage profitability temporarily in the given years, but will increase profits in the successive years.

The local or regional dummy NL affects the current profitability positively. It implies these local or regional industries are more profitable than expected even though these industries are relatively less concentrated from a national perspective. In practice, most of firms in these industries might serve as local/regional monopoly or oligopoly. Finally, the time trend in this equation has positive effects on price-cost margins, indicating an increasing trend of profitability in the food processing industries over past decades.

3.4 Results of Ordinary Least Squares (OLS)

To look at possible inconsistent and biased estimates that OLS may produce, we run OLS for the purpose of comparisons with 2SLS and find some different results due to this misspecification. The results are given in Table 4. The estimates by OLS are qualitatively similar to those found by 2SLS except for the effects of CR4 on advertising, where it takes a normal U shape and advertising intensity reaches its minimum when CR4=32.7%. However the U shape relation is not likely the case in the food processing industries. Besides, the other difference is that the effect of advertising on price-cost margins is now positive though it is only significant at a 10% level. We conclude that a system of simultaneous equations performs better and prove itself to be useful for conducting the structure-conduct-performance research.

4 Concluding Remarks

In this study, we explore the intertemporal interrelations among dependent variables of structure-conduct-performance for 48 four-digit SIC Food and Tobacco Processing Industries during the 1970s, 1980s and 1990s. By an intertemporal simultaneous-equation framework, our findings provide evidence of structural changes over time in the U.S. food manufacturing sector and support some of the conventional SCP wisdoms.

On the other hand, however, we also find some challenges. First, industry structure is not dependent of current and past performances, but current performance does depend on structure. Second, past performance has an effect on current conduct, but current conduct does affect current performance. Before we can answer these paradoxes, more investigations are needed. For example, we may estimate some subsets of data like high/low advertising categories presented in Table 2 and figure out the differences between groups when advertising intensity differs. Moreover, the complete assessments of this study should include data from 1997 and 2002 Economic Census. So far, the data availability limits our scopes to 1992 as the final year. We will soon update this study as the new census concentration ratio data will be released in June 2006.

References

CABLE, J. (1972): "Market Structure, Advertising Policy, and Inter-Market Differences in Advertising Intensity," in K. Cowling, eds, *Market Structure and Corporate Behaviour; Theory and Empirical Analysis of the Firm*. Gray-Mills Publishing Ltd., London.

COLLINS, N. R., AND L. E. PRESTON (1966): "Concentration and Price-Cost Margins in Food Manufacturing Industries," *Journal of Industrial Economics*, 14(3), 226–242.

——— (1969): "Price-Cost Margins and Industry Structure," *Review of Economics and Statistics*, 51(3), 271–286.

COMANOR, W. S., AND T. A. WILSON (1974): *Advertising and Market Power*. Harvard University Press, Cambridge, Mass.

CONNOR, J. M., R. T. ROGERS, B. W. MARION, AND W. F. MUELLER (1985): *The Food Manufacturing Industries: Structure, Strategies, Performance, and Policies*. Lexington Books, Lexington, Mass.

DELORME, C. D., P. G. KLEIN, JR., D. R. KAMERSCHEN, AND L. F. VOEKS (2002): "Structure, Conduct and Performance: A Simultaneous Equations Approach," *Applied Economics*, 34(17), 2135–2141.

DORFMAN, R., AND P. O. STEINER (1954): "Optimal Advertising and Optimal Quality," *American Economic Review*, 44(5), 826–836.

GREER, D. F. (1971): "Advertising and Market Concentration," *Southern Economic Journal*, 38(1), 19–32.

GUPTA, V. K. (1983): "A Simultaneous Determination of Structure, Conduct and Performance in Canadian Manufacturing," *Oxford Economic Papers*, 35(2), 281–301.

IMEL, B., AND P. HELMBERGER (1971): "Estimation of Structure-Profit Relationships with Application to the Food Processing Sector," *American Economic Review*, 61(4), 614–27.

Kambhampati, U. S. (1996): *Industrial Concentration and Performance: A Study of the Structure, Conduct, and Performance of Indian Industry*. Oxford University Press, Delhi; New York.

Kwoka, Jr, J. E. (1979): "The Effect of Market Share Distribution on Industry Performance," *Review of Economics and Statistics*, 61(1), 101–109.

