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CAN HEALTH WARNINGS AND NUTRITIONAL
INFORMATION LOWER WELFARE?

by

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CAN HEALTH WARNINGS AND NUTRITIONAL INFORMATION LOWER WELFARE?

Increasingly, government agencies and consumer groups are disseminating information about the nutritional, health, and other attributes of foods and drugs. The effect of this information on prices, quantities, and welfare depends upon market structure. In monopolistically competitive markets, even free, accurate information could lower welfare, while inaccurate or irrelevant information might raise welfare.

Because of the public-good nature of information, even competitive product markets do not supply the optimal level of information to consumers. As a result, there may be a social benefit to public-sponsored information programs. In a competitive market, if information can be inexpensively and accurately conveyed to consumers, welfare will rise. If a market is monopolistically competitive—as Salop has argued—information could either benefit or harm society, since information causes a shift from one second-best equilibrium to another in which neither price nor variety are optimal. In imperfect competition, information may increase welfare by reducing consumer uncertainty or improving health, but it may decrease welfare by raising prices or diminishing variety. Unlike Salop's paper, which focused on information's effect on variety, this paper concentrates on its effect on price.

Conflicting experimental and survey evidence leaves open the question whether nutritional and health information can be accurately and inexpensively conveyed to consumers. On the other hand, there seems little doubt that large-scale government warning programs can (rightly or wrongly) have major impacts upon markets. For example, American consumption of meat and eggs has changed profoundly in response to warnings about cholesterol, though

scientists still debate the importance of dietary cholesterol levels on health (Consumer Reports). Similarly, the recent saccharin scare has affected consumption, while the actual carcinogenic nature of saccharin is still being investigated, and the cancer danger from consumption may be offset by a reduction in obesity-related dangers.

Dixit and Norman; Colantoni, Davis, and Swaminathan; and Sexton examine the effect of accurate and inaccurate information on welfare. This paper concentrates on the effects of changes in purchasing behavior caused by either correct or incorrect interpretations of the warnings or nutritional statements and not on the health benefits per se. A complete cost-benefit analysis of an information program would consider the cost of administration, the health benefits from correctly interpreted information, the harms from misinterpreted information, and the effects of the information on market equilibrium (e.g., price and variety).

The first section briefly surveys the literature on information programs. The second section describes the price effects of information in competitive markets. The third section presents an illustrative monopolistic competition model. In that section, evidence that many food and drug firms operate under conditions of increasing returns (and, hence, cannot be purely competitive firms) is presented. In the fourth section, simulations based on a flexible utility function are used to show that information could have a variety of perverse effects. The last section presents conclusions.

Information and Warnings

Many government agencies and consumer groups provide nutritional information, health warnings, and even taste comparisons. Sexton provides a good summary of this literature.

Today, statutory authority for food labeling is shared by at least three federal agencies. The U. S. Department of Agriculture (USDA) has jurisdiction over meat and poultry products while the Food and Drug Administration (FDA) controls all other foods. The Federal Trade Commission (FTC) is involved with food labeling through its regulation of food advertising.

In 1972, in response to the White House Conference on Food Nutrition and Health, the FDA promulgated rules requiring the current standardized nutritional label for all packaged food products which either are nutritionally fortified or which make nutritional claims. Further, the regulations require that any voluntarily provided data be in the FDA format.¹

A pending FTC proposal would require that nutritional and caloric labeling on packages be presented in television commercials (Bettman). Similarly, drug warnings on packages would have to be presented in advertising and commercials (Muller and Perloff).

The FDA intends to propose that sodium and potassium content be included in all nutritional labels (Sexton, p. 2). The USDA, FDA, and FTC have held joint public hearings on the issue of food labeling at five locations in the United States in 1978.

Further various governmental and private agencies have provided health warnings concerning cholesterol, sodium, potassium, saccharin, cyclamates, calories, protein levels, and other components and attributes of foods and drugs.

The empirical evidence on the effects of these information programs indicates that many consumers may ignore or incorrectly interpret the information, while others may intelligently utilize it. Sexton summarizes many of these studies.

Typically, surveys find that consumers approve of nutritional labeling and that they claim they would use such data and that many would be willing to pay for it. Actual behavior, however, is generally not consistent with the survey results. Usually, most consumers (and, especially, low-income groups and those with little education) do not understand, acquire, or use nutritional data. There is some evidence, however, that consumers are increasingly making use of nutritional and other information such as drained weight and proper storage instructions (Daly; Smith, Brown, and Weimer).

