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THE FOOD MARKETING SYSTEM: THE RELEVANCE OF ECONOMIC EFFICIENCY MEASURES

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1. Introduction

In this paper we survey the relevance of various economic efficiency measures for the analysis of the food marketing system. In the process of undertaking this task, we encountered in the literature an embarrassing richness of concepts, often poorly defined and unrelated, as is, no doubt, reflected in the following presentation. However, this state of affairs also provides the opportunity for a meaningful dialogue at this symposium.

The economic evaluation of food-marketing systems has had a long history. In general, our profession has followed one of two approaches: (1) focus the analysis on subsystems (processing plants, elevators, transportation systems, etc.) where the measurement and analytical problems are more tractable or (2) consider the organizational structure of the system and the institutional and policy constraints under which it operates, with the aim of identifying the structural and organizational characteristics that are likely to generate "inefficiencies." The first approach led to the analysis of productive efficiency of well-defined marketing subsystems.[1] The second approach has motivated market-structure analyses by students of industrial organization. In such analyses, market structure determines market conduct and, consequently, market performance.[2] In the context of the second approach, inefficiencies are ordinarily attributed to monopolistic misallocations.

The methods and criteria employed by both approaches have been instrumental in identifying actual and potential inefficiencies in marketing systems and in developing policy recommendations. For example, market-structure analyses

provide the bases for antitrust and other regulatory policies. In any event, as Ladd (1983) has noted, efficiency is only defined by the criteria and constraints imposed. Hence, different criteria and constraints will lead to alternative measurements of inefficiency.

Members of the agricultural economics profession generally fall into one of two schools of thought regarding the measurement of inefficiencies. One school focuses on the deadweight loss efficiency calculations advocated by Harberger (1971). This approach has been widely applied to evaluate various market distortions in a partial equilibrium, static context. People who have used this approach are too numerous to list here, but the names of D. Wallace, A. Schmitz, and B. Gardner come to mind. The second school of thought is, perhaps, most eloquently described by Brandow (1977):

> "This reviewer is unwilling to aggregate personal utilities indiscriminately. He is particularly unwilling to accept the assumption that there exist empirical counterparts of either the perfect competition situation or the equivalent situation under the constraints of a program. . . . The neat alignment of resources, output, and prices specified by the perfect competition model is far from duplicated in free markets, and the equally neat alignment assumed under the constraints of a program is not experienced when programs are in effect. In particular, areas under empirically determined supply curves is unlikely to represent opportunity cost."

Basically, this second school of thought does not believe that a first-best world is achievable. Measurements from an efficiency frontier that is not singularly attainable can hardly be viewed as socially desirable.

In this paper, our purpose is to review and evaluate each of these two schools of thought in the context of the food-marketing system. In pursuit of this purpose, we must review a number of basic concepts which should help set the stage for all the presentations which will follow at this symposium. In

essence, we will divide the set of potential problems that arise in food-marketing systems between those that admit an approximate first-best solution and those problems that do not. In the first instance, conventional welfare analysis will be advanced as providing the relevant criteria and appropriate constraints for the measurement of inefficiencies. In some cases, the standard efficiency calculus can be directly applied while, in other cases, it must be modified significantly. For the second subset of problems, nonconventional approaches to efficiency measurement must be advocated. In both instances, of course, a direct empirical analysis of economic efficiency of the foodmarketing system boils down essentially to a benefit-cost analysis.

2. Review of Basic Concepts

According to neoclassical paradigm, all exchange is carried out in competitive auction markets. Under full information and in the absence of externalities and nonconvexities, the resulting equilibrium is Pareto efficient. To the extent that this model of the economy is valid, efficiency analysis is, indeed, redundant. Efficiency analysis is of interest only because market imperfections arise and the quantitative implications of such distortions can be used to serve the public interest. At this juncture, it seems appropriate to offer a number of formal definitions which will provide a common ground for the balance of our discussion at this conference.

2.1. Economic Efficiency and Pareto Optimality

Suppose there are n "goods" in an economy, an economywide endowment of these goods, $\bar{X}$, a production technology which can transform $\bar{X}$ into other

aggregate supply vectors, x, and I individuals with preferences defined over the consumption allocation, X, which is an (n x I) matrix in which the (j, i)th element corresponds to consumption of good j by individual i. Under these conditions, an allocation, X^*, is Pareto efficient if there is no other allocation that makes someone better off and no one less well off. Pareto efficiency is alternatively called economic efficiency or allocative efficiency. Formally, X^* is Pareto efficient if there does not exist any other feasible X such that each individual i either prefers X to X^* or is indifferent between X and X^* and, for some i, i prefers X to X^*. The $X \cdot e = x$ is a feasible aggregate supply vector given the economy's production technology and endowment, $\bar{x}$, where e is a summation vector over individuals.

2.2. Compensation Principle and Economic Surpluses

Formally, the compensation principle tells us that state z' is preferred to state z if, when making the move to z', the gainers can compensate the losers such that everyone is made better off. More formally, if there exists a feasible w', a distribution of incomes among agents, such that X(z', w') is Pareto superior to X(z, w), then the compensation principle states that z' is preferred to z.

The compensation principle is the theoretical underpinning for economic surplus, e.g., consumer-producer surplus (measures of welfare). These measures are based on and answered in the following question: How much money (C_i) must each i be given to make him/her just as happy in state (z', w') as in state (z, w)? To derive expressions for this measure, let P denote a vector of equilibrium outcomes (prices) in economy (z, w) and P', the corresponding vector in economy (z', w'). Further, assume no externalities, and let $V_i(P, w_i)$ denote agent i's indirect utility function. Then, C_i is defined by:

$$V_i(P', w_i' + C_i) = V_i(P, w_i).$$

Agent i's compensating variation (change in surplus), CV_i, for the change from (z, w) to (z', w') is equal to $-C_i$. An expression for CV_i can also be derived in terms of the agent's expenditure function. Let

$$e_i(P, \bar{u}_i) \equiv \min_{X_{\cdot i}} X_{\cdot i}' P$$

subject to

$$u_i(X_{\cdot i}) = \bar{u}_i.$$

Then,

$$CV_i = e_i(P', u_i^0) - e_i(P, u_i^0) + (w_i - w_i')$$

where $u_i^0 = V(P, w_i)$. If $w_i = w_i'$, then this expression for the compensating variation simplifies to the line integral,

$$\int_P^{P'} \Sigma\, h_j(P, u_i^0)\, dP_j,$$

where $h_j(P, u_i^0)$ represents the compensated demand for good j. Although the vector P is conventionally defined as prices, it can be generalized to include measures of other external arguments in an indirect utility function such as good characteristics. Thus, for example, the compensating variation associated with change in a good characteristic can be measured in exactly the same way as for a price change (Hanemann, 1982).

