

INFORMATION AS AN ECONOMIC GOOD: A Re-Evaluation of Theoretical Approaches

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ABSTRACT

Information has proved to be a problematic concept for economic theory. In particular, scholars have noted that the distinctive nature of information as a good have given rise to a series of externalities which hamper its treatment and consideration as an economic good. Some have argued, in fact, that information should not be treated in economic or other analyses as an economic good on theoretical grounds.

This paper reviews the considerations of information which have lead to this view, and finds that such conclusions are based on a limited, traditional, approach to information goods. Specifically, it is suggested that an extended and redefined conceptualization of the value and costs of information goods can internalize the perceived externalities and allow the consideration of such goods as regular economic goods. This concept is extended to a consideration of three aspects of information goods traditionally seen as problematic in economic theory.

Information as an Economic Good: A Re-Evaluation of Theoretical Approaches

"The exercise of determining the quality and definition of information is one that has to be survived and gotten over, rather than resolved." —George Gerbner

The question of information and its economic nature is one that has plagued social scientists for decades. Due to its ubiquitous and pervasive nature, information has by and large defied attempts at definition, much less quantification. While attempts have been made to concretely measure the flow (Pool, 1983) and value (Machlup, 1962; Porat, 1978) of information, these have tended to aggregate only external ramifications of information rather than address the concept of pure information as a good. As a result, these studies have tended to raise as many questions as they address. In the absence of consensus on what information is, and how it can be measured, the concept of information and its various ramifications has remained largely theoretical.

Yet even in theory information has remained a problematic concept in economics. And that has hampered considerations of the question of value, and/or the economics, of information in its various forms in other disciplines. The goal of this paper is to examine this problematic nature of information and to propose an extension of economic theory which may help to resolve some of the quandaries and apparent paradoxes which currently plague economic considerations of information in the field of communication.

Information has played, from the beginning, a dual role in economic theory. First, information (as a discrete entity) can be considered as a commodity or good, and thus a subject of theory. Information (as a state of awareness), however, has also been one of the primary assumptions of any economic theory.

This reflects the ubiquitous, heterogeneous nature of information which has been noted in both economic (Black & Marchand, 1982; Hirschleifer, 1973) and non-economic (Dervin, 1976; Korobeinkov, 1980) studies. As this second aspect of information in economics is a feature of theory rather than the object of theory, this aspect will be disregarded in favor of considering information as a distinctive good.

Information as an Economic Good

In economics, the concept of a good is generally defined quite broadly. Ferguson (1972), for example, defines economic goods as the ends through which the goals of the economic actors are achieved. Marshall (1930; p.54) was equally general when he used the term goods to "represent all desirable things, or things that satisfy human wants." Goods may be material or non-material, transferable or not, free or costly. Only some of these goods, however, fall within the scope of economic science, and these are termed economic goods.

There has been some doubt raised in the field as to whether information can even be considered as an economic good or commodity. Krippendorf (1984) stated that information (albeit conservatively defined) was in fact not a good, although his definition of information can fit his definition of a good. Economists, as a rule, have failed to make this extreme statement, although noting that information violates some features generally attributed to consumer goods (Arrow, 1962; Boulding, 1966; Hall, 1981; Hirschleifer, 1973).

It is clear, though, that information is something which (a) can be transferred, (b) has some utility (usefulness), and (c) is capable of having a value attached to it. Therefore, despite its distinctive, problematic, nature, information can be considered to be an economic good. And it is the consideration of information as an economic good which has led to three basic quandaries in the economics of information.

First, there is the problem of whether information is truly a public or a private good. Some economists (Boulding, 1966; Demsetz, 1967; Marshall, 1974; Stigler, 1983) have argued that information, in particular additional information about a market, creates economic value through its use, and has thus entered the realm of theory as a private good. Others, led principally by Samuelson (1954; 1958), have argued that certain features of information, notably that the consumption of information by one consumer does not affect the availability of that good to other potential users, earmarks information as a public good. advertising.