A number of studies suggest that how the data are presented is crucial in determining whether consumers will use and understand it.² There have been a number of relatively carefully controlled experiments where consumers have been shown commercials with nutritional information or health warnings and were then tested on their comprehension, or their purchasing behavior was observed.³ Like most of these studies, Scammon examined an FTC proposal to require presentation of nutritional data on television commercials. Commercials for two peanut-butter spreads were shown with (fabricated) nutritional information designed to show that the less popular brand was more nutritional. Several formats for presenting the data were used. The results were mixed. Apparently, the model of presentation is extremely important. One disturbing result was that the experimental group which received nutritional information in percentage form was more likely to choose the less-nutritional brand than was a control group which did not receive the

information. On the other hand, where the control group received nutritional information in adjective form, they were more likely to choose the more nutritional product than was the control group.

A number of studies have found that manufacturers' promotional statements on labels are as effective in influencing consumers' purchasing decisions as explicit nutritional data (Berning and Jacoby; Jacoby, Chestnut, and Silberman). In short, the efficacy of conveying nutritional information is open to question. Nonetheless, some warning programs—especially those which refer to generic groups of food items rather than brands—have clearly influenced behavior: witness the consumption of eggs, cigarettes, or specific brands with botulism or other severe warnings.⁴

While the possibility of cheaply conveying information which consumers will understand and use is of crucial importance in evaluating a public policy program, the remainder of this paper largely abstracts from this issue to concentrate on the market implications of such an information program where consumers stop purchasing certain food or drug items. For the purpose of illustration, consider two markets for similar types of food. In the first market, X_1 units of type one food are sold, while X_2 units of type two food are sold in the second market. Suppose that type one food is inherently high in sodium (saltwater fish) or cholesterol (eggs and pork) while the type two food is not. To the extent that consumers react to warnings about sodium or cholesterol, we would expect that X_1 would fall while X_2 could rise or fall.

Thus, whether consumers correctly understand the reason for switching is less crucial than whether they switch as far as prices, quantities, and

number of firms are concerned. The following model concentrates on programs which actually cause consumers to change their consumption behavior.

In the following, an agnostic approach to the effect of the warning on the second market is taken. For example, if the government warned consumers that candy which contained peanuts was dangerous (due to the possibility of aflatoxin) and consumers inferred that all candy was carcinogenic, consumption of nonpeanut-containing candy might drop as well.⁵ Alternatively, if consumers understood that only peanut-containing candy was dangerous, demand for other candy could rise as consumers switched types of candy.

Competition

For comparison purposes, we first consider the effects of information-induced brand shifts under competition. If both sectors of the industry are competitive, then the warning information could cause prices to rise or fall; however, if supply curves are essentially horizontal, no price effects will occur. Even if supply curves are upward sloping, prices will fall in the sector with the warnings and rise or fall in the other sector, depending on whether the warning causes the demand in the second sector to rise or fall. While it is conceivable that the warnings could cause demand to fall in both sectors, it is hard to imagine a situation where it would rise in both. The warning will only cause both prices to rise if it is completely misinterpreted. Indeed, the necessary condition for prices to rise in both sectors is that demand increases in both sectors. If the market is competitive and free, correctly interpreted information will increase social welfare. The price effects are "correct" in the sense that they reflect changed consumer demands. That is, the price effects represent appropriate consumer responses to the information. In monopolistic competition, however, prices need not reflect appropriate changes in demand.

Monopolistic Competition

In most packed and processed foods and over-the-counter (OTC) drug industries, there are a large number of firms and, apparently, few barriers to entry other than initial start-up costs. As a result, it seems reasonable to assume that these markets are competitive, monopolistically competitive, or oligopolistic. The distinction being drawn between the last two categories is that, in monopolistic competition, entry drives economic profits to zero, while in oligopoly economic profits may be positive. While a reasonable case can be made that most of these industries have no better-than-average profits, most of the following analysis of monopolistic competition would be little changed if the zero-profit condition were replaced by an exogenous number of firms condition.⁶

There are many possible reasons why processed food and OTC drug firms might be noncompetitive (i.e., face a downward-sloping demand curve). First, to the extent consumers perceive taste differences between brands, each brand is a differentiated product and, hence, has a finite demand elasticity. Second, if marginal costs are largely constant while there are large fixed costs associated with each brand (lumpy capital, research and development, and introductory advertising or marketing), then the average cost lies strictly above marginal cost everywhere. Thus, due to strictly increasing returns to scale, a purely competitive industry is impossible. Each monopolistically competitive firm will operate in the downward-sloping portion of the average cost curve. Local monopoly power and other possible explanations exist as well.

