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Concentration Change and Countervailing Power in the U.S. Food Manufacturing Industries

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Abstract. The purpose of this paper is to determine whether the countervailing power of grocery retailers has had a restraining influence on increases in seller market concentration in the U.S. food manufacturing industries. We empirically test this notion by examining changing four-firm concentration ($\Delta CR4$) from 1967 to 1987 across 48 processed food product classes. Employing a model developed and tested by Venturini, we measure countervailing power of retailers with the share of market sales of private-label products.

For the 20-year period four variables were found to be significant determinants of $\Delta CR4$. However, for the most recent 1977–1987 period, virtually no significant determinants are discovered. Unlike Venturini, no evidence of countervailing power could be detected in the 1980s and only weakly or rarely in the longer period. We suggest that the lax federal antitrust enforcement of the 1980s, measurement problems, or sampling criteria may be responsible for this unexpected outcome.

Key words: Countervailing power, grocery retailing, food manufacturing, concentration change, private labels.

I. Introduction

The evidence that high sales concentration among U.S. food manufacturers leads to higher-than-competitive selling prices and profits seems overwhelming. Drawing on data from 1950 to the mid-1970s, numerous statistical investigations established significant, positive relationships between seller concentration and oligopolistic performance indicators (Connor *et al.* 1985: Chapter 7). These studies generally give consistent predictions. When one compares the lowest observed levels of concentration with the highest observed levels, *ceteris paribus*, processed food prices rise about 10 to 14 percent, price-cost margins (gross margins) rise about 65 percent, and profits increase about 100–200 percent. Since most of these studies were published, a number of criticisms have been raised about the assumptions imbedded in the Bainian structure-conduct-performance (SCP) approach and the interpretation of results. However, a recent survey of newer estimation techniques that relax most of the SCP assumptions found that concentration continues to exert a

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positive relationship on the size of consumer overcharges in the food manufacturing industries (Connor and Peterson, 1996).

It is the negative relationship between concentration and static allocative efficiency¹ that has caused economists to view with dismay the seemingly inexorable rise in food industry concentration in the United States. In 1947, the top four food manufacturers selling their products in broad geographic markets² held an average of about 40 percent of their markets. The most recent information from the 1987 *Census of Manufactures* shows that the average CR4 forty years later was at least 60 percent in national food industries.

The two determinants of changing concentration in the U.S. food manufacturing industries were believed to be well understood (Rogers, 1984). First, there was a “regression toward the mean” effect; that is, initial-period $CR4$ was inversely related to change in concentration ($\Delta CR4$). Second, media advertising intensity, more specifically the electronic media of radio and television, accelerated $\Delta CR4$, presumably by creating long-lasting barriers to new market entry. Generally, tests have failed to confirm that either market demand growth or plant economies of scale had any significant effects on $\Delta CR4$.³ However, a recent paper by Venturini (1993) proposed that Rogers’ model was incompletely specified. He altered a well-known two-stage, game theory model of Sutton (1991) that incorporates vertical competition by retailers as an explanation of market concentration change. Fitted with 1958–1977 data from the U.S. food manufacturing industries, Venturini’s proxy for vertical competition does indeed slow down the change in $CR4$. This finding, if upheld, has important consequences for public competition policies.⁴

The issue known to economists as the efficacy of countervailing power is basically the same as the question addressed in the business-management literature: Has market power shifted from food manufacturers to food retailers, or *vice-versa*? Opinion surveys of food marketing companies appear to confirm a shift in power toward retailers. A 1992 survey of grocery chains, wholesalers, and manufacturers found agreement among all three groups that power had shifted (61 to 85 percent agreed) and that the shift favored retailers (55 to 87 percent agreed) (‘Progressive Grocer’, April, 1992, Part 2, p. 25). Chu and Messinger (1993) identified five major reasons for increased retailer clout: (1) the proliferation of new products by manufacturers, which has forced manufacturers to offer more trade promotions, including slotting and renewal allowances, to retailers; (2) greater retailer access to information on product sales due to the widespread adoption of scanner-check-

¹ Rising concentration may give rise to compensating improvements in dynamic performance, but the evidence is not so clear as it is for static performance.

² That is, omitting highly localized markets, such as those for fluid milk, bread, animal feeds, soft-drink bottling, and manufactured ice. Reliable information on changes in concentration in local markets is not available.

³ The period covered in Rogers’ study was 1958–1977. Retesting this model with 1967–1982 changes in concentration upheld the earlier results (Togle, Rogers, and Adams, 1990).

⁴ The finding also calls into question whether the static structure-performance results were misspecified by omitting measurements of retailer power. See the literature review below.

out technology; (3) increased grocery retailer concentration in local markets; (4) slowing overall growth and declining effectiveness of advertising in food markets; and (5) greater numbers of private-label programs.

Yet, rigorous tests of this alleged shift in power have yet to be seen. While food retailer concentration has indeed increased in the United States, food manufacturer concentration properly measured increased apace (Marion *et al.*, 1987). While the inflation-adjusted amount spent on food advertising by manufacturers remained almost constant in the 1980s, that is hardly evidence that advertising effectiveness has declined. The most satisfactory approach taken to analyze this question has been to look at relative profit rates or stock prices of manufacturers and retailers over time. Farris and Ailawadi (1992) examined the profits of listed companies from 1972 to 1990 and concluded that grocery retailer profits were steady while food manufacturer profits rose. A similar study using somewhat better samples found that comparing 1986–1991 profits on equity with 1961–1966 profits, food manufacturers' profits rose much more than retailers (Messinger and Narasimhan, 1993, Table 12). Therefore, there is a contradiction between businesspersons' opinions on this issue and the scant quantitative analyses available.⁵

The purpose of this paper is to explore further the role of countervailing power by grocery retailers on changing concentration in the U.S. food manufacturing industries. We develop and test alternative models of concentration change and new measures of vertical competition. In addition, we extend the period investigated by Venturini (1993) by ten years to 1987. There are several reasons to believe that the decade of the 1980s might yield quite different results than earlier periods.