2.3. Technical Efficiency

To describe technical efficiency production (Farrell, 1957), more structure is required. Let production be undertaken by firms which are indexed by k. Each firm's production technology is defined by the set of feasible net-put vectors, $y^k \in R^n$, which will be denoted as Y^k. Positive elements of this vector are outputs and negative elements are inputs.

Given any input bundle, no more output can be produced than is currently being produced. More formally, a production plan, y^k, for firm k is technically efficient if there does not exist any other feasible plan, $y'^k \in Y^k$ such that $y_i'^k \geq y_i^k$ for all i (where y_i denotes the ith element of the y vector) and $y_i'^k > y_i^k$ for some i.

2.4. Cost Efficiency

Given a net put vector, y, denote the (n x 1) vector with all the negative terms in y set equal to zero as y_+ and the (n x 1) vector with all positive terms set equal to zero as y_-. Let Y^{*k} denote the set of technically efficient y^k and y^{*k} the elements of this set. Define the function $F^k : R^n \to R$ such that $F^k(y^{*k}) = 0$ for all $y^{*k} \in Y^{*k}$. Finally, let r denote an (n x 1) price vector for goods.

For a given output, y_+^o, a cost-efficient production plant minimizes input cost. More formally, a production plan, y, is cost efficient relative to w if y_- solves the following cost-minimization problem:

$$\max_{y_-} w' y_-$$

subject to:

$$F^k(y_- + y_+^o) = 0.$$

Note that, assuming a common r faces all firms, the first-order conditions for a solution to this problem imply the standard condition of equality between rates of technical substitution across firms, viz., write as $(r_i/r_j) = (F_i^k/F_j^k) = (F_i^{k'}/F_j^{k'})$ where F_i^k denotes $\partial F^k/\partial y_i^k$ and r_i denotes the $\underline{i}$th element of the r vector.

2.5. Production Efficiency

However, if there are production externalities, cost efficiency within each firm will not generate a social optimum. Hence, economywide production efficiency may be defined as the set of production plans, $\{y^k\}$, which result from solving the following maximization problem for some vector r:

$$\max_{\{y^k\}} \; r'(\sum_k y^k)$$

subject to:

$$F^k(y^k \mid y^{-k}) = 0, \; k = 1, \ldots, K$$

$$\bar{x} + \sum_k y^k \geq 0$$

where y^{-k} is stacked vector of net puts for all firms except the $\underline{k}$th firm, and the vector inequality means that the inequality must hold element by element.

Hence, productive efficiency requires that each firm produces in such a way as to place the economy on its production possibility frontier. Note that, when there are no externalities [i.e., $F^k(y^k \mid y^{-k}) = F^k(y^k)$], the first-order conditions for a solution to the above problem also imply

equality between rates of technical substitution across firms. In this case, cost efficiency and production efficiency are synonymous.

The above concepts focus on production and neglect the role of consumer preferences. From the standpoint of consumption, similar efficiency notions can be advanced to capture the optimal mix of products and allocation of products among consumers. The relevant conditions for an efficient allocation are that the value placed on produced goods by an individual (marginal rate of substitution) must be equal to the cost of transforming one good into another (marginal rate of transformation); the value of consuming factors of production directly (marginal rate of substitution) must be equal to the cost of transforming the inputs into goods (marginal rate of technical substitution); and the value placed by consumers on consumption of an input and an output (marginal rate of substitution) must be equal to the marginal product.

2.6. X-Efficiency and O-Efficiency

Other less formal concepts have also been offered in the literature. In particular, Liebenstein (1966) advances the notion of X-efficiency. Three key determinants of this efficiency are said to be (1) intra-plant motivational efficiency; (2) external motivation efficiency (e.g., due to competitive pressures); and (3) nonmarket input efficiency. Liebenstein (1966) argues that these forces are significant for four major reasons: contracts for labor are incomplete; not all factors of production (e.g., management knowledge) are marketed; a production function is not completely specified or known; and interdependence and uncertainty lead competing firms to cooperate tacitly with each other in some respects and to imitate each other with respect to technique to some degree. Competitive forces and economic adversities spur cost-

reducing measures which, of course, implies that the efficiency costs of a monopoly are much greater than the allocative inefficiencies identified by conventional efficiency measures. A formal definition of X-efficiency is not possible in the absence of a model which specifies the processes to which Liebenstein alludes.

Analogously, Helmberger (1968) offered the notion of 0-efficiency. Specifically, consider a given set of firms, each engaged in defined economic activities; call this set an 0-configuration. Associated with each 0-configuration is a set of intra-firm processes ("conscious coordination of economic activities") and market processes ("unconscious coordination") which yield equilibrium. 0-configurations, which lead to Pareto-efficient equilibria are termed 0-efficient.

2.7. Efficient Market Hypothesis

Once we relax the assumption of certainty and full information, still other definitions may be advanced. In the context of uncertainty, the efficient market hypothesis has been widely applied in finance and to commodity futures markets. To be sure, uncertainty and limited information are largely responsible for the institutional forms that have emerged in the U. S. food-marketing system.

An asset market is said to be efficient with respect to an information set if revealing that information to all agents would not change equilibrium-asset prices or equilibrium-portfolio holdings.[3] Operationally, this means that a price of an asset will be the discounted expectation of future cash flows and new information concerning cash flows must be reflected immediately in the price of the asset, where new information is presumed to arrive randomly. In

the context of commodity futures markets, this implies that a quoted futures price is nothing more than the expected spot price at some future date based on current information.

Three levels of asset-market efficiency have been distinguished (Fama, 1970): Weak form (the market is efficient with respect to the history of its past prices); semistrong form (the market is efficient with respect to all "public information"); and strong form (the market is efficient with respect to all information on the economy--public and private).

Recognizing limited information, still other definitions have been advanced. Private information efficiency occurs if an equilibrium allocation is Pareto optimal and all agents use only their own private or personal information. Price information efficiency occurs if an equilibrium is Pareto optimal and all agents use any information that can be rationally extracted from observed prices in addition to their private information. Full information efficiency occurs if an equilibrium allocation is Pareto optimal and every agent has access to all available information. Obviously, private information and price information, when prices are not fully revealing, both imply differential information across individuals.

Some of the above definitions are motivated by the limiting features of the efficient market hypothesis. As Grossman and Stiglitz (1980) have shown, for the property of efficiency to hold, costless information is not only a sufficient but also a necessary condition. In testing the efficiency of futures markets, for example, the implication of these definitions is that, even if a particular model forecast is more accurate than forecasts of futures markets, inefficiency does not necessarily follow. This condition is only necessary; inefficiency implies that a model does exist whose forecasts are

more accurate than the futures market forecast (relative accuracy condition). Sufficiency can be obtained by including the condition that the cost of constructing and utilizing the model does not exceed the incremental benefits appropriately adjusted by risk (relative cost/benefits condition). The two conditions--relative accuracy and a favorable cost/benefits relation--are necessary and sufficient for the inefficiency assessment of commodity futures markets to hold.