Salop has examined a model in which product differentiation matters. In this paper, the second factor is emphasized for expositional simplicity. It would be technically straightforward to extend the model to take into account nonhomogeneous products, but doing so would only complicate the mathematics without providing important insights beyond those Salop has obtained.

Unfortunately, there is a limited empirical literature on the costs of producing processed foods. That literature which exists, however, indicates that many packing and processing firms operate under conditions of increasing returns. Those studies use both engineering and econometric evidence. For example, Thor and Capel examined the operations of the Florida citrus packing-houses and found that marginal costs were largely constant while both short- and long-run average cost curves were strictly declining (due to large fixed costs).

Other studies of packing found similar results. Stollsteimer, Courtney, and Sammet showed the same shaped marginal and average cost curves in Californian pear packing. Jesse indicated that marginal costs are constant in mature green tomato packing in California and that plants operated at 70 percent of maximum capacity. Wilmot, Shaw, and Heron found similar shaped average and marginal cost curves with cotton gins in the San Joaquin Valley of California. Moreover, they found that in 1971-72 firms operated at 53 percent of maximum capacity while in 1972-73 they operated at 78 percent of capacity.

Bird found that there are strictly declining average cost curves in freeze drying of foods with constant (or possibly falling) marginal costs. There is also a literature showing that OTC drugs are produced with constant marginal costs and falling average costs; see, for example, Bartels.

In a monopolistically competitive industry, each firm's equilibrium level of output is determined by marginal revenue equal marginal cost, while the number of firms is determined by the entry equation: entry occurs until profits are zero.⁷ If we assume that within each sector products are viewed by consumers as being roughly equivalent (as would be appropriate in a packing industry) and each firm has an identical cost function, each firm's profit-maximizing objective may be written as

$$(1) \quad \max_{x_i^j} x_i^j p_i \left(x_i^j + \bar{x}_i^j \right) - \left(m_i x_i^j + F \right),$$

where x_i^j is the output of the j th firm in the i th sector, \bar{x}_i^j is the output of all the i th sector firms except the j th one ($x_i^j + \bar{x}_i^j \equiv X_i$), m_i is the constant marginal cost faced by all firms in the i th sector, F is the fixed costs faced by all firms, and $m_i x_i^j + F$ is the total cost of producing x_i^j units of output. In order to maximize profits (1), each firm will set marginal cost equal to marginal revenue. This condition may be written in elasticity form (suppressing the j superscript) as

$$(2) \quad p_i \left(1 - \frac{1}{n_i \epsilon_i} \right) = m_i,$$

where n_i is the number of firms in the i th sector and ϵ_i is the market demand elasticity for the i th sector products. Equation (2) is the familiar symmetric-firm, Cournot-equilibrium condition where $n_i \epsilon_i$ is an i th sector firm's elasticity.⁸

If entry occurs until profits are zero, price equals average cost:⁹

$$(3) \quad p_i = m_i + \frac{n_i F}{x_i}.$$

Equations (2) and (3) determine the equilibrium in each sector. As is well known, these equilibria will not be Pareto optimal.

To capture the effect of information on consumers' behavior (and, hence, on the equilibrium), an explicit model of consumer behavior will be postulated. Each individual's utility depends on the two products, X_1 and X_2 ; an individual's health, H ; and other goods, z .

For specificity, a representative consumer's utility function is assumed to have a constant elasticity of substitution (with homogeneity of degree greater than one) between X_1 and X_2 , while health and other goods enter additively. By assuming this additive specification (strong separability), we are assured that the following partial equilibrium results are equivalent to the general equilibrium solution.¹⁰ The utility function [which is separable in (X_1, X_2)] is written as

$$(4) \quad U [(X_1, X_2), z, H] = \left\{ \alpha X_1^{-\rho} + (1 - \alpha) X_2^{-\rho} \right\}^{-(\mu/\rho)} + z + H,$$

where σ , ρ , and μ are parameters.¹¹

Initially, consumers on low sodium (or cholesterol) diets do not know that the X_1 products contain high levels of sodium so that they do not realize that the ingestion of these products can lower health (H). Health is taken as a constant (independent of consumption of X_1 , X_2 , and z) so each consumer attempts to maximize his utility through his choice of X_1 , X_2 and z :

$$(5) \quad \begin{aligned} & \max_{X_1, X_2, z} U [(X_1, X_2), z, H] \\ & \text{subject to } p_1 X_1 + p_2 X_2 + z = y, \end{aligned}$$

where y is a consumer's income, the price of all other goods (z) is normalized to unity, and the constraint is the usual budget restriction.

