TELEVISION PRICING AND THE THEORY OF PUBLIC GOODS*

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I. Introduction

In a paper on the theory of public expenditures published a decade ago, Professor Samuelson offered a tripartite taxonomy—blue-chip private goods, pure public goods, and impure goods—that has become well-known. Pure public goods are those:

> which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good . . . .[1]

In a more recent contribution, Professor Samuelson refers to television broadcasting as a pure public good involving the "vexing problems of collective expenditure."[2] He then offers certain optimality propositions with reference to the pricing of television services. I shall argue that Samuelson's apparent conclusion is predicated upon a misapplication of an optimality rule to this problem. After analyzing resource use under the two systems of advertising and subscription-supported television, I shall indicate the nature of the problem at issue and offer an alternative approach to the more general problem. The final section contains some critical comments on the present theory of public goods.

II. Television Broadcasting

Television broadcasting is an economic problem by virtue of its employment of scarce resources—the rights of radiation (frequencies) and other resources. Neither a television broadcasting system, nor the broadcasting of a particular program at a given time and place, has a zero opportunity cost.

* This paper is a revised version of RAND P-2773, which was written in July 1963 while the author was at the RAND Corporation.

[1] Samuelson, The Pure Theory of Public Expenditures, 36 Rev. Econ. & Stat. 387 (1954).

[2] Samuelson, Aspects of Public Expenditure Theories, 40 Rev. Econ. & Stat. 332, 335 (1958).

The problem of scarcity requires a system for allocating resources, in the first instance to television and, secondly, within television, among types of programs.

Professor Samuelson, in the course of a discussion of the theory of public expenditures analyzed the desirability of pay-television in the following terms:

> Here is a contemporary instance. The Federal Communications Commission is now trying to make up its mind about permitting subscription television. You might think that the case where a program comes over the air and is available for any set owner to tune in on is a perfect example of my public good. And in a way it is. But you would be wrong to think that the essence of the phenomenon is inherent in the fact that the broadcaster is not able to refuse the service to whatever individuals he pleases. For in this case, by use of unscramblers, it is technically possible to limit the consumptions of a particular broadcast to any specified group of individuals. You might, therefore, be tempted to say: A descrambler enables us to convert a public good into a private good; and by permitting its use, we can sidestep the vexing problems of collective expenditure, instead relying on the free pricing mechanism.
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> Such an argument would be wrong. Being able to limit a public good's consumption does not make it a true-blue private good. For what, after all, are the true marginal costs of having one extra family tune in on the program? They are literally zero. Why then prevent any family which would receive positive pleasure from tuning in on the program from doing so? Upon reflection, you will realize that our well-known optimum principle that goods should be priced at their marginal costs would not be realized in the case of subscription broadcasting. Why not? In the deepest sense because this is, by its nature, not a case of constant returns to scale. It is a case of general decreasing costs. So long as increasing returns prevail in the actual range of consumption, we know that perfect competition will not be self-preserving and market behavior is unlikely to be optimal.[3]

The argument is that since "the true marginal costs" of providing television viewing to an extra family are zero, a subscription television system (using positive prices) would violate "our well-known optimum principle that goods should be priced at their marginal costs." In what follows I shall show that a television system, in order to maximize the value of scarce resources utilized in broadcasting and competing uses, may very well require the prevention of nonpaying families from tuning in on a program.

The Nature of the Optimum Condition

The crucial element of Samuelson's argument is that, once a program is on the air, the marginal cost of viewing is zero; therefore, consistent with the

[3] *Ibid.* Strictly speaking, the power isoquants, delineating the geographical boundaries of broadcasting, and their shapes depend upon the amount of scarce resources utilized. That is, a larger area of coverage requires the employment of a greater amount of scarce resources, with no obvious characteristics of decreasing or increasing returns to scale.

Paretian optimality condition, the price should be zero.[4] Although Samuelson's inference is correct, if we take the quantity and quality of programs as given, the rule would uniformly define all output combinations as optimal without any discrimination. Once programs are on the air, irrespective of their nature, the value of the services made available would be defined by the rule to be optimal, *if and only if* tuning-in is free.