II. Countervailing Power

John Kenneth Galbraith takes full credit for inventing the concept of countervailing power. "The notion . . . has been almost completely excluded from economic thought" (Galbraith, 1952, pp. 110–111). Yet, finding a precise definition in Galbraith's writing proves to be difficult. Perhaps the statement that comes closest is:

Private economic power is held in check by the countervailing power of those who are subject to it. The first begets the second. The long trend toward concentration of industrial enterprise . . . has brought into existence not only strong sellers . . . but also strong buyers (*ibid.*, p. 111)

Thus, according to Galbraith, countervailing power is an *autonomous regulator of competition*, which operates much like Adam Smith's invisible hand to check increases in seller concentration or improve static performance in the sellers' industry. The automatic nature of the countervailing power of organized buyers fits in well with Galbraith's evident disdain for government antitrust policies.

⁵ There is a more satisfactory body of studies examining the relative power of farmers' marketing cooperatives and food manufacturers (see Rogers and Petraglia, 1994).

Galbraith, whose early career was devoted to agricultural economics, cites many examples of successful countervailing power in the food and agricultural system. Consumer retail food cooperatives in Scandinavia and farmers' marketing cooperatives in the United States are notable for restraining the market power of food manufacturers (*ibid.*, p. 126 and pp. 155–165). Perhaps his favorite example of countervailing power was an episode in 1937 that involved the then largest U.S. grocery retailer, the Great Atlantic and Pacific Tea Company (A&P). Concerned about the high price of corn flakes, A&P commissioned a costly consultants' study (2.1 million 1994 dollars) to establish the economic feasibility of vertically integrating into the manufacturing of breakfast cereals. When A&P showed this study to its suppliers, the mere threat to build a plant was sufficient to evoke a 10 percent price discount from the breakfast cereal manufacturers (*ibid.*, p. 119–123). However, Galbraith does admit that some industries with unusually strong solidarity and consumer brand loyalty may be able to resist countervailing power; tobacco manufacturing is given as an example (*ibid.*, p. 122).

The theory and empirical relevance of countervailing power was the subject of a memorable debate (Galbraith 1954, Stigler 1954). Galbraith's critics noted the absence of a rigorous theory of bilateral oligopoly, while Stigler focussed on the lack of evidence that large-scale retailing firms arose most prominently to sell products made by the most concentrated manufacturing industries. That is, Stigler proposed that countervailing power would be verified by a test that demonstrated a correlation between high concentration in manufacturing industries and a parallel (or subsequent) rise in buyer concentration for those same products. It is ironic that while Galbraith's definition of countervailing power refers explicitly to concentration dynamics, all of his examples concern the static exercise of seller market power. Indeed, nearly all subsequent empirical verification of the countervailing power hypothesis has tested the static effects of buyer concentration on manufacturers' profits or price-cost margins, where it has received modest support.⁶

III. The Venturini Model

Venturini (1993) must be credited with bringing economists back to a consideration of the *dynamic* implications of the countervailing power of distributors, which he has rechristened "Vertical Competition." Venturini's model explaining market concentration change draws on concepts from John Sutton's (1991) well-known book. Sutton, frustrated by the difficulties of operationalizing theoretical models of oligopoly, sought a simple, but robust prediction on the relationship between market concentration and market size. This question has occupied industrial-organization

⁶ Scherer and Ross (1990) also discuss a related hypothesis. Sellers in producer-goods industries should have *higher* margins if the inputs they sell are "unimportant" to buyers (*i.e.*, the intermediate products form a small share of all inputs used by buyers). At least three statistical studies confirm this relationship in U.S. manufacturing.

economists since the seminal book by Joe Bain (1966) on international differences in industrial concentration.

In brief, Sutton's theory and empirical findings demonstrate that in the limit a negative relationship is present for industries where sunk costs of entry are exogenous, but the tendency toward deconcentration is lost when firms can pursue strategies to increase sunk costs—the case of endogenous sunk costs (Connor 1992). The other major factor affecting market concentration is the degree of pricing toughness. When pricing is tough, markets will become more concentrated, as firms require larger market shares to cover their sunk costs. When pricing competition is lax, more firms can survive. Pricing toughness is in turn affected by government industrial policies and the degree of product differentiation. Pricing toughness would lessen as product differentiation increased, shifting the emphasis from price to nonprice rivalry. International comparisons of a series of historical case studies of the food industries provided empirical verification of Sutton's theoretical predictions.

Venturini extended Sutton's theory to include vertical competition between food distributors and food manufacturers. Venturini is specifically interested in the relationship between the branded and unbranded segments in the food sector and how vertical competition will affect market concentration. He hypothesized that industries that experience an increase in the share held by private labels will experience deconcentration. This hypothesis is justified with two models.