Consumers will choose \tilde{X}_1 and \tilde{X}_2 which maximizes their constrained utility:

$$(6) \quad \tilde{X}_1 = \frac{y - z}{p_1 \left\{ 1 + [(1 - \alpha)/\alpha]^{1/(\rho+1)} (p_1/p_2)^{-\rho/(\rho+1)} \right\}},$$

$$(7) \quad \tilde{X}_2 = \frac{y - z}{p_2 \left\{ 1 + [\alpha/(1 - \alpha)]^{1/(\rho+1)} (p_2/p_1)^{-\rho/(\rho+1)} \right\}}.$$

Their elasticities of demand for the two products are

$$(8) \quad \tilde{\epsilon}_1 = \frac{1 + [\alpha/(1 - \alpha)]^{1/(\rho+1)} (p_1/p_2)^{-\rho/(\rho+1)}/(\rho + 1)}{1 + [\alpha/(1 - \alpha)]^{1/(\rho+1)} (p_1/p_2)^{-\rho/(\rho+1)}} < \frac{1}{\rho + 1}$$

$$(9) \quad \tilde{\epsilon}_2 = \frac{1 + [(1 - \alpha)/\alpha]^{1/(\rho+1)} (p_2/p_1)^{-\rho/(\rho+1)}/(\rho + 1)}{1 + [(1 - \alpha)/\alpha]^{1/(\rho+1)} (p_2/p_1)^{-\rho/(\rho+1)}} < \frac{1}{\rho + 1}.$$

If consumers on low sodium diets learn that their health depends inversely (and possibly discontinuously) on their use of X_1 and that their expected health loss is large, their optimal policy will be to stop using X_1 . These consumers conduct a suboptimization:

$$\max_{X_2, z} U [(X_1, X_2), z, H]$$

$$\text{subject to } p_1 X_1 + p_2 X_2 + z = Y$$

$$X_1 = 0.$$

Here, no X_1 is consumed and utility is maximized when $p_2 = U_2$ (the marginal utility of X_2):¹²

$$(10) \quad \hat{X}_2 = (1/\mu)^{1/(\mu-1)} (1 - \alpha)^{\mu/[(\mu-1)\rho]} p_2^{1/(\mu-1)}$$

$$(11) \quad \epsilon_2 = \frac{1}{\mu - 1}$$

If restricting $X_1 = 0$ makes $\widehat{\epsilon}_2$ more inelastic than $\widetilde{\epsilon}_2$ for given p_2 , which seems reasonable,¹³ then we need

$$-\frac{1}{p+1} < \frac{1}{\mu-1},$$

or

$$(12) \quad \mu < -\rho.$$

Since only s fraction of all consumers (without loss of generality, normalized to one) are on low sodium diets and heed the warnings, after the warning information becomes known, market demands and elasticities become:

$$(13) \quad X_1^* = (1-s) \widetilde{X}_1$$

$$(14) \quad \epsilon_1^* = \widetilde{\epsilon}_1,$$

$$(15) \quad X_2^* = (1-s) \widetilde{X}_2 + s\widehat{X}_2,$$

$$(16) \quad \epsilon_2^* = (1-s) \widetilde{\epsilon}_2 + s\epsilon_2.$$

Simulations

The easiest way to demonstrate the unusual properties of this equilibrium is to simulate an economy. For specificity, a relatively small subset of all consumers, $s = 10$ percent, is assumed to be influenced by the new information. That is, 1 in 10 consumers will stop purchasing the type one product (e.g., foods or OTC drugs which are high in sodium or cholesterol).

Initially (prior to the provision of the information), 30 percent of sales were for the type one product (and 70 percent were for type two). There are two obvious ways to impose this condition. Either marginal costs differ while tastes are symmetric (i.e., $\sigma = 1/2$, and the marginal costs differ by enough that $p_1 X_1 / (p_2 X_2) = 3/7$) or the marginal costs are identical across sectors while tastes are asymmetric (i.e., α is set so that $p_1 X_1 / (p_2 X_2) = 3/7$).¹⁴ The following simulations use the asymmetric tastes approach, but similar results would be obtained using the other method.¹⁵ Given this assumption, the two prices are virtually identical initially.

