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Staff Paper

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**PRIVATE STRATEGIES AND PUBLIC POLICIES:
The Economics of Information and the Economic Organization
of Markets**

Ralph D. Christy

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PRIVATE STRATEGIES AND PUBLIC POLICIES:

The Economics of Information and the Economic Organization of Markets*

Ralph D. Christy

Issues concerning the economics of information including theoretical development, public investments, and private use, have received considerable attention from the agricultural economics profession. The American Agricultural Economics Association established the Committee on Economic Statistics in 1969 and since that time principal papers, a presidential address, organized symposia, and national conferences have focused on improving agricultural and rural statistical systems. The AAEA recently established yet another taskforce on economic and environmental data needs. Several developments have heightened interest and awareness of the inadequacy of our present information system: a) certain costs of information and information systems have risen while others have declined dramatically; b) income distributional impacts of differently structured information systems have begun to be recognized; c) increasing number of questions about what types of data should be provided by the public and private sectors; d) a growing realization that our ability to conceptualize often is limited by data; and

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e) related to the above, an expanding awareness exists that the economics profession may have relied too heavily on deductive analysis without proper concern for the relevance of the data base (Bonnen 1975, Eisgruber 1978, Streeter 1988, Duncan et al. 1993).

One widely accepted aspect of the recent debate on information is that we have neither the theory nor methods for solving informational problems. These theoretical and methodological shortcomings are particularly evident in our inability to value information and, when user burden is considered, it is not clear that we can accurately measure the costs of producing certain types of information. The problem of attaching costs and benefits to information has implications for public managers of statistical systems who are faced with shrinking budgets (Figure 1) and private market participants who are confronted with alternative marketing decisions under uncertainty.¹

Much of the theoretical work on the economics of information has attempted to equate marginal cost with marginal benefits. Unfortunately, this approach has resulted in few empirical results that are useful. At the same time, relatively little conceptual work has focused on information and market organization. The purpose of this paper is to provide a conceptual understanding of the costs and benefits for public and private acquisition of information under alternative market structures. This analysis will show that due to market structure, the investment incentives and cost structures for information can be very different for private firms as compared to public agencies.

Before presenting arguments concerning information and market structure, four major forces -- legal, technological, ethical, and economic -- influencing the collection, management, and disclosure of information are described. The balance of the paper expands discussion on