Secondly, there is the quandary of advertising. As Stigler (1983: 171) quipped, "one of the information-producing industries, advertising, is treated with a hostility that economists normally reserve for tariffs or monopolists." While recognizing that advertising may have value as information and may be socially desirable through the reduction of market imperfections, the general argument has been that most advertising content is persuasive and misleading (therefore of little informational value) and that the supply of advertising is excessive since it is supplied at zero price to consumers.¹ While objections have been expressed to these sentiments (Doyle, 1968), advertising is generally perceived as being economically inefficient and non-optimal.

A third problem area exists in the suggestion that information goods inherently fail to meet the conditions of social efficiency

¹ It has been argued that consumers do, in fact, pay for advertising through increased prices for other products (see, for example, Lees and Yang, 1966). This can not be considered to be a direct price, however, as it is not associated with the acquisition or consumption of the good itself. That is, such costs are accrued independent of the consumption of the information good advertising.

(Arrow, 1962; Hall, 1981). This problem arises from the unique nature and features of information as a good. In particular, the problem is traced to the same features of information which make consideration of the value of information problematic: uncertainty of the precise outcome of production or exchange of information goods, the infinite reproducibility of information, and the fact that the transfer of information goods to another does not diminish the stock of information held by the first holder.

It is primarily this last feature, when combined with the fact that information is reproducible at essentially no cost (although there may well be costs associated with the distribution of that information), that has made economic analysis of information somewhat problematic. This state essentially arises from the perceived failure of information to satisfy one of modern economic theory's most basic optimality and efficiency criteria: that the marginal cost of a good equal the marginal revenue gained from the exchange of the good.² This problem is linked to the issue posed by the first feature of information as a good mentioned above, the difficulty of ascertaining the value of information. This paper will begin with an examination and consideration of the economic value of information.

The Value of Information Goods

There have been many considerations of the value of information, across several disciplines. A conclusion reached by nearly all is that the value of a piece of information is not fixed. Hirschleifer (1973), for example, noted five general attributes

² This criteria is actually valid only in competitive markets, although it also forms a first order condition for equilibrium in monopoly markets as well. In other cases, however, equilibrium is also affected by marginal cost considerations, both directly and through its impact on average cost (Ferguson, 1972). Thus, it is useful to focus on the impact of marginal cost.

affecting the value of information: certainty, diffusion, applicability, content, and decision-relevance. Black and Marchand (1982) added to this by stating that the value of information is also related to its mode of use as well as structural and political factors. These, of course, are in addition to the more traditional factors affecting the value of a good, such as opportunity costs and the costs associated with production and/or distribution.

While these attributes and factors may be seen as influencing the value of information, they provide little insight into the problem of determining the value of information. The beginnings of such an insight may be found in Arrow (1962), who noted that the full value of information could not be known in certainty until after it had been consumed and put to use. This insight was developed and extended by Stigler (1983), Marshall (1974), and Hirshleifer (1971) who concurred in finding that the value of information arises from its use.

A further step in addressing this problem can be made by formally taking the step from a deterministic to a probabilistic framework of analysis. From the above beginnings, it is known that value is uncertain, but arises from the use of the good. The development of decision analysis has provided a theoretical framework to deal with uncertainty through probabilistic analysis. Thus, the problem of uncertain value is handled through the concept of expected value, essentially an averaging of the possible value outcomes weighted by their likelihoods.

The value of an information good, X, can then be expressed as the expected value to be gained from the use of that information good, or expressed as

$$\text{Value of X} = E[\text{use}(X)].$$

The use of expected value enables the analyst to treat the value of information goods as fixed. There is still, however, a degree of variability inherent in this conceptualization of value

in that the value of the information good X is still dependent upon context and the differing tastes or preferences of the parties involved. This, however, is not that different from more traditional goods, whose utility value to the consumer has long been other market situations. considered variable in precisely the same manner, although it has not always been treated as such in economic analysis.³ It has really only been the concept of exchange value (for the producer) which has been regarded as fixed, and for all intents and purposes considered to be the same as price.