The simulations are presented in table 1. It is assumed in this table that μ equals 0.3. Other values are not presented since none of the percentage change results for the important variables (e.g., price and number of firms) are sensitive to this parameter. In the table, for any given (ρ, n_1) pair, two simulations are presented.¹⁶ These simulations correspond to different choices of $(Y - z)$ and F which, in turn, affect the change in sales by different amounts.¹⁷ In the first simulation of each pair, X_2 sales rise, while in the second, they fall. Thus, the first example shows what happens if sales of X_1 and X_2 remain relatively constant or increase, while the second shows what happens if sales fall (by up to 7.5 percent).

Table 1. Asymmetric Utility, Identical Marginal Costs Simulations

ρ	n_1	Percent Change in:									Market Elasticities After Information	
		$\frac{p_1 X_1}{p_2 X_2}$	X_1	X_2	X_1+X_2	p_1	p_2	n_1	n_2	U	ϵ_1	ϵ_2
-.35	10	-34.24	-9.61	39.59	25.06	.16	-1.38	-7.67	2.28	-1.90	1.38	1.26
	10	-9.35	-9.94	-.06	-2.98	.16	-.44	-8.00	-8.46	-5.09	1.38	1.19
	30	-33.99	-10.36	36.15	22.26	.51	.24	8.39	55.08	-2.30	1.38	1.25
	30	-9.17	-10.36	-1.05	-3.83	.51	.24	8.39	12.71	-5.30	1.38	1.19
-.45	10	-26.09	-9.63	23.58	13.74	.20	-.86	-6.83	.74	-1.10	1.57	1.30
	10	-6.71	-10.12	-3.55	-5.50	.20	.09	-7.34	-1.72	-4.64	1.57	1.26
	30	-25.74	-9.64	22.18	12.67	-.16	-.57	-16.54	-22.86	-1.23	1.57	1.29
	30	-6.99	-10.15	-3.94	-5.80	-.16	.41	-17.01	21.29	-4.73	1.57	1.26
-.55	10	-21.76	-9.83	15.90	8.26	.29	-.28	-5.02	8.14	-.65	1.85	1.38
	10	-4.73	-9.83	-4.81	-6.30	.29	-.28	-5.02	-11.19	-4.23	1.85	1.37
	30	-21.17	-9.73	15.15	7.71	.17	-.38	-1.30	-17.12	-.71	1.85	1.38
	30	-5.74	-10.48	-5.44	-6.95	.17	.60	-2.13	36.12	-4.45	1.86	1.37
-.65	10	-17.98	-9.22	11.79	5.53	.43	-.56	-.14	-6.40	-.21	2.29	1.54
	10	-4.54	-10.35	-6.05	-7.33	.43	.40	-1.39	4.87	-4.14	2.30	1.55
	30	-18.07	-9.67	11.01	4.82	.52	-.16	22.85	-4.84	-.38	2.30	1.54
	30	-3.25	-9.67	-5.99	-7.09	.52	-.16	22.85	-19.41	-4.07	2.30	1.56
-.75	10	-16.63	-9.78	8.67	3.15	.65	.22	8.26	17.60	-.13	3.09	1.82
	10	-2.87	-9.78	-6.73	-7.64	.65	.22	8.26	.93	-3.95	3.09	1.89
	30	-17.73	-10.26	8.88	3.15	-.09	.09	-17.44	20.01	-.14	3.10	1.82
	30	-4.49	-10.26	-6.20	-7.42	-.09	.09	-17.44	3.38	-3.94	3.10	1.88
-.85	10	-17.28	-10.77	7.62	2.11	-.05	.18	-13.15	18.24	.07	4.98	2.48
	10	-4.94	-10.77	-6.35	-7.67	-.05	.17	-13.15	2.90	-3.82	4.98	2.64
	30	-16.44	-10.56	6.96	1.71	.32	.40	32.37	78.42	-.03	4.97	2.49
	30	-4.08	-10.56	-6.83	-7.95	.32	.40	32.37	55.42	-3.90	4.97	2.65
-.95	10	-15.69	-10.63	5.97	.99	.29	.32	26.91	57.38	.14	14.32	5.88
	10	-4.00	-10.63	-6.94	-8.05	.29	.32	26.91	38.21	-3.79	14.32	6.50
	30	-15.37	-10.80	5.39	.53	.76	.77	281.76	371.76	.00	14.31	5.89
	30	-3.62	-10.80	-7.46	-8.46	.76	.77	281.76	314.17	-3.92	14.31	6.51