In the first "technological" model, Venturini divides the consumers into two groups. Type I consumers of manufacturer brands are loyal to products, and Type II consumers are foodservice firms or retailers who purchase the food products to sell as own brands. The first group defines the size of the branded sector, θ , and the second group defines the size of the unbranded and private label sector, $1 - \theta$, where $0 \leq \theta \leq 1$. The private label segment is characterized by smaller manufacturing firms that do not advertise but compete solely on the basis of efficiency in production and distribution. These smaller firms can co-exist with the larger, marketing-oriented firms, because Type II consumers are unwilling to pay for the higher costs of marketing and advertising that brand manufacturers must incur.

These two groups of firms are assumed to be distinct – no manufacturing firm supplies both types of buyers. The relationship between these two strategic groups is of primary interest in Venturini's work. The fixed costs of each of these strategic groups will be markedly different. The branded group's fixed costs of production will consist of the sunk setup cost for a minimum efficient scale plant and endogenously determined advertising costs (MES_1). The unbranded-private label group's fixed costs consist only of the costs involved in setting up an *MES* plant (MES_2). Given that the branded group's fixed costs are larger, then $MES_1 >$

MES_2 . Because in long-run equilibrium, all the firms within each strategic group are of equal size, the Herfindahl-Hirshman index of concentration (H) is:

$$H = N \left(\frac{MES_1}{S} \right)^2 + M \left(\frac{MES_2}{S} \right)^2. \quad (1)$$

Then substituting $N = \theta S / MES_1$ and $M = (1 - \theta) S / MES_2$, he found:

$$H = \theta * \frac{MES}{S} + (1 - \theta) * \frac{MES_2}{S}, \quad (2)$$

where N and M are the equilibrium number of firms in the branded segment and private-label segment, and S is the total market size. Given that $MES_1 > MES_2$, the partial derivative of H in [2] with respect to θ is positive. Therefore, as the private-label share, $(1 - \theta)$, increases, concentration will fall, even though market size remains constant.

Venturini's second theoretical model builds on Sutton's two-stage, Cournot-Nash model with advertising an endogenous sunk cost for manufacturers of branded products. In the first stage, higher advertising expenditures could enhance the demand for a firm's product in the second stage. In this model there are again two groups of consumers, two strategic groups of manufacturers, and no dual branding. In the branded strategic group, advertising is positive and endogenous, while advertising is zero in the unbranded group. The equilibrium number of firms in both strategic groups (N and M) is an outcome of Cournot-Nash competition. Under certain parametric assumptions, the partial derivative of H w.r.t. θ yields:

$$\frac{\partial H}{\partial \theta} = \theta - \frac{(2S^2 + 1)[(1 - \theta)S]^{1/2}}{2S^3}. \quad (3)$$

A numerical analysis shows that, holding S constant, as θ increases beyond 0.1, concentration will increase. Only at lower values of θ does (3) become negative. Venturini also shows that H declines with increases in S .

Therefore, taking into account both of Venturini's models, a behavioral model of the following form is suggested:

$$\Delta H = \alpha + \beta_1(PL) + \beta_2 \cdot S, \quad (4)$$

where $PL = (1 - \theta)$ is the private-label share of a market of size S . From Equations (2) and (3), we expect $\beta_1 < 0$ and $\beta_2 < 0$. Because the U.S. Herfindahl-Hirshman index of sales concentration H has only been published for the years 1982 and 1987, too brief a span, we use $\Delta CR4$ in place of ΔH . The two concentration indexes are known to be highly correlated within years, therefore changes in the two indexes ought to be closely correlated as well. Moreover, Equation (4) will be augmented with other explanatory variables that have performed well in past empirical studies.

IV. Private Labels and Vertical Competition in the Food Industries

A critical feature of Venturini's model is the assumption that the share of private-label products in total product category sales (*PL*) is a reasonable proxy for the countervailing power of grocery retailers. In this section we examine the definition of private-label products, describe their empirical significance in the food system, and appraise the suitability of *PL* as a variable in industrial-organization analysis.

Foods and beverages sold in grocery stores may be divided into three analytically significant categories: manufacturers' or packers' brands, private-label products, and unbranded products. All prepackaged foods in the United States are required to have on their labels "manufactured by . . .," "packed by . . ." or "distributed by . . ." The first two cases are commonly called "national brands" or "manufacturers' brands," many of which are distributed in only a few states of the USA. *Manufacturers' brands* account for about two-thirds of the sales of grocery foods when measured at manufacturers' shipments values (Connor *et al.*, 1985, p. 25). The degree of consumer loyalty or repetitive purchases varies along a spectrum from very strong to relatively weak. "Coca-Cola" and "Marlboro" are widely recognized as strong brands, but some brands are very weak. For example, most eggs are sold in U.S. stores with the name of the packer on the egg carton, but most grocery stores sell only one brand of eggs on a given day and frequently change the brand of eggs they stock in the store. This is an example of weak brand loyalty, so weak that eggs could just as well be sold in cartons without the packer's name. In other words, very weak packer brands shade into the private-label category.

Private-labels are also known as "store brands" or "controlled brands" (and in British English are called "own brands"). Private-label products have labels that tell the consumer who is responsible for distributing the item, but the manufacturer's name is practically never shown. The brand shown on the private-label food item is either a trademark owned by a grocery chain (a true "store brand") or a trademark owned by a wholesale distributor⁷ (a true "controlled brand"). Store brand programs are typically found among the 40 to 50 largest U.S. grocery retail chains, whereas smaller chains and independent stores *contract* with wholesalers to use their controlled brands (Marion *et al.*, 1987). Thus, it is not unusual to see the same private-label trademarks in the stores of two or more smaller retailers in the same city. Most commercial data sources cannot distinguish between retailer store brands and wholesaler controlled brands.