2.8. Global Efficiency

The above measures of single market efficiency have been extended to a multimarket context by Rausser and Walraven (1985). In their work, the notion of global efficiency is advanced. Formally, a set of multiple interrelated assets markets is efficient if all markets adjust instantaneously and converge to a stable, general equilibrium allocation as a result of the random arrival of any new information. Operationally, global efficiency is a relative concept which measures price dynamics rather than the all-or-nothing characterization of most other concepts. The dynamic properties of the entire set of market prices are employed to assign an accuracy and a speed of convergence measure to each market. As a result, the efficiency of any individual market is considered, not only with a regard to its own internal forces but also its linkages to other markets, i.e., the rest of the system. In a measurement context, price deviations reflecting inaccuracies in the measurement of a conditional expected forward price, and its distributed lag adjustments in moving from current prices to a stationary state, can be introduced directly into standard welfare loss analysis. To the extent that the speed of convergence is slow or the distributed lag adjustments to shocks and other markets is

delayed for a particular asset, the price of that asset will not be the discounted expectation of future cash flows.

2.9. Market Failure vs. Government Failure

The above definitions focus on only the private sector economy and neglect the role of government and its influence on the structure, conduct, and performance of a particular economic system. The definitions are couched in standard welfare economics which treats government as a perfect instrument for correcting whatever market failures might be identified by the application of conventional efficiency analysis. This view has been seriously challenged by the accumulation of empirical evidence on the performance of governmental intervention (Rausser, 1982). In the rent-seeking literature, the economics of regulation literature, and the theory of state literature, the emphasis is not on market failure; quite to the contrary, the emphasis is on government failure. In this literature, government policies are not introduced to improve efficiency but rather to redistribute wealth from one group in society to another. In much of this literature, a crude predatory theory of the state is advanced in which government is simply a gigantic transfer mechanism for redistributing wealth and income. In some of these frameworks, the government has no separate autonomy; it is manipulated by powerful interest groups seeking to increase their own welfare to the detriment of society as a whole.

The above perspective quite obviously suggests that the efficiency of government should also be evaluated. This has led Becker (1983) to introduce the notion of "efficient" government redistribution. The Becker framework has been utilized by Gardner (1983) and de Gorter (1983) to evaluate the efficiency of redistributing economic surplus. Formally, this has led to the following definition.

For any particular selection and setting of government policy instruments, there is an equilibrium allocation with a corresponding distribution of utilities among agents. Suppose that there are N instrument mixes and that any one instrument mix is represented by n, and the actual settings or levels of instruments in this mix are represented by the vector X_n. Let $[u_1(n, x_n), \ldots, u_I(n, x_n)]$ denote the utility distribution among the I agents produced by instrument n set at level x_n. Let the set

$$U_n \equiv \{[u_1(n, x_n), \ldots, u_I(n, x_n)] \mid 0 \leq x_n \leq \bar{x}_n\}$$

be the set of utility distributions induced by x_n given n, where x_n is the maximal possible level of x_n. Finally, let U* denote the set of suprema for the union of $U_1, \ldots, U_N$. Now efficient redistribution can be defined: A policymaker's choice of instrument and level of (n^*, x_n^*) achieve efficient redistribution if and only if (n^*, x_n^*) produce a utility distribution which is an element of U*. In words, a planner has a feasible set of utility distributions which can be obtained by policy means. Redistributive efficiency is achieved when policies are chosen so that the frontier of this feasible set is achieved. Operationally, "utilities" can be measured by economic surplus and agents are aggregated into groups such as producers, consumers, intermediaries, and government. Specifically, redistribution inefficiency has been measured as deadweight loss divided by the amount of economic surplus transferred from consumers (producers) to producers (consumers), i.e., as the social cost per dollar of economic surplus transferred (Gardner, 1983).

The role of government can be viewed from a number of different perspectives. In each instance, it is important to recognize that political and economic markets are not separable (Rausser, 1982). Efficiency in

"political/economic markets" can be analyzed from the perspective of political/economic-seeking transfers or PESTs. As noted in the rent-seeking literature, competition in political markets, in contrast to private economic markets, generates social waste rather than social surplus. Interest groups are viewed as competing for political influence by spending time, energy, and money on the production of political pressure to effectuate both the design and tactical implementation of governmental policies. The allocation of these resources is directed toward political/economic gain-seeking transfers. In the context of economic efficiency or a first-best world, PESTs' activities on the part of interest groups are merely wasteful.

Private agents' PESTs activities were first emphasized by Tullock (1967) who argued that the standard deadweight losses implied by welfare analysis for tariffs, monopolies, and thefts were, at best, lower bound estimates of the actual cost. This argument was in response to the large number of empirical studies, using conventional welfare analysis, which showed that the cost of monopolies and tariffs to society were, indeed, small.[4] On the basis of his review of these studies, Liebenstein (1966) argued that "microeconomic theory focuses on allocative efficiency to the exclusion of other types of efficiencies that, in fact, are much more significant in many instances."

In Tullock's analysis, the standard "welfare triangle" is only part of the story. In addition, the transfers from one group in the private sector to another motivate the expenditure of resources in PEST-related activities. Governments do what they do, in part, because they are lobbied or pressured into doing so. Pure transfers cost society nothing; but, for the people engaging in such transfers, they are like any other activity, and this, of course, means that large resources may be invested in attempting to make or

prevent transfers. Thus, to achieve accuracy in the measurements of monoply effects, for example, the standard welfare triangle measures must be extended to include those resources that are invested by potential monopolists who seek the income transfer from their potential customers. As noted by Tullock, "in fact, the investment that could be profitably made in forming a monopoly would be larger than this rectangle since it represents merely the income transfer. The capital value, properly discounted for risk, would be worth much more."

Governments are not only involved in PEST-related activities but, in addition, often generate PERTs. PERTs are defined as political/economic resource transactions and are equivalent to governmental interventions which completely or partially correct market failures by designing a set of rules to reduce transaction costs faced by the private agents (Rausser, 1982). The net effect of PERT policies is to increase the size of the pie. Most governmental interventions generate both PERTs and PESTs. The evaluation of these two sets of activities can be performed by the measurement of a "political preference function." Such a function can be used as the criterion for evaluating efficiencies in both the private sector as well as in the public sector. As emphasized by Steiner (1969), the choice of weights in such a function is an important dimension of the public interest. Empirically, such a function can also establish an alternative norm for standard efficiency analysis which places weights on both the size and the distribution of the pie.