The simulations show that the information could cause a wide variety of effects. First, even with constant marginal costs, prices may move up or down together or in opposite directions. Further, the direction in which a sector's price moves is independent of the direction of the shift of demand in that sector (prices depend on changes in both ϵ_i and n_i). In contrast, if the industry were competitive (e.g., $F = 0$ so that marginal cost = average cost = price), the information would create no price effect at all.

Second, though these results demonstrate that, unlike competition, both prices may rise, the price changes in these simulations are relatively small. This result, however, is dependent on the actual parameters used in the simulation. If fewer firms were involved (e.g., fixed costs were higher), all the results would be (generally) magnified.

Third, though prices do not vary greatly in these simulations, under the more extreme parameter assumptions shown, the change in the number of firms might be substantial. It should be noted that the price movements and the change in number of firms need not move inversely.

Fourth, the column labeled "U" shows the change in the (admittedly arbitrary) utility index (neglecting health effects). It represents the weighted average of the two types of consumers (those who are affected by the warnings and those who are not). As most of the price effects are positive, the utility measure generally falls. That is, unless the health gains to the consumers who stop consuming X_1 offsets these negative effects, social welfare will fall. In some cases, however, the welfare measure rises, even ignoring the (hopefully, positive) health effects. That is, the warnings—even if inaccurate or overstated—may improve welfare because of the change in prices. This unusual result stems from the non-Pareto-optimal nature of the

monopolistically competitive equilibrium. The information causes a shift from one second-best equilibrium to another. As a result, it is possible that welfare can rise or fall. It should be noted that our utility/welfare measure ignores the number of firms (diversity of products). If product differentiation were allowed, these results would be reinforced: welfare could rise or fall because diversity and prices could rise or fall. As a quick scan of the table indicates, virtually any combination of prices and number of firms rising and falling in the two sectors is possible.

In contrast, if the fixed costs were zero so that the two markets were competitive, utility (net of health effects) must fall. Consumers switch from X_1 to X_2 while prices remain constant. Since they could have chosen the new combination before and did not, the new equilibrium is revealed inferior. Here, welfare can only increase if the health gains more than offset the loss to the health-conscious consumers of a shift from X_1 to X_2 . Further, in the monopolistic competition case, consumers who ignore the health warnings (or are unaffected by them) may gain or lose as p_1 and p_2 rise or fall. In the competitive case, these disinterested consumers are unaffected since both p_1 and p_2 remain constant. That is, in the competitive model, unlike the monopolistically competitive model, there is no income redistribution effect due to price changes.

Conclusions

Where markets are noncompetitive, even free, accurate information may have adverse price effects which could more than offset the health benefits. Thus, cost-benefit analyses of government programs should examine price effects as well as the cost of disseminating the information and the health benefits. The analysis here, of course, applies to goods other than just foods and drugs. For example, the FTC is currently studying information programs in several food cases, protein supplements, antacids, other OTC drugs, insulation, gas mileage, and care labeling.

While this paper concentrated on the possibility that new information could lead to a shift to an inferior monopolistically competitive equilibrium due to adverse price effects, the effect on product variety could reinforce or mitigate the price effects.¹⁸ The simulation ignored the possibility of product reformulation which could be important—especially if diversity matters.

Perhaps the most striking result of this model is that, if a market is monopolistically competitive, even if marginal costs are constant, prices of those products which require warnings and those without warnings may both rise, fall, remain constant, or move in opposite directions after the information is presented. This property of monopolistic competition contrasts with that of competition where, given horizontal supply curves (industry marginal costs are constant), there are no price effects. In competition, even if supply curves slope up, prices of the products with and without warnings will move in opposite directions. Thus, while both prices cannot rise in a competitive world, they can both rise in a monopolistically competitive world.

Reflecting these many possible price effects in a monopolistically competitive world, utility net of health effects may rise or fall. That is, it is possible that the provision of accurate (but relatively unimportant) health warnings may decrease welfare while the provision of irrelevant or incorrect information could raise welfare.

Footnotes

¹For example, see Sexton and the cited papers.