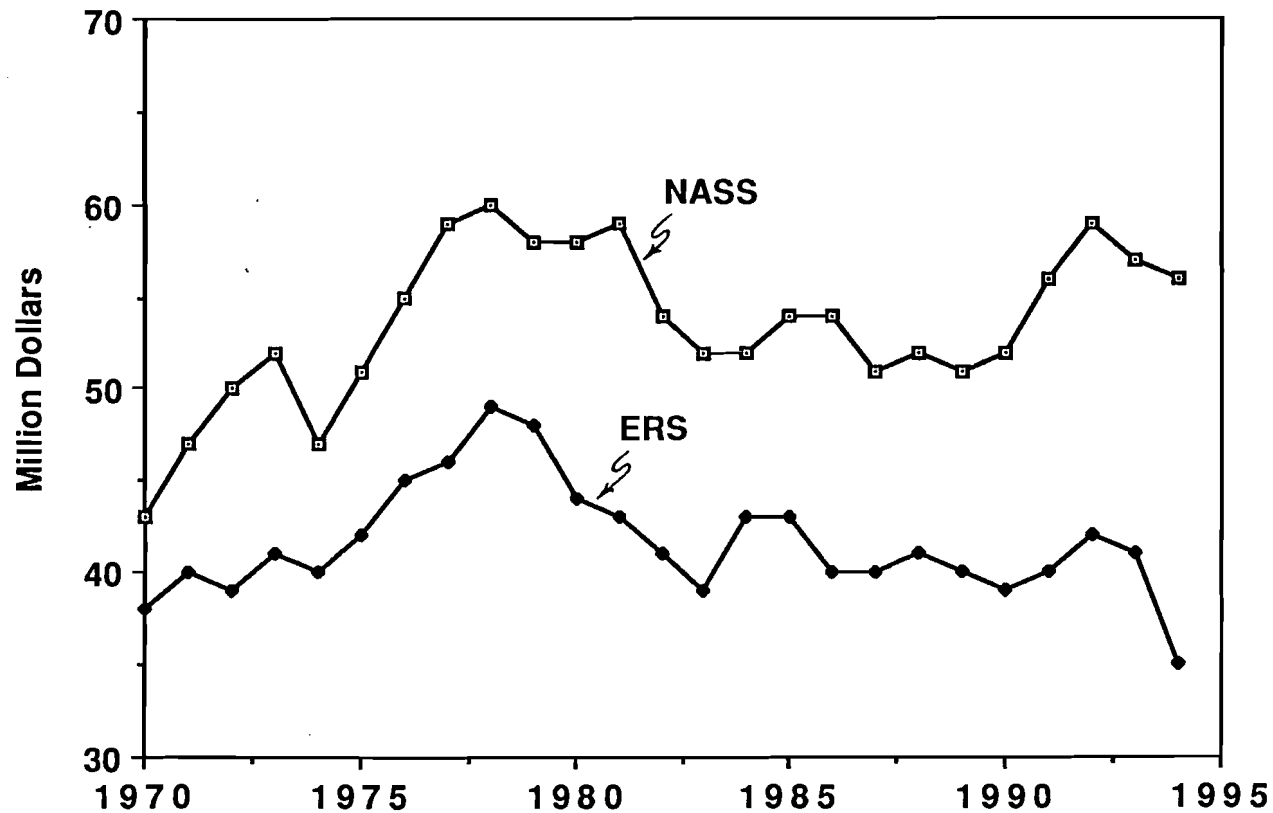


Figure 1. Federal Statistical Agency Budgets, US Department of Agriculture, National Agricultural Statistics Service, Economic Research Service, 1970-1994 (in millions)

the economics of information by conceptualizing the relationships between market structure and information. To help illustrate this conceptual relation of how the costs and benefits of information to public agents and private firms vary across market structures, four hypothetical cases are considered. The implications of this analysis for agricultural economists interested in the study of food and agricultural markets are then developed.

Forces Influencing the Management of Public Statistical Systems

In a free society, the management of public information systems increasingly involves tradeoffs between the public right to know (accessibility to information) and the private interest of individuals and businesses (confidentiality). This balancing of tradeoffs, to include other issues related to the management of public information systems, is influenced by, at least, four major forces: legal, technological, ethical, and economic (Figure 2). These prime forces can act independent of one another but are often interrelated in their combined influence on managers of public statistical systems. For example, a change in technology, i.e. the introduction of computers, presents new legal questions about ownership of property rights and also has implications for the economics (costs) of certain information systems. Moreover, legal and ethical considerations are often in conflict for individuals in a society which promotes freedom of information. Below, I briefly describe each of these influences and indicate areas of concern for the federal statistical system.

Legal

For the purposes of this discussion, legal forces influencing the management of public statistics includes legislative policies (government wide) and administrative procedures (agency specific) adopted by statistical agencies (Table 1). Both formal and routine sets of rules provide