The leading grocery chains obtain their private-label products in two ways. First, most large chains vertically integrate backward into food manufacturing. Parker (1975) presented data that the 40 largest U.S. grocery chains manufactured foods in their own plants that accounted for 9.8 percent of their retail sales in 1954; the share dropped to 6.9 percent in 1967 and has remained at about 7 percent since then (Marion *et al.*, 1987, Table 5-8). Grocery retailers account for about 2.5 percent of total food manufacturing output in the United States, but it is highly concentrated

⁷ The distributor is usually a U.S.-based grocery wholesaler, but in some cases it is the importer.

in fluid milk, ice cream, bread, meat products, and roasted coffee (Connor *et al.*, 1985, Table B-9).

Second, the major part of private label products are purchased by retailers or wholesalers on a negotiated basis from generally small food manufacturers (Connor *et al.*, 1985, pp. 219–226). Retailers frequently renegotiate prices and frequently change their suppliers. This is especially true of *generics*, a special kind of private-label products that is distinctly lower in quality and price than regular private-labels. Regular private-label products typically sell for 15 to 20 percent lower retail prices than manufacturers' brands, and retailers attempt to match the quality standards of the leading brands. The variety and perceived quality of private-label products affect the enterprise images of grocery retailers. At their peak, only 5 to 10 percent of the sales of private-label food products were generics (Wills and Menzer, 1982).

In the United States, private-label products have accounted for 10 to 14 percent of total grocery-store sales volume (Galbraith, 1993). This private-label share is closely related to macroeconomic conditions. The share reached almost 14 percent in 1982, a year of deep recession and high unemployment; fell monotonically to about 10 percent by 1988 during years of robust growth; and rose again to 14 percent in the early 1990s. Private label shares are even higher in several European countries.⁸

Private-label penetration in the United States varies considerably across product categories. In 1980, private-label (and generic) products accounted for very low sales shares in canned baby food ($PL = 0.7$ percent), ready-to-eat breakfast cereals (3.0 percent), and frozen dinners (4.2 percent) (Connor *et al.*, 1985, p. 222). However, PL was very high in sugar (54.6 percent), frozen orange juice (54.0 percent), canned peaches (50.5 percent), and canned tomatoes (49.6 percent). An even more complete study of 1980 shares found that private-label products as a group were the leading "brand" in 81 out of 378 warehoused food product categories. Data from 1993 show that U.S. private-label shares are in most cases similar to 1980 (Galbraith, 1993; Shapiro, 1993).

There is considerable research trying to explain cross-sectional variation in PL . Parker (1975) showed that backward vertical integration into food manufacturing in the 1960s by grocery retailers was significantly positively correlated with concentration in food manufacturing; the simple correlation coefficient ranged from +0.45 to +0.68. Parker considered this strong evidence that the manufacture of

⁸ In 1992–1993, private-label foods had captured almost 30 percent of the sales in British and Swiss super-markets, more than 20 percent of the French and German, and almost 20 percent of the Dutch and Belgian markets (Ogilvie, 1994, p. 26; Hughes, 1994). The French retailer Carrefour sells more than 3,000 store brands that are priced on average 15 percent lower than the leading brands in the same category. The leading U.K. grocery retailer, Sainsbury, has 8,000 private-label items out of 16,000 items in its average store (de Lissier and Helliker, 1994). Moreover, Sainsbury has been introducing 1,400 to 1,500 new private-label products each year, while dropping hundreds of others that have proved unpopular. Gross margins on Sainsbury's private-label products are twice as high as the margins on manufacturers' brands. The extensive private-label programs of European grocery retailers have been aided by the formation of international wholesale "buying groups" (Linda, 1993).

private-label products occurs in industries with market power, unless the industry was too small to allow retailers to achieve economies of scale or the loyalty to manufacturers' brands was too great. Later, Parker and Connor (1979) extended this analysis to the determinants of the total *PL* share, both own-manufactured and purchased. Using 1976 data on 41 processed-food classes,⁹ they fitted the following equation:

$$PL = 36.0 - 0.22CR4 - 2.31TAS, \quad R^2 = 0.94$$

(3.78) (4.33) (5)

where *TAS* is the total media advertising-to-sales ratio (*t*-statistics are given in parentheses). Therefore in this sample, nearly all the variation in *PL* is explained by manufacturing *CR4* and the intensity of advertising.

Other researchers have found that *PL* helps explain food manufacturers' profits or selling prices. A small study by Horst (1974) found that a dummy variable for *PL* (= 1 when *PL* was high) had a significant negative effect on (1) 1969–1971 food firms' profits as a percent of stockholders equity and (2) 1963 food manufacturing price-cost margins. A more ambitious study of 1979–1980 average, U.S., retail, food-brand prices found that private-label prices were 7 to 12 percent lower than the prices of comparable manufacturers' brands, *ceteris paribus*¹⁰ (Wills and Mueller, 1989).

Private-label share would seem to be an incomplete measure of vertical competition between food retailers and food manufacturers. Relative information access, temporal measures of advertising or promotion effectiveness, and measures of the actual share of promotions received by retailers relative to manufacturers' willingness to pay are all potentially useful indicators of relative power. However, none of these is measurable at this time to our knowledge. By contrast, *PL* is measurable, though difficult or expensive to obtain.

It seems desirable to include the sales of both regular private-labels and generics in any measure of *PL*. But what about the third category of grocery products—unbranded goods? Unbranded foods are found mainly in fresh meats and seafood, fresh fruits and vegetables, random-cut cheeses, and certain delicatessen items. These items are purchased in bulk and sorted or wrapped by retailers in their stores. Because retailers have typically resisted encroachment by branded products into their unbranded product categories, we believe that it is appropriate to include unbranded sales in any measure of *PL* as we have done in this study.