Thus, as suggested by Coase (1974), it would seem that information goods can be treated in economic analyses in much the same manner as traditional goods: subject to the same criteria, laws, and manipulation. It should therefore be expected that information should be subject to the same optimality and efficiency criterion as traditional economic goods, namely that the marginal cost of information goods be equal to the marginal revenue that the transfer of the goods brings about (i.e., the price of the information good).⁴ Why, then, have information goods generally been perceived as failing to satisfy this basic criteria?

A number of researchers have felt that the problems of economic analyses of information can be traced to deficiencies in the analytic treatment of information goods. Minasian (1967), for example, argued that traditional theory ignored some aspects of costs which rendered such theory deficient as an analytical tool. More generally, Demsetz (1967), Lee (1982), and Leff (1984) have noted that the failure of theory to incorporate important aspects of information is a source of the problematic status of

³ To illustrate, the value of a gallon of water is recognized as being higher for a person dying of thirst in a desert than for another person sitting beside a fresh water spring, having drunk their fill.

⁴ Again, strictly speaking this is valid only under competition, although the concepts are extendable to other market situations.

information in economic theory. This paper will attempt to demonstrate that this perception is largely rooted in the failure to consider the full costs of information transfer to the provider.

The Full Costs of Information Transfer

As noted above, information is a distinctive good. Its unique features are evident even in typical cost considerations. The production of information for distribution is characterized by a high fixed cost (the cost of acquiring or developing the information in question) and an essentially zero variable cost. This zero variable cost reflects information's distinctive characteristics of being essentially non-material and infinitely reproducible. Physical distribution of information, it should be noted, may contribute additional fixed and variable costs, depending upon the medium used.

Ignoring, for the time being, distribution costs, the marginal cost of production for economic goods would typically be seen as being equal to the fixed cost of production for the first transfer of the good, and equal to the variable cost for any subsequent production. For information, that would suggest an initial high marginal cost, but one which, after the first transfer, would be essentially zero. For all intents and purposes then, the marginal cost of production for information goods was treated as being zero. Even when including the cost of physical distribution, the marginal cost may be zero, and thus require for efficiency and optimality a price, or exchange value, of zero.

This is where traditional considerations have led: the paradox where the economic (exchange) value of information is linked to the medium of distribution rather than the quality or utility of the information itself. The consumer's demand for information goods (and thus its price—given supply), on the other hand, is linked to the utility value of the good and thus its quality and potential usefulness, just as for any other good. That is, under the

more traditional considerations of the past, different aspects of information goods have determined cost and price; price by the usefulness of information, and cost largely by the mode of distribution. With costs not necessarily related to price, it was conceivable, perhaps even likely, that under traditional economic analysis the efficiency criteria might not be satisfied for information goods.

Information, however, is not a typical good. With the typical economic good, transfer entails loss of the good and the rights to it. Thus, the loss in value to the producer (seller) of the transfer of the good is the cost of producing and transferring the good, called the marginal cost of production for that good. This has led to the general perception that the marginal cost of the good to be exchanged was simply its cost of production. With information, though, transfer does not necessarily entail the loss of the information good and the rights to its use. Thus, the loss to the producer (seller) from the transfer of information goods is not only the marginal costs associated with that good's production and transfer (distribution), but also the expected loss of value resulting from any future use of that information by the producer resulting from that transfer.

In other words, as the producer of the information retains the information as well as exchanges it and the value of information lies in its future usefulness, if the exchange of the information affects that information's future usefulness to the producer, that impact should be reflected in any cost computations for that good. Thus, a loss in what may be termed the stock value of information is an appropriate component of the cost of information production and transfer, and therefore should be considered in marginal cost considerations.⁵ This returns the consideration of

⁵ As an example, suppose an individual knows that a merger will soon be announced which will double the price of a certain stock. Clearly, the value of such information to that individual is the expected returns from

cost to a basis in the utility, or usefulness, of the information itself, rather than solely on the mode of transmission.

It would therefore seem that the perceived quandaries in the economics of information result from the exclusion of what is likely to be a vital, if not necessarily major, component of marginal cost from traditional analysis. The following sections will reconsider these perceived difficulties in light of this oversight.