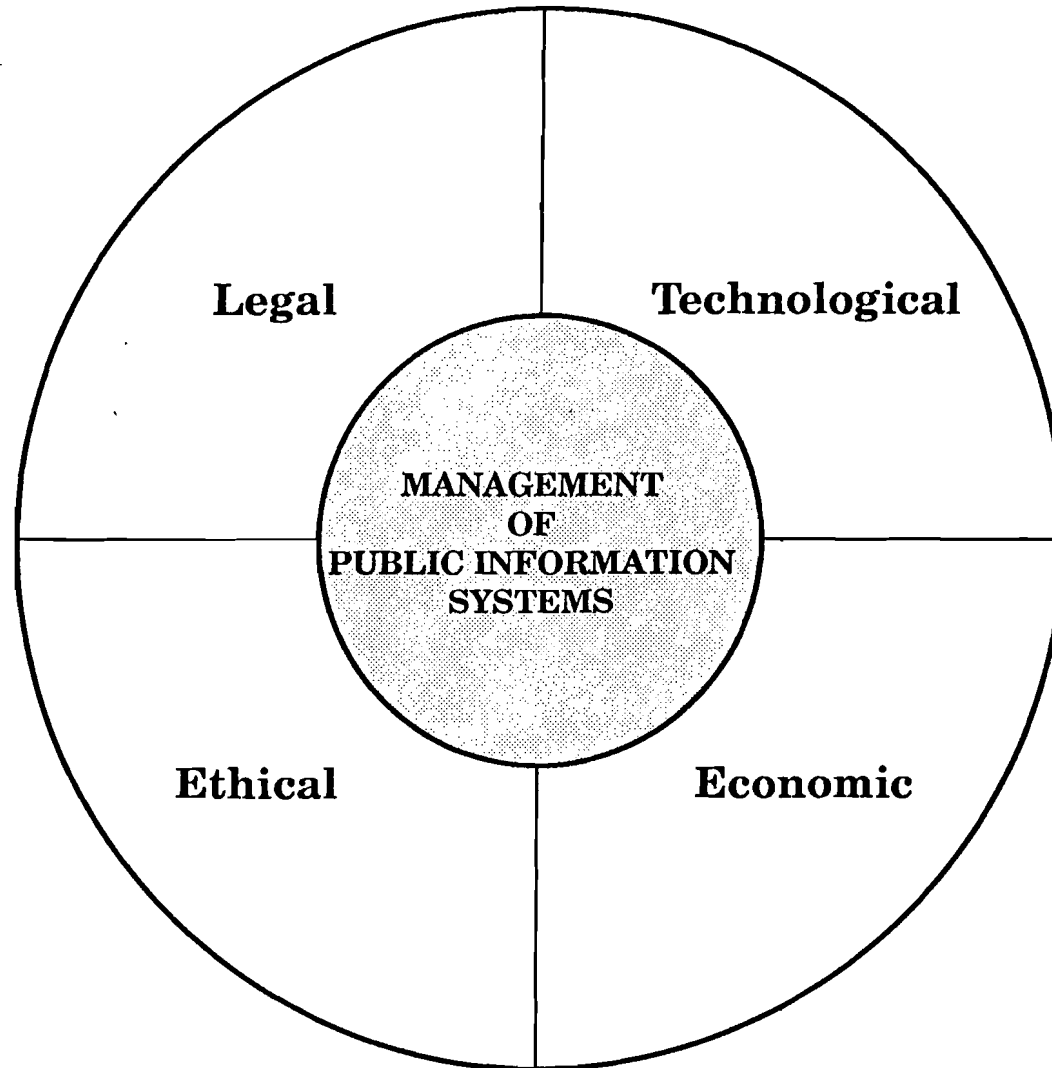


Figure 2. Major Forces Influencing the Management of Public Information Systems

Table 1: Milestone Legislation and Administrative Procedures Governing Collection, Management, and Disclosure of Federal Statistics

Legislation:

The Freedom of Information Act 1966 (5 USC 522)	Designed to facilitate access of individuals government data, records, and procedures.
The Privacy Act 1974 (5 USC 522a)	Designed to prevent disclosure of data on persons and to provide a mechanism for persons to verify the accuracy of government records.
Paperwork Reduction Act 1980 (P.L. 96-511)	Designed to reduce response burden of individuals and businesses.
Computer Matching and Privacy Protection Act 1988 (P.L. 100-503)	Regulates the use of computer matching of federal records subject to the Privacy Act.
American Technology Preeminence Act 1991	Requires federal agencies to transfer to the National Technical Information Service (NIIS) copies of federally funded research to be organized and marketed to the public (academic and industry).

USDA Statistical Agencies Administrative Procedures:

National Agricultural Statistics
Service (NASS)
Standard for Suppressing Data Due
to Confidentiality Policy and
Standard Memoranda on 12-89,
July 12, 1989.

Economic Research Service (ERS)
ERS Policy on Dissemination of
Statistical Information,
September 28, 1989

Sources: Thomas B. Jabine. 1993. Statistical Disclosure Limitation Practices of United States Statistical Agencies. *Journal of Official Statistics* 9(2):427-54.

George T. Duncan, Thomas B. Jabine and Virginia A. deWolf. 1993. *Private Lives and Public Policies: Confidentiality and Accessibility of Government Statistics*. Washington, D.C.: National Academy Press.

guidance for managers of statistical systems. The Privacy Act of 1974 (5 U.S.C. § 552a) was the first attempt by Congress to provide comprehensive protection of an individual's right to privacy by setting rules governing the collection, management, and disclosure of personal information maintained by public statistical agencies (Cecil 1993). The Freedom of Information Act (5 U.S.C. § 552), specifies disclosure conditions for agencies to provide individual citizens access to government data. On the surface, these laws appear contradictory or, at best, reflect a trade-off between access to government records and confidentiality. The Panel on Confidentiality and Data Access (Duncan et al. 1993) rejected the notion of such "trade-offs," asserting that across certain statistical agencies the mission varies greatly and so the access-confidentiality tradeoff issue may be seen instead as a "win/no lose" proposition. Therefore, both public law and administrative procedures are major influences on the management of federal statistics.

Ethics

Ethics is concerned with the right and wrong of a given action with the purpose of identifying principles that guide behavior. What is right or wrong is governed by the ethos of society. Since statistical agencies are governmental institutions, to varying degrees, these agencies reflect the ethos of society. The Panel on Confidentiality and Data Access considered the question "What principles should guide statistical agencies?". The principles of *democratic accountability*, *constitutional empowerment*, and *individual autonomy* underlie the ethics of American society and provide valuable ethical guidance for the structure and practice of federal statistical agencies. Democratic accountability "recognizes the responsibilities of those who serve or represent others" (Duncan et al. 1993, 25). Constitutional empowerment refers to the

capability of citizens to make informed decisions about public policy and private issues. Individual autonomy "refers to the capacity and right of the individual to perform in society as an individual, uncoerced and cloaked by privacy" (Duncan et al., 27). These combined ethical principles influence the management of public statistical systems, for these principles define the rights and responsibilities of individuals in a free society.

Technology

Technology refers to the capabilities that humans possess for improving their material welfare and for performing tasks in ways that involve less effort or are more efficient. Rapid changes in the computation and communication capacity within society have expanded the demand for data. This heightened demand for statistics places greater pressure on managers of public statistical systems. Technology made it feasible to have easy access to data banks and thus issues surrounding confidentiality of information intensify, further influencing the management of public statistical systems.