2.10. Other Coordinating Mechanisms

The above concepts and definitions recognize only three coordinating mechanisms along the vertical marketing chain of the food system, namely, spot markets, future markets, and the government. There are, of course, numerous other mechanisms or institutions which coordinate the exchange of food products

including inter alia contracts, cooperatives, vertical integration, horizontal integration, commodity associations, marketing orders and agreements, and so on. The neoclassical paradigm, upon which many of the definitions are based, emphasizes competitive spot markets. In the U. S. food marketing system, however, the decline of spot markets has been dramatic. Recent estimates suggest that the spot market accounts for a very small percentage of transactions in a number of commodity systems. For example, in the case of fresh fruits and vegetables, this percentage is only 5 percent; in processed fruits and vegetables, it is 2 percent (Paul et al., 1980); and for eggs, commercial broilers and market turkeys, the percentage is below 3 percent (Lasley, 1983).

Alternative coordinating mechanisms will influence transaction costs, technology, the quantity and quality of output in a particular commodity system, the size and distribution profits and losses, and, equally as important, the sharing of risk among the various components of the food-marketing system. Kilmer and Ward (1982) have advanced a framework for analyzing alternative mechanisms in accordance with their effect on product characteristics, transaction costs, and technology. Unfortunately, uncertainty and risk is not included in their framework.

At the heart of any analytical framework designed to evaluate the peformance of alternative coordinating mechanisms is the notion of a contract. In fact, the organization or configuration of coordinating mechanisms can be viewed as a system of interrelated contracts. Such a perspective can be traced back to the conception of a firm adopted long ago by Coase (1937). More recently, the Coasean perspective has been accepted and employed by students of economic organizations (e.g., Fama and Jensen, 1983).

Unfortunately, the choice of contractual arrangements and the evolution of stable contractual systems have been generally ignored by the market structure literature. Since it is analytically necessary to view any organizational form, including hierarchy (internal organization) as a nexus of contracts, traditional market structure analysis is insufficient for evaluating economic efficiency of marketing systems. As Williamson (1971) has shown, the phenomenon of vertical integration, so central in many markets, can hardly be explained without considering the alternative underlying contractual arrangements and the transaction costs that they entail.

The importance of contracts in the development of a theory of market organization can be seen by distinguishing the four general types of exchange systems that arise. The first type consists of the competitive auction markets that are assumed by the neoclassical paradigm. Although several kinds of complex contracts (e.g., securities) are often traded in auction markets, such markets can be clearly distinguished from contractual markets. The second type consists of imperfect noncontractual markets. These are comprised of various forms of imperfectly competitive trade in goods and services. The noncontractual nature of the transactions is characterized by the virtual absence of trade over states of nature even when uncertainty prevails. No risk bearing is, therefore, allocated in these transactions. An example of this second type is a monopolistically competitive retail market for food products in which no long-term, state-contingent commitments are undertaken. The third type consists of contractual markets in which transactions involve complex contractual arrangements among independent transactors. Contracts struck in these markets ordinarly include trade over states of nature under conditions of uncertainty and imperfect and asymmetric information structures. Risk bearing is, thus,

traded as part of the transaction of goods and services. An example of this third type is grower-processor contractual arrangements in which prices depend on delivery dates, the quality characteristic of the product, and so on. The fourth type of exchange mechanisms consists of trade among different components of a single hierarchical economic entity (e.g., a wine producer who also grows the grapes used as raw material). Here the terms of exchange are often, though not always, determined by fiat. Note, however, that, since an internal organization may also be viewed as a network of contracts, there is no sharp demarcation line between contractual exchange and hierarchies. Furthermore, noncontractual exchange, too, may be regarded as a special extreme case of contractual exchange. Contracts, in their variety of shapes and forms, thus become the common building blocks and the unifying concept in any theory of market organization.

2.11. Achievability of First-Best Solution

When the cost of resources consumed in the marketing process and the various benefits that are created can be summarized in some net value measure and compared to a feasible net value-maximizing norm, the efficiency problem is adequately treated. Unfortunately, this is virtually impossible under many circumstances for two reasons:

1. The cost and benefits are not easily identified and are often difficult to measure.
2. A feasible net value-maximizing norm may not be achievable.

To be sure, it is not too difficult, at least in principle, to measure the net social surpluses associated with certain price-quantity combinations due to the instability of these variables. But how should such benefits as availability of food products near buyers' homes, product quality and variety,

in-store conveniences, low probability of stock outs, unrestricted choice of quantity (nonrationing), and short queues be valued?[5] Similarly, how should the availability of information on transaction opportunities, the lowering of uncertainty and risk to the various market participants (farmers, processers, market-clearing intermediaries, and final consumers), and the saving of precious time and efforts of farmers seeking out potential buyers in implementing exchange be valued?

Where information is incomplete and asymmetrically distributed among transactors, states of nature uncertain, and nonconvexities exist, a first-best solution or a feasible net value-maximizing norm cannot be obtained. Uncertainty, itself, is not the responsible culprit for the inability to obtain a first-best solution. As Debreu (1959) has shown, competitive markets in state-contingent claims could still constitute a perfectly efficient system of exchange. However, as information is imperfect and asymmetrically distributed, many markets in contingent claims will fail to emerge (Radner, 1982). Complex contracts, which allow trade over states of nature while taking into account the information compatability constraints, may then provide more efficient solutions, although these solutions are only second-best results. Under these arrangements, risk bearing is traded in conjunction with the transaction of goods and services. The determination of the contractual terms ordinarily depends on the market structure in which the exchange is carried out. The typology of market structures traditionally adopted in the industrial organization literature applies here as well. It should be emphasized, however, that the diversity of buyers and sellers is often conducive to differentiated customized contracts and, hence, to multiple thin markets ruled by bargaining relations.

For circumstances where a first-best solution is not achievable or cannot be approximated, conventional efficiency comparisons must be discarded. In this situation, analysts are left with one of two alternatives. The first alternative would be to define a new norm. For example, a political preference function, based on the notion of political efficiency, could be advanced (Rausser, 1982; Zusman, 1976). In fact, such a political preference function could admit nonmaterial well-being. The "tradeoff weights" appearing in the political preference function can be utilized parametrically in the derivation of political efficiency measures. For analysts who are not prepared to operate with such norms and who prefer to continue with conventional economic efficiency norms, we have no recourse but to turn to the theory of second best. In this case, the actual efficiency is compared to the "second best" solution rather than to an infeasible first-best solution. Moreover, with this approach, analysts must be concerned with the constrained Pareto efficiency and the theorem of second best.