Liebowitz, S. J. (1982): "What Do Census Price-Cost Margins Measure?," *Journal of Law and Economics*, 25(2), 231–246.

Mueller, W. F., and R. T. Rogers (1980): "The Role of Advertising in Changing Concentration of Manufacturing Industries," *Review of Economics and Statistics*, 62(1), 89–96.

——— (1984): "Changes in Market Concentration of Manufacturing Industries 1947-1977," *Review of Industrial Organization*, 1(1), 1–14.

Nagle, T. T. (1981): "Do Advertising-Profitability Studies Really Show That Advertising Creates a Barrier to Entry?," *Journal of Law and Economics*, 24(2), 333–49.

Ornstein, S. I. (1975): "Empirical Uses of the Price-Cost Margin," *Journal of Industrial Economics*, 24(2), 105–117.

Rhoades, S. A., and J. M. Cleaver (1973): "The Nature of the Concentration-Price/Cost Margin Relationship for 352 Manufacturing Industries: 1967," *Southern Economic Journal*, 40(1), 90–102.

Rogers, R. T. (2001): "Structural Change in U.S. Food Manufacturing, 1958-1997," *Agribusiness*, 17(1), 3–32.

Rogers, R. T., and R. J. Tokle (1995): "The Economics of Advertising: Where's the Data?," *Review of Industrial Organization*, 10(6), 675–687.

Schmalensee, R. (1989): "Inter-Industry Studies of Structure and Performance," in R. Schmalensee and R. Willig, eds, *Handbook of Industrial Organization*, vol. 2. North-Holland, New York.

Strickland, A. D., and L. W. Weiss (1976): "Advertising, Concentration, and Price-Cost Margins," *Journal of Political Economy*, 84(5), 1109–1121.

Sutton, J. (1991): *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration.* MIT Press, Cambridge, Mass.

Weiss, L. W. (1991): *Structure, Conduct, and Performance.* New York University Press, New York.

Table 1 Concentration in Food and Tobacco Processing Industries, 1972-1992

SIC	Name	CR4 1972	CR4 1982	CR4 1992	Change 72-82	Change 82-92
2011	Meat packing plant products	26	27	50	1	23
2013	Sausages & prepared meats	16	15	25	-1	10
2021	Butter	37	29	49	-8	20
2022	Cheese, natural and processed	40	35	42	-5	7
2023	Condensed and evaporated milk	34	33	43	-1	10
2024	Ice cream and ices	27	22	24	-5	2
2026	Fluid milk	17	15	22	-2	7
2032	Canned specialities	62	59	69	-3	10
2033	Canned fruits and vegetables	18	20	27	2	7
2034	Dehyd. fruits, vegetables, soups	31	41	39	10	-2
2035	Pickles, sauces, salad dressings	30	40	41	10	1
2037	Frozen fruits and vegetables	28	28	28	0	0
2038	Frozen specialties	36	31	40	-5	9
2041	Flour & other grain mill products	32	40	56	8	16
2043	Cereal breakfast foods	84	86	85	2	-1
2044	Milled rice and byproducts	42	44	50	2	6
2045	Prep. flour mixes & refr. doughs	62	62	39	0	-23
2046	Wet corn milling	63	73	73	10	0
2047	Dog, cat, and other pet food	50	50	58	0	8
2048	Prepared feeds, n.e.c.	22	19	23	-3	4
2051	Bread, cake, & related products	27	32	34	5	2
2052	Cookies and crackers	58	59	56	1	-3
2061	Sugar cane mill products	43	41	52	-2	11
2062	Refined cane sugar	58	65	85	7	20
2063	Refined beet sugar	66	67	71	1	4
2066	Chocolate and cocoa products	72	69	75	-3	6
2067	Chewing gum *	84	87	96	3	9
2074	Cottonseed oil mill products	42	50	62	8	12
2075	Soybean oil mill products	52	56	71	4	15
2076	Vegetable oil mill products, n.e.c.	45	49	89	4	40
2077	Animal and marine fats and oils	17	24	37	7	13
2079	Shortening and cooking oils	40	40	35	0	-5
2082	Malt beverages	52	78	90	26	12
2083	Malt and malt byproducts	49	61	65	12	4
2084	Wines, brandy, and brandy spirits	52	52	54	0	2
2085	Distilled liquor, except brandy	50	46	62	-4	16
2086	Bottled and canned soft drinks	14	15	37	1	22
2087	Flavoring extracts & syrups n.e.c.	62	61	69	-1	8
2091	Canned & cured seafood inc soup	38	44	29	6	-15
2092	Fresh or frozen packaged fish	21	13	19	-8	6
2095	Roasted coffee	64	66	66	2	0
2097	Manufactured ice	29	17	24	-12	7
2098	Macaroni and spaghetti	34	37	78	3	41
2099	Food preparations, n.e.c.	26	29	22	3	-7
2111	Cigarettes	84	90	93	6	3
2121	Cigars	55	58	74	3	16
2131	Chewing, smoking tobacco, snuff	60	75	87	15	12
2141	Tobacco stemming and redrying	66	68	72	2	4
	means for SIC 20-21	44.10	46.21	53.90	2.10	7.69