⁹ These 41 five-digit SIC product-class observations were built up from 167 finer product categories taken from a leading commercial supplier of grocery market information. The sample included all warehouse grocery categories with *PL* ≥ 5 percent.

¹⁰ Being held constant are advertising intensity (*TAS*), the leading brand market share, and generics' presence and share. This monumental study had a sample of thousands of brands of processed foods and beverages.

V. The Sample

In 1987 the Census includes 160 processed food and tobacco product classes (five-digit SICs) which most economists agree better represent the product definitions of consumer product markets than more aggregated definitions. However, sometimes the more aggregated four-digit industry definition provides the best correspondence with an economic market (e.g., beer). To arrive at the final sample of food and tobacco markets to test the hypotheses, we first removed the 47 product classes that were classified as producer goods. From the remaining 113 consumer-product classes, those product classes that were too narrowly defined at the five-digit level were replaced by the more appropriate four-digit industry or by a special combination given by the Census in a 1987 special tabulation (see Connor *et al.*, 1985 for a description of the special tabulations for 1977 and prior census years). This left 101 markets but six more were not appropriate economic markets for various reasons.¹¹ This left 95 food and tobacco markets as the universe for inclusion in the present study.

The last major reason for the loss of observations was the lack of reliable information on private label (and generic) shares held in each product class. We took the data developed by Willis and Rogers (1994) for their advertising intensity model, for which they calculated private label shares held in each of 60 food and tobacco markets for the year 1987. Their major source was SAMI, but they also used IRI data for a handful of observations and industry knowledge in four additional cases (for details see Willis, 1992). To these data we added 1977 data, but since not all industries were comparable over time we lost a few observations (e.g., pasta). We also added broilers and turkeys to the Willis and Rogers data using industry information for the private label share.

The net result was a sample of 48 food and tobacco markets which could be compared over the 1967 to 1987 period. These 48 observations represented 58 percent of the value of 1987 shipments from the universe of nonproducer good product classes that at least approximated economic markets. Every three-digit industry group was represented in the data set. The complete list of industries, along with several variables, are given in Table II of Connor *et al.* (1995), sorted by the size of 1977–1987 change in concentration.

VI. Variable Definitions

1. CHANGE IN $CR4(\Delta CR4)$

The dependent variable is the absolute percentage point difference between ending concentration ($CR4_{87}$) and beginning concentration (either $CR4_{77}$ or $CR4_{67}$), where concentration is measured by the percentage four-firm concentration ratio.

¹¹ Miscellaneous food products SIC 20999 or SIC 20873, soft drink syrup manufacturing was combined in just one observation on soft drinks, SIC 2086, to account for the vertical nature of that industry).

Others, most notably Wright (1978), rejected this specification due to its boundedness $[0, 100]$ and used a transformed dependent variable that treated a change in concentration from 4 to 5 the same as a change from 40 to 50 or from 95 to 96 (see Rogers, 1984 for details). Previous research found Wright's specification had negligible effects on the estimates. We use only the simple arithmetic difference in this paper.

2. INITIAL CONCENTRATION RATIO (*ICR*)

ICR is the beginning year's four-firm concentration. In their survey article on concentration-change studies, Curry and George (1983) conclude that *ICR* was the most important explanatory variable. A negative relationship is expected because leading firms in concentrated industries are likely to lose market share over time to fringe firms by following dominant-firm strategies. In addition, empirical researchers find unconcentrated industries tend to increase in concentration over time (Rogers 1984). *ICR* helps correct for the boundedness in ΔCR .

3. INITIAL SIZE (*IS*)

Industry size is measured by the natural logarithm of value of shipments in the initial year. Including *IS* follows directly from Equation (4).

4. GROWTH (*GRO*)

Since this is a concentration change study, some economists might argue that the most relevant variable is change in industry size or the industry's growth rate. In previous concentration-change studies, growth was the most commonly used explanatory variable, yet it has both theoretical and empirical support for either a negative or a positive influence on concentration change. If large firms outgrow small firms, as they might during strong merger waves, then growth could lead to higher concentration. However, if growth creates niches that encourage new entry on a small scale, then growth should result in lower concentration. Growth is measured by the percentage increase in value of shipments over time.

5. ADVERTISING INTENSITY (*TAS*)

Economists differ on whether advertising impedes or encourages entry into consumer goods markets. A new firm entering a market with established firms that have been advertising their products for decades will likely turn to advertising to inform consumers of its new presence in the market. To switch consumers, entrants will usually have to advertise or promote their products more intensely than the incumbents. This use of advertising to assist entry is often cited as supporting the position that advertising aids entry. However, the higher advertising intensity of new entrants might trigger a reaction from existing firms who would escalate their

advertising levels to protect their market position. The likely result is that fewer firms can withstand the new, higher levels of advertising costs and some firms will fail. Connor *et al.* (1985) concluded that advertising-supported-and-maintained product differentiation was the primary barrier to entry in the food and tobacco manufacturing industries.

Research on advertising and concentration has been frustrated by the lack of advertising data across a wide spectrum of industries. The first studies used crude categorical variables to represent the degree of product differentiation. Rogers and Tokle (1996) reviewed available data sources on advertising and concluded that the data supplied by a private commercial firm, Leading National Advertisers (LNA), are best suited to research on competition. In this study, we have *TAS* supplied by *LNA* for both 1977 and 1987, allowing us to test the change in advertising intensity hypothesis for a total media advertising-to-sales ratio.

