

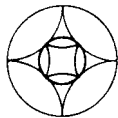
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THE CONCEPT OF COPRODUCTION AND ITS IMPLICATIONS FOR
PUBLIC SERVICE DELIVERY

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Contrary to most economic theory, consumers are not always easily distinguished from producers, particularly in the consumption and production of public services. Consumers of public safety add to their consumption and add to the community's supply of public safety by installing extra locks and outdoor lighting to their homes, changing living patterns to decrease exposure to attack, training in methods of self-defense, joining with neighbors to patrol the neighborhood, and providing police with details about criminal incidents. Consumers of fire protection increase their own safety by clearing away flammable materials, installing home fire alarms, and volunteering to fight fires with local fire companies. Consumers of educational services increase their consumption by teaching themselves and their own children, monitoring their children's progress in school, and volunteering as teacher aids. Consumers of clean environments increase their consumption by hauling trash to dump sites, recycling household waste, packaging household waste and carrying it to the curbside for pickup, and participating in community clean up campaigns. Consumers can thus increase the amount and/or quality of services they consume by directly contributing to their production.

This duality of economic roles is not consistent with prevailing concepts of consumption and production, where the two activities are ordinarily viewed as separate and distinct. However, recent analyses of public sector service delivery have begun to focus on this duality and to reconceptualize consumption and production. We review this work and suggest some directions for developing a theory of coproduction.¹ We

conclude the paper with a brief sketch of current theoretical and empirical research on coproduction of public goods and services.

Old and New Concepts

Traditional concepts of production and consumption have guided economic analysis since the beginnings of modern economic theory. Defining production as the transformation of inputs into outputs and consumption as the transformation of outputs into utility, economists have sharply distinguished the two activities and have used them to support separate branches of economic theory. However, in analyses of public services, including police services, fire protection, education, and litter control, consumption and production have not withstood such sharp distinction.² Here consumption and production begin to resemble each other, causing confusion in the use of these concepts transplanted from traditional economic analysis.

To sort through this confusion, we introduce new concepts for analyzing consumption and production in the public sector. One is the concept of the consumer producer, another is the concept of the regular producer, and a third is the concept of production. Consumer producers are those who engage in production in order to consume the resulting output (Parks, et al., 1979; Percy, 1980). Private individuals, firms, neighborhood groups, and other collective organizations can all serve-as consumer producers given that they directly consume some portion of produced output.³ For example, a profit-seeking firm using some of its own employees to erect a security fence is a consumer producer of security. The firm consumes

the increased protection from theft and vandalism while its own inputs produced that protection. A private citizen is a consumer producer when he paints his own home or repairs his own automobile. He supplies the effort and receives the benefits of an improved home or a well functioning automobile.

Regular producers, on the other hand, undertake production to exchange the outputs for payments, which are in turn exchanged for other goods and services. The payments usually involve money, but can include votes or barter. A firm producing goods and services to generate income for employees and profit for the owners is a regular producer. A public agency producing goods and services to generate income for employees and political support for officials is also a regular producer.⁴ Regular producers may or may not value the product of their efforts except as the product can be exchanged for something more valuable.

Consumer and regular production, although distinguishable, are not necessarily isolated from each other in practice. A single individual or organization mixes consumer production and regular production by consuming part of the output from the production and exchanging the rest for money payment. The proportions vary, depending on the individual or organization and depending on the good or service. Also, those who are regular producers and those who are consumer producers can both produce the same good or service. Individuals paint their own homes, while painting contractors paint houses for pay. Citizen-consumers produce security from crime by installing lights and extra locks on their property, while police employees patrol to produce security. Parents instruct their children in reading at home, while teachers instruct these same children in reading at school.