Constrained Pareto efficiency follows if markets are incomplete so that allocations are constrained by the feasible trading space. Specifically, an allocation X is constrained Pareto efficient relative to available markets if, without the implicit or explicit addition of markets, there does not exist any feasible Pareto superior allocation [Newberry and Stiglitz (1981)]. The theorem of the second best sheds further light on this concept. Lipsey and Lancaster (1956) state the theorem as follows: Let there be some function $F(x_1 \ldots x_n)$ of the n variables $x_1, \ldots, x_n$, which is to be maximized (minimized) subject to a constraint on the variables $\Phi(x_1 \ldots x_n) = 0$. This is a formalization of the typical choice situation in economic analysis. Let the solution of this problem--the Paretian optimum--be the n - 1 conditions

$\theta^i(x_1 \ldots x_n) = 0$, $i = 1, \ldots, n - 1$. Then the following theorem, the theorem of the second best is:

> If there is an additional constraint that makes the satisfaction of the jth condition impossible, i.e., $\theta^j \neq 0$, then the maximum (minimum) of F subject to both the constraint Φ and the additional constraint 0 will, in general, be such that none of the still attainable Paretian conditions $\theta^i = 0$, $i \neq j$, will be satisfied.

In a world of second-best, initial conditions are crucial and intransitivities, along with paradoxes, can arise. Under limited and asymmetric information, conventional efficiency norms force comparisons of second-best solutions. As a result, we can not be assured that unambiguous evaluations can be performed.

For circumstances where a first-best solution is achievable or can be approximated, conventional efficiency methods can and should be used. There are, however, many problems in food marketing where these circumstances do not arise. In what follows, we examine a number of cases where the conventional efficiency analysis is misleading and should be avoided. These cases are grouped into one of two categories. The first category focuses on dynamic measures of efficiency, which are examined in section 3, and the second category focuses on the second-best outcomes which are examined in section 4.

3. Dynamic Measures of Efficiency

Traditional static measures of efficiency, market power, and welfare are inappropriate for use in markets where prices and output levels are inter-

temporally determined. In the case of the food-marketing system, most prices and output levels are generated from dynamic markets. The inappropriateness of such measures is particularly obvious in the case of renewable and non-renewable resource industries, markets with learning curve effects or dynamic demand functions, and agricultural markets where supply adjustments take years to complete. The latter type of adjustments are particularly common in perennial crops and in the livestock sector. Indeed, dynamic adjustments may take years in many, if not most, agricultural markets; thus, traditional static measures may be highly misleading. Also, under technological progress and growth, it is possible that a noncompetitive structure may be more efficient in the long run whereas, in the short run, conventional measures would imply inefficiencies.

In a general equilibrium context, it is important to recognize that the effect of economic forces from "outside markets" on the various components of the food industry can be quite different. In the context of storable commodities, asset arbitrage opportunities have a much more pronounced effect on tradables relative to nontradables. In the formation of the price of food at the retail level, both tradable and nontradable goods play important roles. Nontradables for most food products represent a greater proportion of the retail value than the tradable component, e.g., the raw agricultural commodity value. To the degree that long waves appear in the dynamic paths of these two general types of goods, the more misleading will be the static measures of efficiency, market power, and welfare.

3.1. Dynamic Partial Equilibrium Measures of Efficiency

The biases from using static measures are often substantial. For example, La France and de Gorter (1985) found that it takes more than 10 years for the dairy industry to adjust so that "the average annual dynamic welfare change is three times the static estimate" in evaluating dairy support programs.[6] Baumann and Kalt (1983) have used dynamic models to calculate consumer surplus over time from freezing natural gas prices. They conclude that the appropriate static analysis overestimates the present value of such a program by 15 percent ($12 billion).

Thus, traditional types of studies, such as the efficiency and welfare effects of marketing orders, should take these adjustments into account. To illustrate this point, consider an agricultural market subject to a marketing order which allows for market allocations and the elimination of some of the crop.[7] If entry takes time (which seems the case in all agricultural markets in which marketing orders have been used), early entrants make large short-run gains while, in the long run, marginal firms break even. Consumers, correspondingly, suffer larger welfare losses at first than in the long run when supply increases. Due to the supply allocation rule between two markets, however, price falls more substantially over time in the secondary market than in the primary market.

Because these types of adjustments can take years or decades, the present value of the efficiency or welfare losses and gains depend crucially on the interest rate, both for discounting reasons and because it affects the rate of entry. As the interest rate increases, the present value of profits for each

new entrant decreases. Thus, during the adjustment period, supply is lower, price is higher, and consumer surplus is lower.

Similarly, anything which affects the rate of entry will affect the adjustment path and the present discounted value of efficiency or welfare. As the rate of entry increases, the supply increases, the price falls, consumers are better off, and producers' profits may rise or fall. Most static analysts, because they have only looked at the long-run steady state, neglect the gains of early entrants. Similarly, such studies typically ignore the larger losses that consumers face in the short run than in the steady state.

Pindyck (1985) has shown that Lerner's approach to measuring monopoly power in a static model can be generalized to use in a dynamic model. Lerner's index of monopoly power is $L = (P - MC)/P$ (where P = price and MC = marginal cost) which, in the static case, depends only on the elasticity of demand. In a dynamic market, however, such a measure will depend on more than just the elasticity of demand so that the Lerner measure is inappropriate even as an instantaneous measure of monopoly power. For example, the price and production trajectories of an exhaustible natural resource monopolist, who faces an iso-elastic demand curve and has zero extraction costs, are identical to those of a competitive market (Stiglitz, 1976). Thus, the monopolist has no monopoly power; yet, the Lerner measure would equal one at every point in time.

Similarly, if a monopolist is using a new technology in which the learning curve is important, current prices will be below current marginal cost. As a result, even though output is less than in a competitive market, the Lerner index is negative.

Pindyck argues that, even if the Lerner index sufficed as an instantaneous measure, averaging such short-run measures would not be informative for two reasons. First the short-run monopoly price depends on more than the firm's short-run demand curve so that using the short-run elasticity would be misleading. Second, the firm's gain and consumer's loss from monopoly power depends on the rate at which demand adjusts which, in turn, depends on the firm's price trajectory. Thus, Pindyck recommends a measure that reflects the trajectory of monopoly power over time weighted by the firm's revenues (consumer's expenditures).[8]

3.2. Flexible/Inflexible Markets and Overshooting

In both macroeconomics and general equilibrium theory, analysts have begun to recognize the incentive for long-term contracting in a number of important markets. For example, labor contracts generally fix the wage rate over long periods of time. Over the period of the contract, wages are pegged to some general indices such as the consumer price index. The incentives for long-term contracting have been found to be particularly important for nontradables, heterogenous goods, markets in which information is limited, and markets in which price adjustments are costly. These characteristics arise in many of the input markets to the assembly, processing, and distribution components of the foodmarketing system. In contrast, the more homogeneous, storable, and tradable raw commodities that are produced at the farm level offer less incentives for longer term contracting. This simple dichotomy of markets in the general economy, fixed and flex, leads to the nonneutrality of money and over-shooting in the more flexible price markets (Rausser et al., 1985).