A pricing rule that takes the kinds of output as given cannot be expected to shed light on the nature of resource allocation and, moreover, should not be identified with the optimum principle for resource allocation. While the optimum principle dictates the use of costs, the value of foregone alternative uses of scarce resources, the dictum that price should equal zero is independent of the value of television output.

The rule can neither serve as an analytical vehicle for deciding whether it is economic to have more than one channel operating in an area or in a country, nor discriminate among kinds of programs to be put on the air. Therefore, the rule provides no economic criterion for evaluating total resource utilization in television broadcasting, or the alternative uses of a given amount of scarce television broadcasting resources at a given time and place. This is to be expected. Samuelson's rule is applicable to the problem of rationing a given output, and is not a rule which will select those uses which enable the value of the television services to be maximized.

The rule is of ambiguous merit, because what is being rationed "efficiently" may be worth very little. At the extreme, the program might be a constant beep-beep signal. It could be provided to extra viewers with no additional expenditure of resources. Yet even each viewer who tuned in would incur a significant opportunity cost measured by the loss of more valuable programs that could be produced with the same resources. Thus, it is not true that a zero price for television programs allows extra viewers to be made better off without making anyone worse off; the "free rule" makes it impossible for the actual or potential viewer to bid for programs which represent to him a more valuable alternative.

The "free" television rule *must* look for an auxiliary mechanism to determine both the quantity and the kinds of output to be produced. It follows that a comparison of the "free" television rule (accompanied by some supplementary mechanism) with subscription-supported television, has economic meaning *only if both systems produce the same quantity and quality of broadcasting*. Otherwise, such a comparison can throw no light on the choice among different systems, since the comparison provides no information about the nature of resource allocation.

[4] I may possibly have misunderstood some aspects of Samuelson's argument, but the viewpoint that I will be criticizing is certainly one which is held by many economists writing on questions of welfare economics.

Professor Samuelson appears to be opposed to subscription television because it would raise price above marginal cost (which is zero). What alternative he would favor is not clear, except that presumably it would be one in which there was a zero-price. As it happens the alternative to subscription television, so far as the Federal Communications Commission was concerned, was the continuance of the system which currently exists in the United States and which has the property considered desirable by Professor Samuelson, namely, a zero-price for viewers. I propose to use this as an example of a system in which price is equal to marginal cost and to show that the results to which it leads are in no sense optimal. Whether Professor Samuelson had in mind this alternative or some other is of small importance. Whatever "free" television rule is adopted must have some auxiliary mechanism for the determination of output and until this auxiliary mechanism has been specified and its performance examined, the fact that subscription television will raise price above marginal cost provides no reason for rejecting it.

The institutional arrangement which has been in operation since the 1930's, is the following: (1) the Federal Communications Commission (FCC), on the basis of its mandate of public interest, grants restricted licenses to individuals to operate television stations, and (2) the television programs are usually determined by the interplay of advertising outlays. The question arises, would the prevailing and the subscription systems of television yield the same results? Let us briefly analyze the fundamental difference in the two mechanisms leading to output choices. This will not only provide analytical reasons why we would expect different results, but, as a by-product, it will shed light on the question of program diversity which has seriously concerned students of television broadcasting.

Output Choices: Advertising and Subscription Systems

In order to obtain the opportunity to advertise, a firm sponsors (bids for) programs which will be preferred by those who are likely to be persuaded by the message broadcast and thus increase their purchases of that firm's product.[5] We would expect a firm to incur additional advertising costs up to the point where the last increment equals the marginal net revenue derived from the additional advertising. The size of the audience depends upon the total cost of broadcasting the message—that is, audience size is a function of the quality of the broadcast. But the productivity of advertising—viewer's