6. PRIVATE LABEL SHARE (*PL*)

Vertical competition is measured by the percent share held by private label (and generic) products. The 1977 private label share, which includes unbranded food product sales, was calculated by Connor (1982). As *PL* increases we would expect retailers to countervail, as shown in Equation (4).

7. MINIMUM EFFICIENT SIZE (*MES*)

MES serves as a technical barrier to entry created by economies of scale and, therefore, should be positively related to ΔCR . Four times *MES* is a lower bound on *CR4*. The *MES* value is critical to Sutton's model because it is a proxy for the exogenous sunk costs a firm must commit to enter an industry. In Venturini's technological model, the effect of *MES* is already included in *PL*. Despite its theoretical appeal, the empirical proxies available suffer substantial shortcomings. The method of calculating *MES* in this and most other studies rely on the midpoint-plant size approach calculated from Census data. Although this approach has been shown to be highly correlated with the preferred economic-engineering estimates (Connor *et al.* 1985), the approach still suffers from being limited to single-product plant level economies of scale, rather than scope or firm level. Also it has an upward bias whenever constant costs are found, since large firms can expand beyond *MES* levels without a cost disadvantage. Moreover, as *MES* is by construction positively highly related to concentration, we make only limited use of it in models where initial concentration is included.

To summarize, the augmented version of Equation (4) takes the following form:

$$\Delta CR4 = \alpha + \beta_1 ICR + \beta_2 PL + \beta_4 GRO + \beta_5 IS + \beta_6 TAS + \beta_7 MES + e \quad (6)$$

(-)
(-)
(-)
(+)
(+)

where the expected signs of the regression coefficients are given in parentheses. For these coefficients, we apply one-tail tests of statistical significance. Only the growth variable *GRO* has an ambiguous prediction.

8. DESCRIPTIVE STATISTICS

The descriptive statistics of the main variables are given in Table III of Connor *et al.* (1995). Concentration, as measured by the *CR4*, did increase on average over the two time periods of interest. A larger average increase took place in the second decade of 1977 to 1987 than in the decade from 1967 to 1977. By 1987, average sample concentration had increased 7.5 percentage points to reach nearly 60 percent. The total advertising-to-sales ratio, *TAS*, had an average value of 2.4 percent in 1977 and 2.8 percent in 1987. Since the data set excludes producer goods industries, no industry had zero advertising but substantial range does exist – from a low of 0.02 percent (vinegar and cider) to a high of 11.7 percent (chewing gum) in 1977.

PL, the percentage share held by private labels, in our sample averaged nearly 13 percent in 1977 and increased to nearly 17 percent in 1987, with substantial variation in each year as some industries had no private label sales and one (broilers) had over half of its sales in the private label category. Although different procedures were used to calculate private label shares in 1977 and 1987, the data appear quite consistent.

Industry size varied dramatically from the very small (canned mushrooms) to the very large (soft drinks). Growth in value of shipments measured in nominal terms increased on average 71 percent over the 1977 to 1987 period. The use of nominal growth does fail to capture the declining size of the cigarette industry as its price increases more than offset its reduced volume sold during this period. Finally, minimum efficient scale (*MES*), had an average value of 3 percent in 1987, implying about 33 single-plant firms of optimal size would fit in the average food industry.

Simple correlations for the main variables are given in Table IV of Connor *et al.* (1995) for the 1977 to 1987 period. Not surprisingly, *CR477* and growth are negatively related to concentration change. But unexpectedly, the private label variables are positively related to concentration change and all of the advertising variables are negatively related. *MES77* has the lowest simple correlation. Although simple correlations among independent variables do not give the full picture of potential multicollinearity problems, when two variables have a high correlation it can prove difficult to unravel their independent explanatory power in an *OLS* regression. Perhaps the most noteworthy is the high correlations between *PL* and *CR477* and *TAS77*. In fact, a regression of *PL* on just *CR4* and *TAS* (and *TAS* squared) yields a strong fit in each year, explaining just over half of the observed variation. This relationship between *PL* and standard structural variables is a concern for empirical testing of the vertical competition hypothesis. The high

positive correlation between *MES* and *TAS* is also of interest and suggests that sunk costs associated with building a *MES* plant are not unrelated to the degree of advertising intensity observed in an industry. It adds to our concern that the method of calculating *MES* reflects the common belief that large firms in concentrated industries build big plants not because *MES* requires it but because diseconomies of scale do not prevent it (Connor *et al.*, 1985).

VII. OLS Regression Results

The most basic model that controls only for industry growth (*GRO*) and initial concentration (*ICR77*) shows no support for the hypothesis that the private label share in 1977 is negatively related to concentration change during the 1977 to 1987 period (Table I, Equation 1a). To check whether this result was influenced by brevity of the time period, we expanded the period to 20 years (1967–1987) period and reestimated the same model, using *ICR67*, *IS67* and growth over the 20 years (Equation 1b). The results were more encouraging as percent private label *PL77* was negative and significant at the 10 percent level. In Equation 2a, we substitute *TAS77* for the private label variable and add industry size *IS*. Contrary to a long history of research, the coefficient on *TAS77* is insignificant. Again the same model was estimated over the longer 1967 to 1987 period; here the estimated coefficient moved toward positive significance but not nearly enough to reach conventional significance levels (Equation 2b). In Equations 3a and 3b we substitute separate variables for electronic and print advertising-to-sales ratios, but neither reaches significance. The last model of Table I uses both *PL77* and *TAS77* (Equations 4a and 4b). As expected, the collinearity between the two does lower their calculated *t* statistics compared with earlier equations.