With short-run nonneutrality of money, relative prices will become distorted, even though all expectations are formed rationally. It means that the dynamic path of food commodity markets depend critically upon the linkages between these markets, exchange rates, and domestic as well as international money markets. Exchange rates or storable food commodity prices will overshoot their long-run equilibrium because other markets in the general economy respond only with very long lags to any permanent change in money supply (Rausser et al., 1985).[9]

Empirical evidence has been advanced to support the hypothesis of a mixture of fixed- and flex-price markets in the general economy and the overshooting of farm-level prices (Rausser et al., 1985). In the context of efficiency analysis, these phenomena preclude the application of conventional static measures of efficiency. In effect, due to the fixed-price markets, permanent changes in money supply will impose externalities on raw commodity prices. Static measures will not recognize these externalities or the resulting overshooting and, thus, will incorrectly evaluate the inherent instabilities in a particular market. Hence, the use of observed data to perform welfare analysis of various stabilization policies will prove misleading.

The overshooting phenomenon and the composition of fixed- and flex-price markets strongly suggest that, as we move from the farm gate to the food store, much "industrial contamination" occurs that increases the degree of "stickiness" of food prices as we move up the vertical marketing chain.[10] Widening margins or abnormally large profits in the short run do not necessarily imply that oligolopolistic or monopolistic competition is on the rise. Similarly, narrowing margins or decreasing rates of profit do not necessarily mean that competitive behavior has somehow been reasserted. These movements may, in

fact, reflect nothing more than the differential response of one market versus another to a perceived permanent change in money supply. This suggests, of course, that dynamic welfare analysis in food marketing must concern itself with the linkage effects of money markets, interest rates, and exchange rates before arriving at any unambiguous conclusion.

4. Second-Best Solutions

Great care must be exercised in using efficiency and welfare measures in markets with limited information and/or where contracting is pervasive. The traditional partial equilibrium measures, which implicitly assume full information or spot-market exchange, are almost certainly misleading. A few approaches have been developed, however, which can be used in some, but not all, of these situations. In the following two subsections, a thumbnail sketch of these approaches is outlined.

4.1. Limited Information and Efficiency Comparisons

Unfortunately, in the presence of limited information, moving from one second-best to another second-best equilibrium can raise or lower welfare or various efficiency measures. Eliminating a "distortion" which would raise efficiency in a world of full information can lower efficiency or welfare in a world of limited information. Such effects may be missed by traditional partial equilibrium measures either because they ignore the general equilibrium effects or because they implicitly assume full information.

Were this point only an unlikely theoretical possibility, we could continue to use traditional methods. In many final agricultural and resource goods markets (e.g., grocery stores, breakfast cereals, and fast foods), however,

there are reasons to believe that informational problems exist. Chief among these are the presence of market power derived from limited information about the price or the quality of products.

Many papers have shown that, in markets for even homogeneous commodities, limited price information endows firms with informationally based market power which may result in price dispersion.[11] In a model advanced by Perloff and Rausser (1983), market power in one sector of an industry can provide a firm with information which it can use to gain market power in another sector. In this limited and asymmetric information model, an increase in public information known to the competitive fringe can increase or decrease the distortions in various agricultural markets. This ambiguous result simply reflects the general principle that, in moving from one second-best to another, there is no assurance that society's welfare is enhanced.

In markets with heterogeneous goods, consumers are concerned with the quality and variety of goods as well as their prices (Salop, 1977).[12] Thus, since differences in product attributes across brands affect the value per dollar of the products, even if prices of products are known, limited information about attributes can also convey market power to firms. The surprising results of most of these articles on limited information is that an increase in information may not increase efficiency or welfare (properly measured). Unless consumers obtain full information, the increase in information will cause the economy to shift from one second-best equilibrium to another. As the literature on limited price information shows, such an increase in information may leave efficiency and welfare unchanged. The literature on limited information about product attributes indicates that welfare can even be lowered.[13]

An even more striking result, however, is that, where other market imperfections exist, providing full information can actually reduce welfare. In a competitive market, the elimination of limits to information must increase efficiency and welfare. However, it is easy to imagine counter examples in monopolistically competitive markets. Suppose that an industry is monopolistically competitive (as is the case of many processed foods, drugs, and other markets), and consumers have limited information about the health attributes of these products. The government informs consumers with high blood pressure that they should not eat certain of these products because of their (inherently) high levels of sodium or cholesterol.

If consumers heed these warnings, demand for various products will change. The result may be to drive up the price for products with high sodium or cholesterol levels (or possibly even drive these products out of the market) which harms some consumers who are not on a restricted diet. It is possible that the damage to this latter group could exceed the benefit to the group with high blood pressure. Indeed, it is possible that the shifts in demand could drive up the prices for so many goods so that all consumers (including those rationally responding to the warnings) are worse off.

Such health warnings are becoming increasingly common. The U. S. Department of Agriculture, the Food and Drug Administration, and the Federal Trade Commission have held joint public hearings on the issue of food labeling. These agencies have issued health warnings concerning aflatoxin, cholesterol, sodium, potassium, saccharin, cyclamates, calories, protein levels, and other components and attributes of foods and drugs. Obviously, when the government actually removes certain products (e.g., those with cyclamates) from the market, the impact of their actions are even greater.

Warnings on cholesterol appear to have had a substantial impact on U. S. consumption of meat and eggs; warnings on saccharin, cyclamates, and other sugar substitutes have affected a number of markets, especially the soft-drink industry; and cigarette warnings have greatly affected the tobacco industry. For example, since 1965, milk and cream consumption declined 21 percent, butter consumption declined 28 percent, and consumption of eggs fell from 334 per capita in 1960 to 283 in 1979 (Commodity Research Bureau, Inc., various years; Consumer Reports, 1981).

In the cases discussed above, standard partial equilibrium efficiency and welfare measures may be misleading because they ignore the general equilibrium effects. A much more important theoretical issue is that efficiency and welfare comparisons are not well defined where consumers' welfare levels change. Obviously, calculations will depend upon the information levels assumed in the analysis.

Some attempts have been made to come to grips with this problem.[14] Using a clever analysis, Dixit and Norman (1978) argue that, in certain cases, efficiency and welfare statements can be made even when these measures are ambiguous due to information problems because both measures move in the same direction.

There have also been a number of empirical and theoretical studies which have attempted to make efficiency and welfare calculations where government regulations or warnings impact a market (Sexton, 1979; Colantoni, Davis, and Swaminuthan, 1965). Where the primary impact of limited information is on price and the minimal impact is on quality and variety, the efficiency effects of providing more information may be measured in the traditional way (Devine

and Marion, 1979; Perloff and Salop, 1985a and 1985b; Boynton and Perloff, 1982).