Economic

Economic forces influencing the management of public statistical systems take on two-related sub-issues. First, public support of federal statistical systems influences greatly the functions of statistical agencies. In fiscal 1992, slightly over \$900 million was budgeted for federal statistical agencies. Figure 3 illustrates the distribution of this budget across the various governmental agencies. Second, at a theoretical level, economics influences the management of statistical agencies when costs and returns on investments in information are evaluated. The balance of this paper expands discussion of these economic considerations.

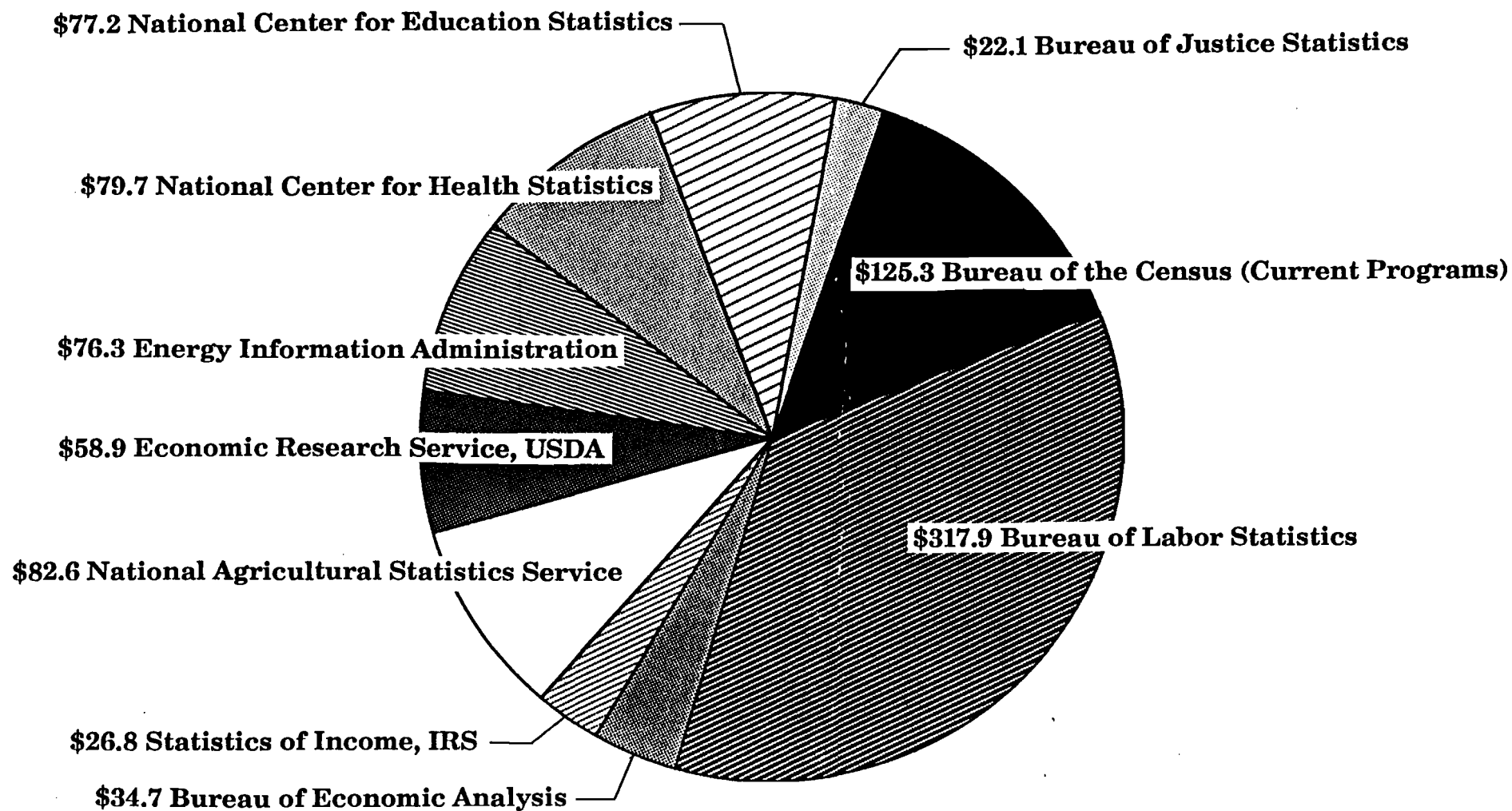


Figure 3. Principal Federal Statistical Agencies (funding in millions)

The Economics of Information

Two variables are of fundamental importance for the decision maker: resources and information. Traditionally economic theory has dealt with the problem of resource allocation among competing uses by assuming that information is equally distributed at no cost among all individuals of an economic system (i.e., that all individuals possess perfect knowledge). It becomes immediately apparent that traditional economic theory does not adequately address information problems; they are simply assumed away. A more specific critique of the theory, suggested by Demsetz, questions a comparison of resource allocation produced under a state of perfect knowledge with those produced under a state of imperfect knowledge. Since imperfect knowledge is often regarded as a distortion, it becomes difficult, if not impossible, to separate the effect of imperfect knowledge from the resulting conclusions of a theory based on perfect knowledge.