The Public Good — Private Good Debate

Previous considerations in this debate have tended to focus on different aspects of information as a good. Supporters of the notion that information is a private good have largely focused upon information as market information and the reduction of uncertainty. Within this focus lies information with definite economic value, value which accrues to the individual(s) who controls the information and its use. This consideration was bolstered by the recognition of property rights to information (Boulding, 1966; Demsetz, 1967), and Marshall's (1974) arguments that such information which was public was valueless.

On the other hand, supporters of the notion of information as public goods have largely focused on information goods such as television and radio broadcasts (Samuelson, 1954, 1958). Such goods clearly fit the proffered definition of public goods as those whose consumption by one individual did not affect that good's availability for any other consumer. It is little wonder that with no common basis for argument, the debate over whether information was essentially a public or a private good remained

being able to use that information, i.e. the profit to be made from purchasing that stock. If that individual should transfer that information to others, who then also purchase that stock, the increased demand will cause the stock's price to rise, reducing the amount of gain to be made from the individual's future use of that information, which is what has been defined as the stock value.

unresolved.

At first glance, it would seem that information as a good would be inherently public in nature. With the feature of infinite reproducibility at zero cost, any level of consumption still leaves an infinite potential supply. It would appear, then, that consumption of information by any one consumer would not affect that information's availability to other potential users. There are, however, two basic problems with this argument.

First, there is what Demsetz (1969) referred to as the fallacies inherent in the "nirvana approach." In this approach, efficiency and optimality are judged against some ideal state. There is a world of difference between this theoretical "ideal" and reality. In the real world of markets, information will not be made available unless the return from the supply of those goods is at least as great as their real cost, at least in the long run. While such returns need not be directly linked to the transfer, the costs must be met in some form, suggesting that the good will not be supplied unless some minimum level of consumption is expected. There is also the potential problem of "congestion;" where the (over)use of the good by enough consumers reduces the utility of the good for all.⁶

Thus, while in theory availability may be unaffected by consumption, in practice it is quite likely that the availability of any information good, whether by public or private agents, will depend upon certain minimum and maximum levels of

⁶ As an illustrative example, consider bridges. Many communities located on rivers find they have use for more bridges than they presently have; the demand for bridges is present. However, in many cases, that demand is considered to be insufficient for the costs involved, as was the case with one city denied funding for a bridge which then applied to foreign governments for aid. On the other hand, many are aware of the impact of congestion on bridges; a bridge which is clogged with traffic is of much less value than one that is not.

consumption.

Secondly, this approach fails to consider the possibility of the impact of consumption of information goods upon their stock value or utility. One implication of the commonly accepted definition of public goods is that the marginal cost of such goods is zero; but as argued above, full marginal cost considerations must include the impact of the marginal transfer upon the stock value of the good. In some cases, such as market information, the value of the information good is clearly dependent upon the degree of diffusion of the information; with each additional transfer of information, the potential gain to the supplier of the information from his or her subsequent use of the information is decreased.

On the other hand, there is other information, such as entertainment or advertising, where the marginal impact of distribution would have no impact on the stock value of the information, or might even increase the stock value.

Therefore, at least for those information goods whose "consumption" has a negative impact on the stock value of that good for the producer, the consumption of the information good by one may well have an impact on that good's future availability. There may well be, then, information goods which are not public because considerations of the impact of consumption upon the producer's stock value in the good would act to restrict supply and availability. On the other hand, there may well be information goods whose consumption does not affect the producer's stock value, and in fact may even enhance it. In the first case, one would expect no change in supply due to consumption: such goods would clearly be true public goods. In the second case, consumption might even be encouraged, thus explaining the private production of public information goods such as radio and television programming.

While this expansion does not resolve the debate in the sense

of determining whether information goods are public or private, it does provide theoretic justification for arguing that information goods, like other goods (Davis & Whinston, 1967; Head & Shoup, 1969), may be either public or private, depending on features of the good itself and its means of production and distribution. In this sense, both sides of the debate may have been correct in viewing their particular examples of information goods as either inherently public or private, depending upon criteria other than their particular nature as information goods.