[5] In principle, individuals who were not affected by the advertising would have no influence on the programs offered, if firms had a perfect means of distinguishing the presence of those who are from those who are not likely to be affected by the message. In a sense entertainment is free for those who have the same preferences but are not affected by the message—except for the burden of viewing the commercial—but it is not free from society's point of view.

receptiveness to the message broadcast—is not uniform or independent of the characteristics of viewers. Therefore, competition among advertisers will result in different programs being made available, each tailored to appeal to various subsets of the population, such as children, male adults and female adults. However, it is plausible to assume that for any subset of population the individual's receptiveness to the message broadcast does not depend on the value of the program in an entertainment or educational sense. Thus, from the sponsor's point of view the choice of a program will depend upon the size of the potential audience it generates, and its value will be measured by the returns to advertising. The return to advertising also determines the revenues received by the station owner who has no demand for his service other than that of advertisers.

The fundamental character of commercial broadcasting, both television and radio, therefore, is that the nature and thus the value of programs (the cost of the scarce resources in alternative uses) are determined by the productivity of advertisements. In contrast, under a subscription system the value of a program will depend upon the demand for the program in its entertainment or educational sense. In order for the two systems to result in substantially the same resource allocation, it is necessary that the quantities both of revenues and of costs be independent of the systems. This means that *in each and every case* for a given cost of production the net revenue obtained from advertising be exactly equal to the revenue that would have been generated if viewers paid for the privilege of seeing the program.

I know of no postulate or, better still, no evidence that lends credibility to the existence of the required relationship. On the contrary, we would expect the results of the two systems to differ because of the effect of the fundamental differences in the nature of voting that underlie the systems.

First, in an advertising-supported system voting is by response to the message, and the program results reflect an all-or-nothing type of voting, since votes take weights of either one (viewer) or zero (nonviewer). In contrast, a subscription system allows proportional representation, since votes take different weights (different prices paid for different kinds of programs) and reveal the voters' subjective evaluations of the program. Therefore, a subscription system can be expected to yield a more diversified program menu than an advertising system, because the former enables individuals, by concentrating their dollar votes, to overcome the "unpopularity" of their tastes.

To gain some perspective, note that programs which are currently discarded may have had as many as 15-20 million viewers. Network programs do not become "profitable" before passing the 20 million mark, and popular shows command 30-50 million viewers, according to the rating services. A nonpopular show by current standards, if viewers are willing to pay a quarter on subscription television, needs an audience of less than a million to compete

with a current show with 30 million viewers on advertising-supported television (many of the current popular programs cost only a few pennies per family).[6]

Second, the total resources used in broadcasting will be different in that the profitability of the broadcast station depends upon the system of payment for its services. It is plausible to expect that viewers would subscribe to see current programs at a higher price than a few pennies per family, as measured by the advertising expenditures. This, in turn, could be expected to induce more resources to be drawn to the industry. In addition, the demand for television broadcasting would further increase to reflect the emergence of programs that are not now profitable but will become so under the subscription system.

The above discussion would lead us to expect a greater quantity and a more diversified program menu to result from subscription than advertising-supported television.[7]

The Real Problem: Choice of the Alternative Systems

The value of television output can be expected to be different in the different systems, and it will depend upon the particular payment system operating. This means that the economic cost of the resources used is also different. If we are ultimately interested in the value of the output generated by scarce resources, then clearly a "free-for-all" (that is, free tuning-in) rule, which enables every set owner in the community to savor the entertainment pie, is of ambiguous merit if the size and the flavor of the pie also depend upon the rule itself. Similarly, normatively speaking, a "better" world would be one in which the nature, the size, and the value of the output of television would be determined by direct competition by community members armed with their dollars, but, once radiated, the reception of the programs would be made "free." Unfortunately, given the constant evaluation which would be necessary, the desired information would not only be costly, but, more importantly, of dubious value once the individuals in the community recognize the rules of the game.