Some economists have attempted to adjust for this problem by viewing information as an economic good or commodity (Arrow 1962). And like any other good, information becomes subject to demand and supply analysis. But unlike traditional marketable commodities, information exhibits a set of characteristics that invalidate the usefulness of a competitive equilibrium analysis; information possesses the characteristics of a public good.

In the Samuelson-Musgrave definition, a public good is characterized by 1) nonrivalness, or jointness in supply and utilization, and 2) nonexcludability. The first attribute implies that the good is equally available to all. The second implies that it is impossible for private producers to appropriate through market pricing the full social benefits arising directly from

production or use of the good. That is to say, it is difficult to exclude from utilization of the good those who do not pay for it--the so called free rider problem.

The public good characteristics of information present a problem on the demand side of the information market (Riemenschneider 1977). Arrow (p. 616) states that similar problems of indivisibility and undervaluation exist for the users of information:

...there is a fundamental paradox in the determination of the demand for information; its value to the purchaser is not known until he has the information. but then he has in effect acquired it without cost.

These problems are clearly serious for those who wish to use neoclassical supply-demand theory for analyses of informational phenomena. Quoting from Marshak et al. (p. 9):

They lead to severe doubts concerning the optimality of the information market in itself and more generally to a view that--when knowledge production is introduced into an economy then neither for the simple competitive mechanism nor for any simple modification of it is the optimality of equilibrium preserved, and even the existence of equilibrium is doubtful.

Market Organization and Information: Some Conceptual Insights

The industrial organization (I/O) framework (Bain 1968) may have application to the study of market information. The paradigm seeks to establish a relationship between the structure of an industry, its firms, behavior, and the resulting economic performance. The framework has been applied to a number of issues concerning market organization. This framework may provide insight into the nature of information and perhaps gives some indication of its value to decision makers.

Intuition suggests that the relationship between information and each component of the I/O framework runs in two directions (Figure 4). Information influences market structure, but