Information Goods and Social Efficiency

Modern economic theory has yielded, via the theory of welfare economics, the concepts of social efficiency and welfare maximization. Such theory has further yielded the result that under the conditions of perfect competition, social efficiency and welfare are optimized. Thus, in one sense, optimality can be traced to the basic condition that marginal costs equate with marginal revenues within all markets for goods, a condition known as marginal cost pricing. Information goods have been held to violate this condition in two basic ways.

The first manner in which information is held to violate efficiency conditions derives from a seminal paper by Kenneth J. Arrow (1962). In this work, Arrow argued that free enterprise, or perfect competition, did not lead to the ideal allocation of resources to the production of knowledge, due to information's properties as a good. In effect, Arrow claimed that information would be under-produced because economic returns were not fully appropriable: that the producer did not receive the full value of the information from its transfer. This can be construed as suggesting that, within free markets, marginal revenue is less than it should be for information goods. Under marginal cost pricing, this suggests that marginal costs are understated.

Other economists have argued the reverse: that some forms of information would be overproduced because it is priced at less

than marginal cost. Advertising is the prime example given (Telser, 1966), although Hirshleifer (1971) argued that "foreknowledge" would also tend to be overproduced in private markets. Provided at a zero price to the consumer, advertising is said to violate marginal cost pricing because marginal costs can not be negative. However, it could also result from true marginal cost pricing if the perceived marginal costs were overstated.

In other words, if one assumes the validity of the marginal cost pricing condition which results from the producer's profit maximizing behavior, both results could be explained by the statement that the marginal costs of information goods as generally perceived by the theorists are not true reflections of the real marginal cost of such goods. In the first case, marginal costs are understated; in the second they are overstated. As was noted above, traditional considerations of marginal cost for information have omitted consideration of a prime factor of the cost of information goods exchange: the changes in stock value. This heretofore ignored component of marginal cost may explain how such misstatement of cost occurred.

Consider Arrow's example of invention and research. Real costs are assumed in its production, and real returns may be expected by the producer in her future use of that information, be it from personal use or the sale of that information. Such (expected) returns may be seen as the initial stock value of that good. The problem of the "inappropriability" of information reduces to the argument that others may gain revenues from the use of information: that the producer may lose future revenues by other's use of that information.⁷ In other words, the stock value

⁷ Although outside the traditional definition of research and invention, a prime example of the question of appropriability may be seen in the current controversy over the "pirating" of recorded entertainment material. Producers of such material argue that the copying of such material reduces the opportunity (likelihood) of future sales of that

of information may be reduced through other's actions.

And the likelihood of such actions is clearly linked with the degree to which the information in question is disseminated, as well as the system of property rights and enforcement of such rights within a society. Taking such systems as given, this suggests that the loss in stock value is truly marginal: that there is a positive loss in the stock value with each additional transfer or use of that information good. For such information, this can clearly be considered a positive marginal cost of production and transfer.

To the degree that such marginal costs are disregarded (by the producer as well as the theorist), the attempt of the producer to maximize profits by equating marginal costs with marginal revenues will result in the setting of prices below the true optimum, thereby yielding Arrow's finding of suboptimal allocation. It is perhaps only in the ethereal world of economic theory, however, that this factor of marginal cost is ignored: it would seem that the actions of information producers in protecting and conserving the value of such information would indicate that producers are indeed aware of this component of marginal cost, and would likely include this factor in their calculations and actions.

Advertising as a Special Case

Advertising is one form of information good which has long been viewed as contrary to economic optimality and social welfare. In part, this has been due to the argument that the persuasive nature of advertising distorts the market allocation process by getting consumers to purchase goods which they neither need nor desire (or at least which they supposedly would in the absence of advertising). A second perceived difficulty with advertising has been that as advertising is delivered free to

material, and thus their overall revenues from the production of that information good.

the consumer, it is likely to be oversupplied. The first argument lies outside of the purview of this paper, and so will not be addressed here. The second, however, is a problem of a presumed violation of the marginal cost pricing condition for efficiency and welfare maximization.