The subscription system yields results that reflect the cost of scarce resources in alternative uses, and therefore tends to solve the problem of efficiency in resource allocation. In contrast, resource allocation under a free-television rule does not depend on the economic costs of resources, but, by necessity, must be determined by the workings of some other system(s). For

[6] One of the networks supplied me with data on the total revenues generated by two successful one hour programs in the 1964-65 season, one being a weekday and the other a weekend program. Revenues generated per family were 1.8 cents (less than a penny per viewer) and 3 cents (slightly more than one penny per viewer).

[7] In order for the quantity of television to increase, it would be necessary for additional frequencies to become available.

example, given the use of a certain amount of radiation rights (frequencies) allowed by the FCC, commercial television makes what is provided for viewing depend on what viewers will support by their purchases of advertised products. This is in effect a subsidy-in-kind in a tie-in sales setting, an arrangement which is not even conducive to suboptimization by the viewers.

The real problem, therefore, is the choice between the results of the two systems and not the rules of rationing they contain. While neither system will reside in the "ideal" world of Pareto, nonetheless, both will confront the problem of scarcity. The problem of scarcity necessitates a system for the allocation of resources *to and among types of programs,* while preserving an *accepted* notion of over-all efficiency.

The correct approach, therefore, would involve the analysis of the effects of different institutional arrangements and would try to determine which arrangements tend to maximize the value of scarce resources utilized in broadcasting and *competing* uses (provided that the underlying implicit and explicit property rights were accepted by the community members).

On technical grounds, I do not see any necessity for either a purely commercial system ("free" reception) or a purely subscription television arrangement; after all, a coexistence policy is a distinct possibility. If the station "owners" had "property rights" which did not restrict them to commercial transmission, broadcasting might in fact consist of both subscription and commercial sponsorship systems.

III. Some Implications about the Present Theory of Public Goods[8]

Professor Samuelson seemed to reject the use of descramblers, which are devices that permit a telecaster to deny a program to viewers unless they pay for the privilege of viewing it. His ground was that television broadcasting was a case of a pure public good. But having the characteristic of a public good does not necessarily imply his conclusion.

In principle one can distinguish between the concept of public goods and the theory of public goods as an analysis determining choice among alternative institutional arrangements. In practice, unfortunately, the two have not been separated. The goods that fit the concept are asserted to involve automatically "vexing problems of collective expenditures" in the context of "the pure theory of public expenditures." In this setting, the concept of a *public good* has misled people to infer the need for collective action for its production and allocation. For the purpose at hand, television broadcasting will serve as the

[8] This section has benefitted from comments made by Armen A. Alchian and William H. Meckling.

context in which the theory of public goods will be both *used* and *criticized* in its *inferential policy role.*

The optimal pricing rule is said to require that public goods be made available at zero price. Goods can be "free goods" in one or another of two senses, and it is necessary to distinguish the two. They can be free in the conventional sense, as is air for breathing, when the "natural" supply exceeds the amount demanded at a zero price, and resources are not used in their "production." They can also be free in another sense, namely, the community organizes their production, and explicit prices are not allowed to operate as either signalling or rationing devices, but resources *are* consumed in their production.

The theory of public goods relies on the technological aspects of the production of a good, with neglect of the economic considerations that lead to choice of alternative technologies. That is, it neglects the effect of different exclusion systems, for example, taxes and prices. It calls forth collective expenditure for cases where others are able to consume a certain good leaving no less of *it* for any of the users of *that* good. But once a television program is on the air, everybody in the area *could* tune in on *that program* without "appreciably" increasing the costs. Granting consumer choice, the important question is not whether others *could,* but rather whether they *would* prefer to consume that good if they had alternatives open to them.[9]

Should one infer that television is to be produced by collective action? Not necessarily. The answer will not depend solely upon whether the technological aspects are such as to make the good a public good. The *theory* of public goods is of little help in distinguishing those goods that are best provided via community action from those that should be left to individual decisions and preferences.