This difference in the results between the 1977 to 1987 period and the longer 1967 to 1987 period will show itself repeatedly in the results. The 1977 to 1987 period is continually marked by insignificance, and even reversal of estimated effects over the standard results found in the literature. Whether the advertising-concentration change finding is specific to the 1980s and the relaxed public policy of that era, or whether it marks the arrival of a new equilibrium, only future studies can tell.

In Tables II and III, we undertook examinations of the sensitivity of the results to alternative samples and variable definitions. Following Venturini (1993, Table II), we calculated some interaction terms between private label and advertising and private label and initial concentration (Table II). The interaction of *PL77* and a concentration dummy split at *CR4* of 50 percent, allowed testing for different effects in concentrated and unconcentrated industries. Venturini's two-stage model and empirical support suggests that private label will exert its greatest deconcentrating effect in the more concentrated markets. In the shorter 1977 to 1987 period (Equation 5a), neither interaction term was significant, but in the longer period (Equation 5b) the private-label effect was negative for the less concentrated industries and

TABLE I. Regression results explaining concentration change in 48 U.S. food and tobacco manufacturing industries

Independent variables	Time Periods: a=1977 to 1987, b = 1967 to 1987							
	1a	1b	2a	2b	3a	3b	4a	4b
<i>ICR</i>	-0.061 (-0.898)	-0.259 ^a (-2.539)	-0.014 (-0.216)	-0.212 ^b (-2.140)	-0.024 (-0.389)	-0.211 ^b (-2.199)	-0.027 (-0.375)	-0.273 ^a (-2.537)
<i>PL77</i>	0.010 (0.095)	-0.223 ^c (-1.416)					-0.010 (-0.098)	-0.207 (-1.267)
<i>GRO</i>	-0.033 ^c (-1.719)	-0.013 (-1.472)	-0.030 (-1.573)	-0.012 (-1.352)	-0.029 (-1.486)	-0.013 (-1.432)	-0.029 (-1.497)	-0.013 (-1.499)
<i>IS</i>			0.757 (0.719)	-0.256 (-0.148)				
<i>TAS77</i>			-0.639 (-1.298)	0.571 (0.749)			-0.164 (-1.231)	0.344 (0.450)
<i>TVR77</i>					-0.564 (-1.019)	0.853 (0.993)		
<i>NOM77</i>					-0.710 (-0.908)	-0.135 (-0.109)		
\bar{R}^2	0.040	0.113	0.063	0.063	0.052	0.073	0.052	0.096

Note: *t* statistics given in parentheses; superscripts a, b, and c represent significance from zero at the 1, 5, and 10 percent levels, respectively.

TABLE II. Regression results explaining concentration change in 48 U.S. food and tobacco manufacturing industries

Independent variables	Time Periods: a = 1977 to 1987, b = 1967 to 1987			
	5a	5b	6a	6b
<i>ICR</i>	-0.052 (-0.636)	-0.346 ^a (-3.082)	-0.065 (-0.953)	-0.261 ^a (-2.582)
<i>GRO</i>	-0.028 (-1.378)	-0.012 (-1.349)	-0.031 (-1.608)	-0.012 (-1.349)
<i>TVR</i>	-0.425 (-0.761)	0.853 (1.029)		
<i>PL77LA</i>			-0.003 (-0.025)	-0.256 ^c (-1.619)
<i>PL77HA</i>			0.083 (0.503)	0.059 (0.229)
<i>PL77 · CR4</i> < 50	-0.006 (-0.059)	-0.261 ^c (-1.620)		
<i>PL77 · CR4</i> ≥ 50	0.074 (0.360)	0.183 (0.610)		
\bar{R}^2	0.014	0.135	0.026	0.131

Note: *t* statistics given in parentheses; superscripts a, b, and c represent significance from zero at the 1, 5, and 10 percent levels, respectively.

insignificant for the more concentrated industries, contrary to Venturini's findings. In Equations 6a and 6b, the interaction between private label and *TAS* (split at *TAS* = 1%) was tested. Again in the shorter period, neither was significant. In the longer period, private label share (*PL77LA*) did have a negative, significant effect for industries with low advertising intensities. In the more advertising-intensive industries, private label share was unrelated to concentration change.

The four models that are presented in Table III examine possible nonlinearities in the effect from advertising intensity. Because separating total advertising into its two forms did not prove successful, we limit ourselves to examining *TAS77*. In the first two models, we omit *PL* and use *TAS77* and its square. Neither prove significant in the shorter time period (Equation 7a), but in the longer period *TAS77* reaches positive significance at the 10 percent level and combined with its quadratic term remains positive throughout the relevant range (Equation 7b). Model 8 is the first time we included the *MES77* variable. It is consistently positive and significant in both periods. This finding is consistent with Sutton's theory that the larger the *MES*, the fewer firms that will be able to fit into the industry profitably. However, readers should recall our reservations about the construction of the *MES* variable. In the longer 1967 to 1987 period, the addition of the *MES* variable does provide improved results with both the advertising terms reaching significance and overall the model provides the highest adjusted \bar{R}^2 so far.