²For example, see Jacoby, Szybillo, and Busato-Schach; and Jacoby, Chestnut, and Silberman. As cited by Sexton, the Better Homes and Gardens 1978 Special Food Survey found 78.5 percent within a panel of its readers had read label information in the last 10 days. This figure is much higher than those found in earlier studies but may be due to the special sample.

³For a discussion of some drug-related studies, see Muller and Perloff.

⁴For example, according to various issues of the Commodity Yearbook, the consumption of eggs has fallen from 334 per capita in 1960 to 304 in 1972 and to 283 in 1979. The per capita consumption of cigarettes was 4,280 in 1967, 4,043 in 1972, and 3,924 in 1979. Of course, other factors beside health information were involved, but a more careful examination would probably magnify the warning effects. According to Surgeon General Richmond, since 1965, milk and cream consumption declined 21 percent and butter declined 28 percent; the percentage of Americans 20 years of age or older who smoke cigarettes dropped 13 percent among women and 28 percent among men (Consumer Reports).

⁵For example, the Proprietary Association, in its presentation before the FTC, argued that sodium and other warnings would cause up to a 7 percent fall in demand for all antacids--not just those containing sodium. See Muller and Perloff for a discussion of this assertion.

⁶According to Business Week, May 18, 1981:

	<u>First-quarter</u> <u>profit margins</u>		<u>Return on</u> <u>invested</u> <u>capital</u>	<u>Return on</u> <u>common</u> <u>equity</u>	<u>10-year</u> <u>growth earn-</u> <u>ings per share</u>
	1980	1981			
All Industries	4.8	5.3	12.1	14.8	11
Beverages	3.8	4.1	13.0	16.8	9
Containers	2.7	3.2	9.6	12.0	8
Drugs	8.7	10.2	17.4	19.7	13
Food processing	3.2	3.0	13.4	16.0	11
Retailing (food)	1.1	1.0	10.5	15.5	8
Tobacco	6.5	6.6	15.4	21.7	12

It should be noted that the drug figures include prescription drugs where patents give firms monopoly power.

⁷In an oligopolistic market, the second equation would be replaced by a condition that the number of firms was predetermined.

⁸If firms have different marginal costs, they may differ in size. In that case, equation (2) should be rewritten as

$$p_i (1 - s_i / \epsilon_i^j) = m_i,$$

where the firm's subscript has been suppressed, s_i^j is the firm's share of total output, and ϵ_i / s_i^j is the firm's elasticity.

⁹For simplicity, we are assuming away the discrete number-of-firms problem. The estimated number of firms will be within one firm of the true discrete number of firms; see Seade for the appropriate modification. Taking explicit account of the discreteness problem would affect the following simulations only trivially.

¹⁰We may think of there being one consumer or many identical consumers. Income-distribution considerations do not enter into the analysis since all consumers are taken to be identical. These specific assumptions which allow

us to ignore general equilibrium feedback effects and income redistribution effects are reasonable given the trivial share of national wealth which is spent on any given food or drug. Below, the assumption that all consumers are identical is relaxed. The utility specification used here is very similar to that used by Dixit and Stiglitz.

¹¹We could, alternatively, assume that health, H , determines the length of one's life, T , and write utility as

$$\int_0^{T(H)} U [(X_1, X_2) z] dt = \int_0^{T(H)} \left[\alpha X_1^{-\rho} + (1 - \alpha) X_2^{-\rho} \right]^{-\frac{1}{\rho}} + z dt$$

which would produce similar results at much greater computational expense.

¹²We need $0 > -\rho > 1$ for the indifference curves to cross the axes. If they did not cross, the $X_1 = 0$ constraint would not be consistent with positive utility.

¹³Presumably, if people are told they cannot safely consume one type of food or drug, they will have a more inelastic demand for that product than before. Previously, they cared about the relative price of the foods or drugs. After the warning, they only care about the price of those foods or drugs which do not carry the warning (relative to the price of the numeraire good, z).

¹⁴In the following simulations, α varies between 0.51 and 0.64.

¹⁵See Perloff. One could reasonably argue that the numbers used in this simulation are close to those in the antacid market for sodium- and nonsodium-containing products.

¹⁶Once n_1 is determined, given the parameter values, so is n_2 .

¹⁷The values of $(y - z)$ and F were initially chosen so that n_1 takes on the value of 10 or 30. The second simulation for each given n_1 uses a value of F which is one-third as large as in the first simulation.