A pure theory of public expenditure purporting to identify on economic grounds the goods that are best provided by collective action should have the power to govern choice among alternative institutional arrangements on the basis of their relative merits. The present theory of public goods is incapable of generating the relevant economic information. It consistently rejects a particular system not on the basis of its merit relative to other alternative approaches to a particular problem, but merely because it does not fulfill the conditions of an "ideal" world. Consequently, it cannot be

[9] Although individual wants have some relevance within any set of political arrangements, they are fundamental in the theory under criticism. But, it is the inherent character of the solution of the cases which call for political or community action—irrespective of the kind of activity, e.g., military, civilian, etc.—that allowance for dissent cannot be made. For example, in defense matters how would we treat religious groups and "pacifists" within the definition? The name itself is unfortunate even if some of the members were not obliged to contribute, since Quakers, for instance, may be willing to pay something in order for others not to indulge in defense—the more others consume the less satisfied they might be.

expected to provide and, as the following examples suggest, it does not provide a correct identification of the economic problem.

According to the theory, television is a *pure* public good that involves the "vexing problem of collective expenditure," as does defense, which is perhaps the *impure* public good. Strategic air defense is frequently cited as another example of a public good, and it is assumed that it should be financed by mandatory collections from the members of the community through the fiscal mechanism. But, so long as "deterrence" or other similar category of protection is *short of certainty*, one group cannot have more without other groups having less. An important aspect of the nature of deterrence is the geographical dispersion of installations. For example, people in Omaha (Strategic Air Command Headquarters) have not been indifferent to the installation in their vicinity for fear that they may have become a favored target for enemy attack. Or consider the often-heard complaints of allies of the United States with respect to establishment of military bases in their territories. Moreover, political or community action has been suggested for providing shelters, which has come to be considered as a deterrence measure, yet we know that shelters in Buffalo will not protect people in Cambridge, Yet, while both defense and television are said to have zero marginal cost for another viewer or person defended, it may be argued consistently that television is better provided by private competition and pricing and defense better provided by collective expenditures. Why? *The absence of an economic method* to exclude those who benefit from defense expenditure has been correctly recognized as leading to "cheating" (the nonrevelation of preferences), and therefore defense is best left to collective action. By the same reasoning, it is not the scarcity of space or place as such that leaves concerts, movies, and the theaters to private choice making, but the *availability of an economic (not costless) method of exclusion* that allows the kind and the quantity of output to reflect individual choice. After all, a tax system is a method of exclusion. Those who do not pay taxes will find themselves "excluded" from society. Furthermore, it is a costly method of exclusion.

The important point is that the choice between allocative systems depends on the differences in outcomes they produce. The net result cannot be determined without considering the relative costs of, or the inefficiencies created by, the operation of the alternative exclusion and incentive systems. In short, the present theory of public goods is a deficient analytical tool (not as a concept, but rather as a theory of actions to be taken in the production and allocation of such goods). It fails to specify the appropriate supply of the good to be produced, and thus the value of the total resources to be devoted to its production. As in the case of television, the theory ignores the effect of different signalling and control systems (alternative institutional arrangements) in revealing alternative values of the used resources. This means that the theory

generates economic analysis which is not based on the opportunity cost notion of economics.

POSTSCRIPT

Professor Samuelson's comment[10] relates to two separate issues: what he meant by his remarks on the FCC's consideration of subscription television and the relevance of the concept of a public good for economic policy. I regret that I misinterpreted Samuelson although I do not regard my reading of his argument as being as unreasonable as he seems to suppose. When he posed the question, "Why then prevent any family which would receive positive pleasure from tuning in on the program from doing so?", it had not been obvious to me that he thought that there might be reasons why it would be desirable to prevent it. Nonetheless, I am delighted to see the record corrected. Samuelson reinforces my conclusion that the theory of public goods, of itself, is incapable of governing choice between institutional arrangements. The fact that a solution raises price above marginal cost provides no reason for rejecting it. I hope that other economists will study Samuelson's comment both to avoid the possibility of misinterpretation and to learn the relevance of the concept of a public good for economic policy.

[10] Samuelson, Public Goods and Subscription TV: Correction of the Record, 7 J. Law & Econ. 81 (1964).