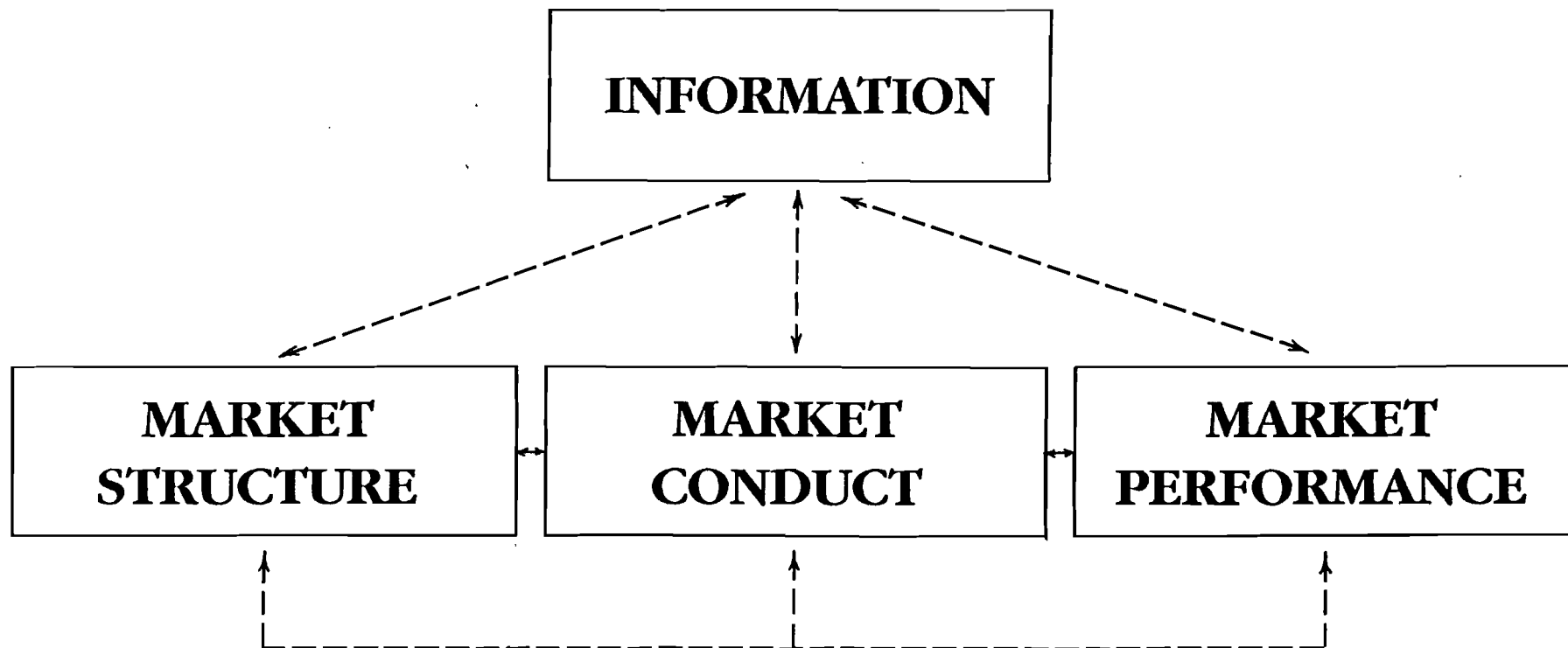


Figure 4. Market Information and the I/O Paradigm

a given structural characteristic of a market can govern the flow and distribution of information. Information influences the behavior (conduct) of the firm, but the firm can reduce its needs for information by adopting various risk management practices which allow it to make decisions in an environment of imperfect knowledge. Information can be associated with market performance, but, conversely, the performance of a market can have an impact on information within that market. Thus, this relationship becomes circular. Although a dynamic relationship between the I/O framework and information is theorized, it becomes more manageable to trace connections between the two in a single direction. That is, one can hold the structural and behavioral dimensions of the market constant, and question what impact various elements of the I/O framework have on the distribution and, perhaps, value of information in the firm's decision making process and in public policy use.

It should be noted that the I/O framework has at least two limitations for analyzing informational problems. Applications of the I/O framework have traditionally de-emphasized 1) vertical market relationships, and 2) the behavior of the firm's decision process. The former has implications for the structural characteristics of a market while the latter relates to market conduct.

Information is a product of exchange, and exchange within markets can take place in both horizontal and vertical dimensions. But traditionally, industrial organization theory has been applied only to horizontal market relationships. Several researchers, including Williamson, Henderson, Marion, and Shaffer have attempted to integrate and combine vertical coordination with I/O theory. They have all recognized that the I/O paradigm has important applications to the study of vertical market relationships and the coordination of these systems in addition to

earlier research applications to a single industry. Developments in this area will have implications for research on information systems because more information (for both private and public purposes) is transferred via vertical market transactions than horizontal ones.

Researchers argue that the I/O framework omits an important aspect of reality: the framework does not consider the firm's decision environment. The I/O framework has concentrated on conditions external to the firm, i.e. definition of the relevant market. Thus, it has treated the firm like a "black box." Shaffer calls for linking the I/O framework with the bodies of knowledge developed by organizational behavioralists (Simon 1975, Cyert and March 1977) whose primary concern commences with intrafirm decision-making. This line of reasoning would not only add to I/O theory, but would also make it possible to investigate the relationship between the firm's decision process and information. If I/O theory does not account for the firm's decision making environment, one cannot expect it to accommodate notions related to information.

While market structure and market conduct can have substantial impact on the design of information systems, an association between information and market performance may also have important application to the study of information. Several studies have attempted to link information to selected dimensions of market performance such as price stability (Houck and Pearson 1978) and price dispersion (Devine and Marion 1979). The difficulty in following this line of reasoning lies in the fact that market performance is a multidimensional concept. Moreover, care must be taken in designing the research such that information impacts on market performance can be separated from other factors which may influence the performance of the market.

The relationships between market structure and information are the primary concern of this paper. I will proceed by using four hypothetical cases to examine the distribution of acquisition costs and of information benefits between private firms and public agencies across alternative market structures.

Impacts of Market Structure on the Costs and Benefits of Acquiring Information by Private Firms and Public Agents

Because the value of information is only realized *ex post*, public or private returns on investments in information are difficult to estimate. It may be reasonable for a decision maker to concentrate on minimizing the costs associated with acquiring information. Sporleder (p. 392) observes that: "... the largest information cost component for a typical firm is likely that associated with acquisition of information through contact and communication." But under other market conditions, private decision makers can realize direct benefits from information. Both costs and benefits of information shape the behavior of decision makers. To help illustrate this point, hypothetical cases of information costs and benefits for private firms and for public statistical agencies under four different market structures and exchange mechanisms can be considered.

For the purpose of this presentation, a special meaning of market information is used. In the strictest sense, we know that market signals are not information *per se* because they have not been analyzed nor interpreted to serve a specific decision.² Economists marvel over the signaling function which prices play under perfectly competitive market conditions. But outside of this set of preconditions, the limitations of the informational content of prices are well documented (Collins 1959). Just identifies two classifications of information in relation to the

phenomena measured: (1) *market data*, including prices and direct measures of supply and demand data and (2) *structural data* defined as "a broad term intended to include data on income, employment, productivity, nutrition, distribution of resources, etc." He further distinguishes the two by asserting that "market data are supplied from both public and private sources" and used primarily by firms in making marketing decisions. Structural data are primarily produced by public statistical agencies and used by public policy makers. Nevertheless, when exchange occurs within a market, information is always present. Questions arise as to: Who has access or rights to this information? How are costs and benefits from its use distributed? Why do public statistical agencies and private firms behave so differently with respect to information distribution and use under different market structures?

To the extent that the distribution of market information varies over market structures, it is reasonable to assume that costs and benefits are also distributed differently among various market participants. Even within the same market structure, the total cost of producing information varies among organizations for a number of reasons including, for example, size of organization, purpose of organization, management styles, analytical capabilities and methods of accounting for costs (Burch 1979). Because of its public good characteristics, the measurement of benefits from information becomes equally difficult.