4.2. Second-Best World: Contracts

Contracts may involve only two parties (dyadic contracts), as most contracts do, or the number of parties to a contract may exceed two (multiadic contracts).[15] They may be prespecified (e.g., futures contracts) or they may be reached through individual independent contracting or through collective bargaining. Contractual forms also abound; they vary with respect to the rights and obligations of the parties, the payoff schedules, the risk-sharing arrangements, the extent to which state-contingent actions and payoffs are specified, the procedures established to deal with situations on which the contract is not explicit, the agreed duration of the agreement, termination clauses, the scope for individual discretionary actions, the monitoring and enforcement arrangements, and so on. Underlying the wide diversity of contracts is a general unified structure, while the observed contractual forms are manifestations of its adaptation in specific circumstances.

4.2.1. Transaction Costs and Economic Efficiency

In a second-best world, transactions involve various costs--transaction costs. The term refers to welfare losses entailed by the actual second-best contractual arrangements relative to a first-best solution in which technology and resource availability are the only constraints. First-best solutions are reached in competitive markets with perfect information. It will prove analytically useful to identify the main categories of transaction costs, their sources, and the determinants. They are as follows.

Information cost. In the absence of nonpersonal competitive auction markets, individual transactors have to seek potential partners to exchange and find out their respective offers. The search, obviously, is not costless. Also, having concluded an agreement, each party must monitor certain variables related to the states of nature and the parties' actions in order to select optimally its own discretionary actions and to detect deviations of the other parties from their agreed contractual obligations. Information cost, therefore, depends on the ease of search, on the parties' access to information, on the informational requirements determined by the contract, on the value of information in optimizing decisions, and on the technology of information processing and communication.

Bargaining cost. When contractual terms are determined through negotiation rather than unilateral dictation by "contract makers" or the announcement of auctioneers, bargaining costs are incurred by the parties concerned. Bargaining situations also arise during the contract implementation phase when circumstances occur that are unaccounted for in the original contract. The level of the bargaining cost depends on the extent of the bargaining space as reflected in the range of potential payoffs to the parties; the number of parties involved and their attitude toward compromise; the complexity and completeness of the original contract (the more complete the contract, the greater the bargaining cost at the formulation phase and the smaller at the implementation phase); and the rules adopted for dealing with disagreement in the implementation phase.

Enforcement cost. This refers to the actual and subjective costs incurred by the parties in enforcing the contract. It includes the cost of stand-by enforcement mechanisms (e.g., entering a legally binding contract in order to

permit enforcement by the state) and the costs of actual enforcement (e.g., litigation costs and the cost of remedial actions).

Externality cost. In the present context, the externality cost arises whenever a party, or parties, select actions which, while being within their contractual rights, affect the well-being of other parties. Presumably, the deciding party maximizes its own gains while ignoring the effects on the others. All "moral hazard" phenomena in agency contracts (agency cost) fall in this category. In authority contracts (e.g., employment contracts), the principal is contractually entitled to decide the agent's actions which also creates externalities if the effects of the action on the agent's utility are ignored by the principal. In incomplete multiadic contracts, contractually prescribed group decision rules for circumstances unaccounted for in the original contract do not always espouse unanimity. When the deciding subgroup (say, a simple majority) ignores the effects of its decision on the utilities of the other parties, externality costs may again be created. These will be referred to as externality costs in group decisions.[16] Welfare loss due to "free riding" may also be included in the present category. Externality costs, in general, may be interpreted as misguided incentives.

The cost of nonoptimal risk sharing. In a first-best world where every individual has perfect information (i.e., monitoring, communications, and search are costless), risk bearing can be optimally allocated among individuals. In a second-best world where information is scarce, optimal allocation of risk bearing is, in general, attainable only at the expense of an increase in the other types of transaction costs. The parties may then opt for suboptimal risk sharing in order to save on total transaction costs. The welfare loss due to suboptimal risk sharing is, therefore, regarded as a transaction cost. This

cost depends on the degree of environmental uncertainty and the parties' aversion to risk.

Other types of transaction cost. There are, in fact, many more types of transaction costs, all of which may be found in marketing systems. Among these, one may list complexity costs reflecting the limited capacity of humans to deal with complex relationships; exclusion costs which are the cost of resources that individuals or groups may have to invest in order to protect their property rights (e.g., protection of patent rights); etc.

The various transaction costs are interrelated through various substitution relations. Thus, agency costs may be lowered by accepting nonoptimal risk-sharing arrangements, and both agency and nonoptimal risk-sharing costs may be lowered by increasing the monitoring and enforcement costs. In internal organizations, consisting, as they are, of a hierarchy of authority contracts, high monitoring and enforcement cost yield pronounced agency relations throughout the hierarchical structure, consequently leading to "organizational slack" or X-inefficiency--to use Liebenstein's (1966) term.

In negotiating a contract, each party seeks to further its own objective which implies that the resulting contract will be constrained Pareto optimal, namely, a second-best solution in which the various transaction costs are traded off so as to minimize the overall cost.[17] But individual contracts are not concluded in a vacuum; they clearly depend on the environment but, also, on the other contracts, thus giving rise to the concept of an equilibrium set of contracts. As Zusman and Etgar (1981) have shown, it is descriptively correct and analytically useful to regard a marketing channel as an equilibrium set of contracts.

The following normative question then arises: Given that individual contracts are Pareto efficient, is the equilibrium set of contracts also efficient? Note that systemic inefficiencies may arise in several ways. First, the pattern of contractual exchange, namely, the matching of buyers and sellers, may be inefficient. Second, productive resources employed by the various parties may be misallocated across contracts, and goods and services may be inefficiently distributed. Finally, the number of parties to a contract may be nonoptimal. The last problem has not been adequately researched hitherto and will, therefore, not be discussed. The first three sources of inefficiency in systems of dyadic contracts were studied by Zusman and Etgar (1981) and Zusman and Bell (1982). It was found that, in the absence of intercontractual externalities and when lump-sum transfers are allowed, the equilibrium set of dyadic contracts is indeed efficient. Unfortunately, in a second-best world, intercontractual externalities are pervasive; and despite the (second-best) efficiency of individual contracts, the entire system need not be efficient. However, it can be shown that, with better informed traders, more effective enforcement measures, and lower overall uncertainty, the systemic inefficiencies are diminished. It should be emphasized that the equilibrium set of contracts is characterized, among others, by the condition that no subset of transactors can improve its members' positions by entering new contracts or by altering existing ones. Hence, inefficiencies often derive from institutional restrictions on free contracting.