¹⁸As the simulations show, the number of firms could increase or decrease in response to new information. If each firm represents a different variety, then variety can similarly increase or decrease. Colantoni, Davis, and Swaminathan have examined the desirability of information or regulation where goods have several attributes. Salop has considered the welfare implications of a change in variety in a monopolistically competitive world.

References

- Bartels, Charles R. "Cost Trends and Controls in Pharmaceuticals." Chemical Engineering Progress 54(1958):59-61.
- Berning, C., and Jacob Jacoby. "Patterns of Information Acquisition in New Product Purchases." J. of Consumer Research 1(1974):18-22.
- Bettman, J. R. "Issues in Designing Consumer Information Environments." J. of Consumer Research 2(1975):169-77.
- Bird, Kermit. "Freeze-Drying of Foods: Cost Projections." USDA Marketing Research Report No. 639, January 1964.
- Business Week. "Corporate Scoreboard." May 18, 1981, pp. 75-104.
- Capel, George L. "Comparative Costs of Alternative Methods for Performing Certain Handling Operations in Florida Citrus Packinghouses." Agricultural Experiment Station Bulletin No. 609, University of Florida, June 1959.
- Colantoni, C. S., O. A. Davis, and M. Swaminathan. "Imperfect Consumers and Welfare Comparisons of Policies Concerning Information and Regulation." The Bell J. of Econ. 7(1976):602-615.
- Commodity Yearbook. New York: Commodity Research Bureau, Inc., 1980.
- . "Diet and Heart Disease." Consumer Reports 46(1981):256-260.
- Daly, Patricia. "The Response of Consumers to Nutritional Labeling." J. of Consumer Affairs 10(1976):170-8.
- Dixit, A. K., and V. Norman. "Advertising and Welfare." The Bell J. of Econ. 9(1978):1-17.
- Dixit, A. K., and Joseph E. Stiglitz. "Monopolistic Competition and Optimum Product Diversity." Amer. Econ. Rev. 67(1977):297-308.
- Jacoby, Jacob, Robert W. Chestnut, and William Silberman. "Consumer Use and Comprehension of Nutritional Information." J. of Consumer Research. 4(1977):119-128.

- Jacoby, Jacob, George J. Szybillo, and Jacqueline Busato-Schach. "Information Acquisition Behavior in Brand Choice Situations." J. of Consumer Research 3(1977):209-216.
- Jesse, Edward V. "Packing California Mature Green Tomatoes." USDA Agricultural Economic Report No. 282, February 1975.
- Muller, Eitan, and Jeffrey M. Perloff. "Statement of Testimony: An Economic Analysis of Proposed FTC Antacid Warning Rules." FTC Antacid Warning Hearings, November 1978.
- Perloff, Jeffrey M. "Is More Information Better than Less: Monopolistic Competition and the FTC's Warning Rules." Center for the Study of Organizational Innovation Discussion Paper No. 38a, University of Pennsylvania, February 1979.
- Salop, Steven C. "The Second-Best Policies in Imperfect Competition: How Improved Information May Lower Welfare." Center for the Study of Organizational Innovation Discussion Paper No. 11, August 1977.
- Scammon, Debra L. "'Information Load' and Consumers." J. of Consumer Research 4(1977):148-155.
- Seade, Jesus. "On the Effects of Entry." Econometrica 48(1980):479-489.
- Sexton, Richard J. "A Theory on Information and Its Application to the Effect of Labeling on Food Products." Department of Agricultural and Applied Economics Staff Paper P79-35, University of Minnesota, October 1979.
- Smith, Richard B., Judy A. Brown, and Jon P. Weimer. "Consumer Attitudes Toward Food Labeling and Other Shopping Aids." USDA Agricultural Economic Report No. 439, October 1979.

Stollsteimer, John F., Richard H. Courtney, and L. L. Sammet. Regional Efficiency in the Organization of Agricultural Processing Facilities: An Application to Pear Packing in the Lake Country Pear District, California. University of California, Giannini Foundation Monograph No. 35, (Berkeley, 1975).

Thor, Eric. "Economies of Scale in the Operation of Florida Citrus Packinghouses." Agricultural Experiment Stations Bulletin No. 606, University of Florida, January 1959.

Wilmot, Charles A., Dale L. Shaw, and Betty K. Heron. "Cotton Gin Operating Costs in the San Joaquin Valley of California--1971/72 and 1972/73." USDA Agricultural Economic Report No. 285, May 1975.