Hypothetical Cases

The following assumptions are made for each of the four hypothetical cases: 1) Within each market structure, one hundred percent of the market volume is transacted under the exchange mechanism associated with that structure; 2) Both buyers and sellers in the market face the same market structures (symmetric markets); 3) Firms are not required by law to report

information to the public statistical agents; 4) The nature and type of information needed for decision making changes over various structures.

The conceptual framework considers a series of four hypothetical cases. Each hypothetical case examines how acquisition costs of information are distributed between the firm and the public statistical agent under the specified market structure and associated price exchange mechanism. The following market structures and associated price discovery mechanisms are considered: 1) competitive market/auction; 2) oligopoly/contract; 3) monopoly/ bargaining; and 4) single firm market/vertical integration.

In the first case, we examine the costs and benefits of information to the public agency and to the private firm(s) in a competitive market. A public auction is a close approximation to the competitive market. In this case, it is hypothesized that the public agent and the private firm would both incur relatively low costs for obtaining information. Why? The competitive market with its assumption of many buyers and sellers (etc), especially in the case of a public auction as the exchange mechanism, presents no problem for a participant or a neutral agent in obtaining accurate and representative market information by merely participating in or observing the centrally located auction process (a characteristic of such information is nonexcludability). The public agency faces relatively modest costs in this case, compared to what it faces under other market structures. Informational costs are no higher and are often lower for the firm, but as one competitive firm among many, it finds it difficult to capture any return on its investments in information. The firm is "regulated" by the market and, to the extent that the market is able to supply an adequate amount of reasonably accurate information, the firm's investment in information acquisition is low. Since no private firm has an incentive to provide the information

needed to facilitate the coordination of the market, the public statistical agency, while facing the same relative low costs, has the capacity to generate very high social return to society (Hayami and Peterson 1972).

As we move to a more concentrated market structure and associated exchange mechanism, oligopoly and contracts, we encounter higher information acquisition costs for the public agency and perhaps slightly lower information cost for the private firm for several reasons.³ While there are fewer firms in the market, the cost of information to the public agent is higher because the private contract pricing mechanism is substituted for the open market auction, thus reducing the amount of readily available market information. Proprietary rights in market information are heightened. It is in the individual firm's interest to withhold information so that it maintains a competitive advantage over other firms in the market. Information ceases to be a product of the public processes of the market and becomes more an internal firm product of a publicly unrecorded private transaction between firms. But, even if the contracting firms should voluntarily report to the public agent, the complex and differing specifics of each of the many contracts would create major formatting and disseminating costs. Also, much of the coordination of the market follows from the fewness of firms and their interdependence in behavior, reducing the benefits to society or consumers of any public investment in market information. Under this market structure, the firm still faces about the same information costs, but the potential net benefit to an oligopolistic firm is higher. Because of the very nature of the market, particularly in cases where there are few firms, a firm can use information internal to its operations to arrive at estimates of the entire market. Moreover, as

an oligopolist, the firm recognizes that it can capture more return on its investments in market information.

Next, the monopoly structure, with bargaining as the exchange mechanism, is considered. In this case it is expected that the public agent will experience substantially higher information acquisition costs and the firm will incur still lower information acquisition costs. All market information is now a product of the internal decisions of the bilateral monopolists. The public agent's information costs are likely to be even higher relative to other market structures because of the obstacle of the firm's entrenched property rights to information. Information held by the firm is reported only if the firm is required by law (i.e. subpoena) to report because of some prevailing public concern (see assumption 3). Consequently, the public agent's cost of acquiring market information becomes extremely high. However, potentially high social benefits for such public investment exist, though these returns are derived from public policies regulating firm behavior, not for facilitating market coordination. The coordination function, which is performed by the firms, is entirely internal to the monopolies. These two firms are in full control of all market information. Exchange between the bilateral monopolists is facilitated by bargaining. Although the bargaining may be inefficient for the monopolists, the cost of acquiring market information is lower for these firms than it is for firms in other market structures since most "market" information is part of the internal records of the bilateral monopolists. Once again, because of the inherent structural characteristics of the market, the firm has low informational cost and can realize high private benefits from information.

In the final case, the situation of a single firm economy, no market transactions are examined. The firm performs internal transactions through vertical integration. Although the

potential social benefits of publicly supplied information are high, the acquisition cost of information for the public agent is prohibitively high. The cost to the firm for access to information becomes extremely low. Vertical integration enables the firm to realize economies of information exchange (Williamson 1971). While information processing, managing, and analyzing costs may be high, the acquisition cost of market information is nil, and the advantage and benefits in the control over distribution of information, especially with respect to public versus private use, resides in the private firm's domain.