Note : * The 1992 CR4 for SIC 2067 is estimated by authors.

Source : Census of Manufactures.

Table 2 Means for Selected Variables in Food and Tobacco Industries, 1972-1992

Variable	Full Sample	High Advertising	Low Advertising
Sample size	240	140	100
CR4 (%)	48.00	52.27	42.03
	(21.14)	(20.72)	(20.36)
Value of shipments ($B)	7.89	8.01	7.73
	(1.19)	(1.06)	(1.34)
MES (%)	3.82	4.34	3.09
	(4.88)	(5.57)	(3.61)
A/S (%)	1.94	3.19	0.19
	(2.84)	(3.16)	(0.30)
KO (%)	31.63	27.93	36.81
	(20.42)	(9.83)	(28.71)

Notes : See text for descriptions of variables and how groups were formed.
Standard deviations are in parentheses.

Table 3 Two-Stage Least Squares Estimates of Simultaneous Equations

Dependent	CR4		AD		PCM	
Variable	Estimate	t-value	Estimate	t-value	Estimate	t-value
Constant	24.8686	7.5892 ***	1.8986	0.3476	4.9991	2.3586 **
CR4			0.0621	3.7671 ***	0.0383	2.1139 **
CR4^2			0.0001	1.1556		
AD-1	1.0539	2.1560 **				
AD					-0.0081	-0.2089
PCM-1	3.3415	0.2387	0.7541	5.9448 ***		
PCM	-1.7290	-0.1304				
MES-1	1.7017	3.0149 ***				
MES	1.1610	2.2582 **			-0.1822	-4.3937 ***
KO-1	0.1051	2.0123 **				
KO					-0.0322	-6.5912 ***
GR			-4.9018	-0.9499	2.2707	1.0980
NL					1.1619	2.9182 ***
Year	1.9551	1.6899 *	-0.4802	-2.7374 ***	0.2900	3.4973 ***

* Denotes significance at 10% level.
** Denotes significance at 5% level.
*** Denotes significance at 1% level.

Table 4 Ordinary Least Squares Estimates of Simultaneous Equations

Dependent	CR4		AD		PCM	
Variable	Estimate	t-value	Estimate	t-value	Estimate	t-value
Constant	24.7961	7.5726 ***	6.0863	1.0578	4.9310	2.3504 **
CR4			-0.0785	-2.0368 **	0.0117	2.4611 **
CR4^2			0.0012	3.3503 ***		
AD-1	1.0581	2.1658 **				
AD					0.0433	1.7719 *
PCM-1	-4.1918	-0.3402	0.7976	6.1593 ***		
PCM	5.4197	0.4648				
MES-1	1.6710	2.9656 ***				
MES	1.1699	2.2771 **			-0.1268	-7.2358 ***
KO-1	0.0999	1.9217 *				
KO					-0.0271	-7.6791 ***
GR			-5.5218	-1.0396	3.0847	1.5649
NL					0.6636	3.0049 ***
Year	2.3115	2.0767 **	-0.4175	-2.3324 **	0.3618	5.3489 ***

* Denotes significance at 10% level.
** Denotes significance at 5% level.
*** Denotes significance at 1% level.