Advertising is produced and delivered to the consumer free of charge. In fact, in some circumstances, the advertising subsidizes the production and distribution of related goods. In the first case, the price of advertising as an information good is zero. In the second, one can see that the effective price of the advertising good is actually negative: that the presence of advertising reduces the actual price of the related good. On the other hand, there are positive marginal costs associated with the distribution of advertising.

According to the traditional theory, then, the marginal cost of advertising is strictly positive (i.e. non-zero), while the price of advertising is strictly non-positive. It was thus seen as being impossible for the marginal pricing condition to be obtained by advertising as a good. Advertising was thus judged to be inherently inefficient. Yet if one considers the contribution of changes in the stock value of information goods in the determination of "true" marginal cost, this dilemma may be resolved.

Advertising is a peculiar form of information: one with a particular purpose. This purpose is to inform or persuade consumers of certain features, attributes, or values of other goods. Specifically, advertising as an information good is used to increase the consumption of other (target) goods, or at least to prevent a decrease of consumption. Thus the value of the advertisement to the producer of the target good is the likelihood of the message's effect upon consumption multiplied by the economic value of that effect, e. the expected value of the (added) consumption of the target good. Further, this value is clearly marginal: the degree of distribution of advertising (as an

information good) will affect both the likelihood of, and expected return from, changes in consumption.

Assuming that the producer of the target good is also the producer of the information good (advertising), the producer can thus be seen to accrue economic value with each additional transfer (consumption) of the information good.⁸ Structurally, this can be seen as a change (increase) in the stock value of the information good, and thus as a (negative) component in the marginal cost computations for that good. The nature of advertising is such that the presumed change in its stock value through dissemination is positive. This implies that the contribution of this component of marginal cost is in fact negative: that it can be said to reduce the costs of transfer, and to perhaps even render the net marginal cost for this form of information good to be negative over some range of quantity.

The concept of zero, or negative, marginal cost carries with it some interesting implications, primarily when subject to the marginal cost pricing condition. Under such conditions, for advertising to be socially efficient and contribute to welfare maximization, such information goods would have to be supplied free, in the case of zero net marginal cost, or with a payoff to the consumer, either directly or through the subsidization of another good, should the net marginal cost be negative. And in fact, such are the conditions under which advertising is produced. Therefore, with the inclusion of stock value considerations, there is no a priori reason for advertising, as an information good, to be considered to be socially inefficient or to lead to suboptimal conditions.

Summary

Information is clearly a peculiar economic good. Its

⁸ In cases where there is an intermediary, value can be seen as basically flowing through such an intermediary, through the provision of intermediate goods or services.

distinctive nature and features have contributed to its problematic treatment in economic theory. These problems appear to arise from the treatment of information as a traditional good with, however, an extensive set of affiliated externalities. In fact, the problems which traditional economic theory has evidenced with information are attributed to these externalities resulting from the peculiar nature of information.

This paper argues that rather than treat information traditionally as a good with externalities, that the economic treatment (analysis) of information be expanded so as to effectively account for the distinctive nature of information within the structure of the analysis, thereby precluding any resort to externalities lying "outside the sphere of analysis." That is, that one expand one's concept of value and cost and related constructs and theories, incorporating the notion of information as a regular economic good subject to the same analysis and conditions as other goods.

To this end, two concepts have been advanced. First, that the value of information is probabilistic, rather than deterministic, and depends on the returns from the (future) use of that information. The expected value of information at any particular point, so defined, was called its stock value. Second, that the stock value of information may be affected by the transfer of the information to others, thus making such changes in stock value a valid component of marginal cost considerations of the exchange of information goods.

With the use of these concepts, it was shown that there need be no problematic analyses raised in the economic consideration of information. While the development of these concepts do not preclude such problems or definitively resolve those addressed, treatment of information goods in such a manner does demonstrate that information goods are not necessarily problematic: that they are neither necessarily public or private in nature, nor that they

are necessarily socially inefficient. In short, that within properly structured conceptualizations and analyses, information can be treated as any other economic good.

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