Implications for Public Investment in Information and Needed Research on Public Information Systems and Food Markets

As one moves from case to case in the purely hypothetical examples above, market concentration and the public agent costs of market information increase greatly, while the costs of market information for the private firm decrease. As market concentration increases, the firm's information acquisition costs decline and returns on the firm's investments in market information increase greatly, providing a major incentive for the firm to invest in information and to deny access to public agents and to competing firms in the market. For the public agent, the social benefits to public investments in information to facilitate market coordination decline rapidly as concentration increases, while benefits from information for public policy and regulatory decisions grow. Thus, the purpose of public investment in market information changes drastically.

The above framework attempts to explain why private market participants invest in market information differently than public statistical agents over various market structures. The framework suggests that the cost of information, defined as a function of accessibility to

information, is a major factor in determining informational investments on the part of both private and public decision makers because the value of information is, at best, difficult to determine. Thus, an individual decision maker faced with uncertainty will attempt to minimize the cost of acquiring information.

The effect of market structure on investments in market information can be perhaps best illustrated when one considers the early 1980's reductions in the public statistical budget. The federal statistical budget is estimated to have been reduced by 20 percent in real terms between 1980 and 1983 (Slater 1982). The budget cut in federal statistics altered the data production efforts of the United States Department of Agriculture, Statistical Reporting Service (SRS) in at least three ways: (1) approximately 27 agricultural-related and crop reports were eliminated, (2) some state level estimates were discontinued, and (3) data series were eliminated for several fruit and vegetable crops (Gardner 1983). More recently, reductions in federal support of agricultural statistical agencies have altered the effectiveness of their ability to respond to new societal challenges such as those relations to rural development, environmental policy and international economics (Johnson and Bonnen 1991). The public data and informational output has been reduced on a wide-range of economic and social issues while demands for new data have burgeoned (environmental baseline data, immigration impacts on labor markets, effects of global competition on rural economies, etc.).

The statistical budget cut starting in the early 1980's have had different distributional impacts between the production of market data and structural data. Just (p. 874) observes the "structural data-gathering efforts seem to be hardest hit by budget cuts." He cites the Office of Information and Regulatory Affairs, Statistical Policy Branch by stating program changes were

made to improve data on crop and livestock production, stock of farm commodities, and data for crop forecasting while special purpose surveys will be either phased out or scaled down. Gardner further notes that the most notable loss of data is the socio-economic statistics that were moved to follow-on surveys in 1974 and were eliminated in 1982. Public investments in the production of structural data, are unlikely to be replaced by private investments. In the cases where private firms would invest in structural data, a return would only accrue to the private sector. Thus, non-price data or information on more concentrated markets would be lost.

Why have we observed a larger reduction of public funds for the production of structural data? Reduced public expenditures for producing structural data, as opposed to market data, may be explained, in part, by the theory of information acquisition cost and market structure developed above. As we move away from the competitive norm, non-price information becomes more valuable, albeit more difficult to quantify, to both public and private decision makers. Because of the structural characteristics of the market, the acquisition cost of structural information becomes more costly for the public agent and less costly for the firm. The relatively high cost of acquiring structural information, given the unquantifiable benefits of this investment, may explain why public expenditures for the production of structural data have been reduced. Conversely, because of the inability to measure the value of information and, given its relative lower acquisition costs in competitive markets, we may experience an over-production of publicly provided market data.

These comparative cases provide hypothetical examples based on theory of how acquisition costs and benefits are distributed between the private firm and the public agent over various market structures and exchange mechanisms. As markets grow more concentrated, the

need of publicly supported information for the purposes of improving private market decisions (market efficiency) will decline. This phenomenon does not necessarily lessen the need to collect public information so much as it suggests a need for public market information to preserve competitive market forces. Market organization and informational properties are important to the design of a publicly supported statistical system. The structural characteristics of a market may serve as criteria for determining public investments in information; the amount and kind of information that decision makers demand is related to the structure/organization of markets. This hypothesis requires further empirical testing.

The lack of data on many segments of the U.S. food marketing system will no doubt have an effect on research methods of applied economists interested in studying food marketing problems. Current thinking requires more dependence on markets, while at the same time, markets are deferring larger shares of economic activity to firms (Christy 1993). Stiglitz argues that now more economic activity is occurring within organizations than within open-market pricing systems. If agricultural economists are to be of service to private and public decisionmakers, an improved understanding of the strategic behavior of the modern firm must be acquired.

ENDNOTES

1. Personal interviews with Richard Allen from NASS/USDA and Edward Spar of Council of Professional Association on Federal Statistics improved my understanding of the current policy environment in which managers of Federal Statistical Agencies operate. Richard Allen provided data which is presented in Figures 1 and 3 of this paper.
2. In his Presidential address to the American Agricultural Economics Association, James T. Bonnen makes the case that data are not information until they were analyzed and placed within a specific decision context.
3. Care must be taken in presenting the few-firm industry case as it relates to the acquisition cost of market information. Several models of imperfect competition exist and each has a different set of implications for the distribution of acquisition costs between firms in the market and between private market firms and the public statistical agent. The arguments presented in this case subscribe to the dominant firm model of the imperfect competitive market.

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