4.2.2. Policy Implications

What are the policy implications of the contractual theory of economic organization elucidated above? The most important implication, perhaps, is a

negative one: minimize institutional barriers to free contracting. There are, however, several important qualifications to this imperative. First, free contracting may benefit the group of actors entering the contracts, but this may be attained at the expense of other participants in the economic process. To the extent that overall social welfare is, thereby, impaired (e.g., the formation of cartels), a regulatory policy is needed. Second, when public goods may be profitably produced through collective action but, due to free riding, the needed voluntary contracts (organizations) fail to emerge, deliberate public action may prove desirable (e.g., setting national grades and standards). Third, public gathering and dissemination of information and legally established mandatory reporting systems are likely to improve market performance. Fourth, strengthening legal support to contract formulation and enforcement will lead to improvements in contractual exchange. Finally, besides other beneficial effects, market stabilization programs are likely to lower transaction costs by lowering the uncertainty due to instability.

The implications for research seem clear. More studies of contractual arrangements and organizational structures are needed in foodmarketing systems.[18] Future research should focus on the relationship between contractual organizational forms and policy programs and social institutions (e.g., marketing orders and bargaining cooperatives).

5. Concluding Remarks

Aside from the political preference function or the notion of political efficiency, the vast majority of definitions and corresponding efficiency measures are all consistent with the first school of thought which operates with the conventional norm of a first-best solution. The major value of this

perspective is simplicity. It results in simple measurements of consumer and producer surpluses and deadweight losses. For circumstances where first-best solution can be approximated, or is almost achieveable, conventional efficiency measures can and should be used. As we have emphasized in this paper, however, for many problems in food marketing these circumstances do not arise. As a result, we must turn to the theory of second-best, assuming, of course, that we are not prepared to operate with some other new norm, e.g., political efficiency.

Our survey of economic efficiency measures clearly signals an urgent need to clarify and focus our view of economic efficiency and the implied operational measures. What seems to be missing is a general approach to the problem in which the various concepts and measures outlined in this paper are special cases induced by the particular simplifying assumptions and the analysts' interest. As our survey would suggest, the general framework should be dynamic and fully allow for uncertainty, limited and asymmetric information structures, and a host of other transactional problems and costs. The "constrained Pareto" criteria may then be employed in efficiency comparisons and in constructing appropriate efficiency measures. Moreover, in any efficiency analysis, the constraints imposed by the political system, existing institutions, and equity considerations should be clearly delineated. Initially, it would seem most appropriate for us to treat these particular constraints as exogenously given. However, for those of us who are very ambitious, an endogenous treatment of such constraints can be entertained.

Footnotes

[1]These attempts have been surveyed by French (1977). Industrywide productivity studies (Heien, 1983) also belong to this category.

[2]For example, see Blake and Helmberger (1971); Manchester (1974); Helmberger, Campbell, and Dobson (1977); and Connor (1981).

[3]See Latham (1984) for an extensive discussion of the merits of this definition, vis-à-vis definitions proposed by Fama (1976), Jensen (1978), and Beaver (1981).

[4]These studies led Mundell (1962) to comment that "unless there is a thorough theoretical reexamination of the validity of the tools upon which these studies are founded . . . someone will inevitably draw the conclusion that economics has ceased to be important."

[5]Indirect methods may be employed in the evaluation of certain costs and benefits produced in the marketing systems. For example, Zusman (1969) attempted an indirect approach to the evaluation of buyers' travel efforts and nonprice offer variations in a network of food retail stores. We are not aware of any attempt at estimating the subjective cost of rationing and time spent in queues. In market economies these costs are obviously negligible. However, in nonmarket economies, where rationing and queues serve as principal market clearing mechanisms, these costs can be enormous.

[6]Taking the present discounted value of the short-run measures of welfare has problems, however [see Schmalensee (1982) and discussion below].

[7]The following discussion is based on Berck and Perloff (1985). The results discussed below are conditional on the specific assumptions of that model.

[8]Pindyck's approach is to incorporate any relevant "user costs" (the sum of discounted future costs or benefits that result from current production decisions where the user costs are calculated assuming that the firm is a pricetaker) in the measure of marginal cost: $L^*(t) = (P_t - FMC_t)/P_t$ (where FMC_t is the full marginal social cost at time t, evaluated at the monopoly output level). $L^*(t)$ lies between 0 (perfect competition) and 1 for all t. His measure is of potential monopoly power rather than actual monopoly power (which depends on how oligopolistic firms interact with each other). To aggregate this measure over time, Pindyck recommends multiplying $L^*(t)$ by expenditure at time t and summing. Alternative weighting variables include quantity and price. The bias of the standard Lerner measure in the case of natural resources, is pronounced. For example, in his simulations using values appropriate for oil, copper or nickel and assuming the elasticity of demand is elastic (say, equal to 5), L is in the range of 0.23 to 0.44, but L^* is in the range of only 0.15 to 0.06. Similarly, in the learning-by-doing case, the standard Lerner index underestimates the true degree of monopoly power, and by a significant amount, where demand is elastic.

[9]As the share of fixed-priced markets rises, the extent of overshooting falls. In the case of the U.S. food system, the introduction of flexible exchange rates in 1973 and, more recently, the introduction of flexible interest rates in late 1979, imply less overshooting for a given shock. Of course, the amount of observed overshooting may be greater, even though more markets become flex-price if the shocks in money markets are larger.

[10]For empirical evidence supporting this observation, see Rausser, et al. (1985).

[11]Probably the first paper to clearly make this point was Scitovsky (1950). The first paper to present a formal mathematical analysis, which illustrates this issue, is in Diamond (1981). Stiglitz (1979) presents an excellent survey of this literature.

[12]Salop (1977) distinguishes between quality, which are characteristics about whose value all consumers agree, and variety which are variations across brands for which there is no consensus or for which consumers' preferences differ.

[13]Ibid.; see, also, Perloff (1981).

[14]See, for example the recent literature on advertising and welfare.

[15]A marketing cooperative is a good example of a highly complex, long-term multiadic contract.

[16]Externality costs due to group decisions were recognized and analyzed by Buchanan and Tullock (1962).

[17]Lang (1980) cites several interesting examples of Pareto improvements in contractual arrangements in vegetable marketing achieved through collective bargaining. It is worth noting that all the cited improvements were achieved through the internalization of externalities accomplished by shifting the consequences of decisions to those who actually make them (because they possess the relevant information or, otherwise, control the operation). Externality costs due to moral hazard behavior (agency costs) were, thus, minimized. Lang also found that collective bargaining was more effective than independent contracting in bringing about the improvement. Though explainable on the basis of cognitive misperceptions, this finding seems to contradict a priori theorizing.

[18]Lang (1980) is an interesting first step in this direction.

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