TABLE III. Regression results explaining concentration change in 48 U.S. food and tobacco manufacturing industries

Independent variables	Time Periods: a = 1977 to 1987, b = 1967 to 1987							
	7a	7b	8a	8b	9a	9b	10a	10b
<i>ICR</i>	-0.026 (-0.394)	-0.235 ^b (-2.349)	-0.064 (-0.996)	-0.262 ^a (-2.841)	-0.040 (-0.603)	-0.250 ^a (-2.548)	-0.061 (-0.878)	-0.272 ^a (-2.736)
<i>PL77</i>							0.076 (0.709)	0.001 (0.007)
<i>GRO</i>	-0.033 ^c (-1.686)	-0.014 (-1.556)	-0.039 ^b (-2.088)	-0.014 (-1.655)	-0.034 ^c (-1.737)	-0.015 (-1.653)	-0.035 ^c (-1.869)	-0.014 (-1.635)
<i>IS</i>	0.753 (0.711)	-0.258 (-0.150)	0.753 (0.751)	-0.371 (-0.236)	0.774 (0.741)	-0.164 (-0.098)		
<i>TASCAP</i>					1.970 (0.992)	6.307 ^b (2.074)	2.988 ^c (1.451)	6.617 ^b (2.149)
<i>TASCAP</i> ²					-0.331 ^c (-1.421)	-0.699 ^b (-1.915)	-0.489 ^b (-2.004)	-0.855 ^b (-2.313)
<i>TAS77</i>	0.426 (0.291)	3.250 ^c (1.427)	1.283 (0.897)	4.215 ^b (1.996)				
<i>TAS77</i> ²	-0.102 (-0.772)	-0.262 (-1.247)	-0.238 ^b (-1.737)	-0.476 ^a (-2.321)				
<i>MES</i>			0.885 ^a (2.435)	1.647 ^a (3.007)			0.706 ^b (2.106)	1.313 ^a (2.567)
\bar{R}^2	0.054	0.075	0.153	0.224	0.081	0.120	0.141	0.232

Note: *t* statistics given in parentheses; superscripts a, b, and c represent significance from zero at the 1, 5, and 10 percent levels, respectively.

The last two models in Table III repeat the first two but make a modification in the *TAS77* variable by limiting the values to no higher than 8 percent. Three industries (chewing gum, 11.7%, cereals, 10.1%, and liquor, 8.8%) with *TAS77* values exceeding 8 percent were given the value of 8% in the new variable called *TASCAP*. This is a check on whether the extreme range of *TAS* was causing estimation difficulties, especially when *TAS* was squared. The results in Equations 9a to 10b suggest that the extreme values of *TAS* were indeed biasing the estimates. *TASCAP* and its square are significant and yield a positive effect beyond the range of the *TAS* values. However, the truncated variable does not help the significance levels of either *PL* or *IS*. Although the models shown in Table III contain our best-filling models, none approach the goodness of fit of Venturini's (1993) or Rogers' (1984) best models.¹²

VIII. Conclusions

We fail to find any evidence supporting a dynamic version of Galbraith's counter-vailing-power hypothesis. Nothing in our empirical work can be construed as support for the idea that retailer vertical competition kept U.S. food-manufacturing from becoming more concentrated in the 1980s, though Venturini found such a relationship in earlier periods. Nor can we find support for Sutton's (1991) model that suggests that industry size is inversely related to concentration. The reasons for rejecting these models deserve investigation.

There are three avenues that we believe may reward further empirical effort. First, our results for the 1980s may be due to special characteristics of the decade. We have already mentioned the egregiously lax enforcement of U.S. antitrust laws, especially merger controls. We note that Rogers and Ma (1994) also find that the pre-Venturini models of concentration change have broken down in the 1980s. It is quite common for macroeconomic conditions to break previously sturdy structural relationships. In their study of the influence of buyers' concentration on allocative efficiency, Clevinger and Campbell (1977) also found the significance of buyer *CR4* sensitive to time period.

¹² In some further testing, not reported here, we found that the effect from *ICR* did differ depending on whether the industry was initially concentrated or unconcentrated. The more concentrated industries displayed a much smaller (about one-half the size) estimated coefficient than was found in the unconcentrated (*CR4* < 50) industries. This result is consistent with that found by Tokle, Rogers and Adams (1990) for all manufacturing industries over the 1967 to 1982 period. Additionally, like Venturini, we found that the deconcentrating effect from growth differed for industries with low advertising (less than 1%) from that found in higher advertising industries. Only in the low-advertising industries did growth have a significant deconcentrating effect. In addition, we estimated a model for the 1977 to 1987 period where every variable was entered in both its 1977 level (e.g., *PL77*) and as an absolute change from 1977 to 1987 (except for growth, which was a percentage change). In these models both *PL* and change in *PL* took negative signs, but insignificant. Growth was negative and significant at the 10 percent level. The change in *TAS* was insignificant, both in a statistical sense and in magnitude, but the level variable, *TAS77*, was negative and significant, contrary to our expectations.

Second, our results may depend on the particular measure of private label share *PL* that we devised. Perhaps in the 1980s food manufacturers developed strategies (e.g., promotional expenditures) to counteract effectively against private-label programs. Perhaps the *PL* measure should exclude unlabeled products. Perhaps retailer backward vertical integration works differently from contractual private-label purchases. Perhaps the information advantages of retailers have become the major source of countervailing power, and private-label programs no longer provide any clout for retailers.

Third, more attention needs to be given to alternative market samples. Marion and Kim (1991) concluded that statistical studies of concentration change really have nothing to say about producer-good industries in food manufacturing. It is obvious that the largest increases in food-industry concentration occurred in producer-good industries or nearly homogenous-good consumer industries, such as beefpacking (Connor, 1991). This upheaval in historical patterns in the 1980s is a most curious phenomenon.

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