The combination of regular and consumer production of the same good or service, whether in the activities of a single individual or in the activities of different individuals, is captured in the concept of coproduction. Coproduction requires only that both regular and consumer producers contribute inputs to the production of a particular good or service (Parks, et al., 1979; Percy, 1980).⁵ Coproduction may or may not involve different sets of individuals or organizations in the two roles. Coproduction may or may not result from simultaneous action by the two types of producers. And coproduction may or may not result from explicit efforts to coordinate the production by the regular and consumer producers. Coproduction as used here is a general concept, but this does not imply that the form and timing of combined regular and consumer production are unimportant. Specific, and perhaps more interesting, issues of form and timing can serve to focus analysis of different aspects of coproduction.

Factors Influencing Coproduction

Three influences -- technology, economics, and institutional constraints -- together determine the proportioning of regular producer and consumer producer inputs in the production of goods and services (Parks, et al., 1979). Technology sets the physical limits, determining the feasibility of mixing various combinations of inputs to produce a given good or service. Outside these limits production deteriorates and ceases altogether. Inside these limits, technology establishes the production recipe that links certain regular and consumer producer combinations to specific levels of output. The economic factor considers

the relative costs of the regular and consumer inputs and the value of the output. Economic considerations are important to the extent that individuals and organizations are concerned with the costs and the value of production. The institutional factor involves the constraints on relationships among producers. The production of services generally requires interactions among individuals (and possible among organizations), and rules guide these interactions, determining whether the interactions are of the form described by regular production, consumer production, or coproduction.

Technological Considerations

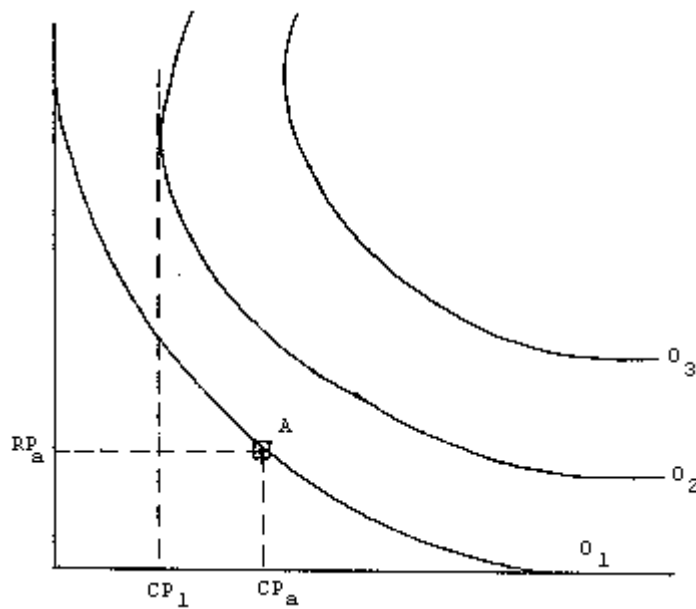
Coproduction can occur only if it is technically feasible, as described in economic theory by the production function. Figure 1 shows a production function involving regular and consumer producer inputs. The vertical axis registers amounts of regular producer inputs; the horizontal axis registers amounts of consumer producers inputs, and the isoquants or product curves O_1 , O_2 , and O_3 register the output resulting from varying combinations of regular and consumer producer inputs. Point A shows that a certain production process transforms CP_a consumer inputs and RP_a regular inputs into 1 units of output. Such a representation in economic analysis usually presumes technological efficiency meaning that RP_a and CP_a are the minimum inputs required to produce O_1 , although those requirements may not be met in practice. Our use of the production function, however, represents whatever technology is in use, whether efficient or not. Shifts from inefficient to efficient technology are shown by comparing different production functions -- one set of isoquants representing inefficient technology

and another set representing more efficient technology. Technology illustrated in Figure 2, using RP_a regular inputs combined with CP_a consumer producer inputs to produce O_2 is inefficient. The consumer producer inputs are redundant; they contribute nothing to the production. Eliminating the consumer producers from the process entirely and producing only with RP_a regular producer inputs maintains output at O_2 .

Figure 1

Technical Relationships in the Production Activities
of Consumer Producers and Regular Producers

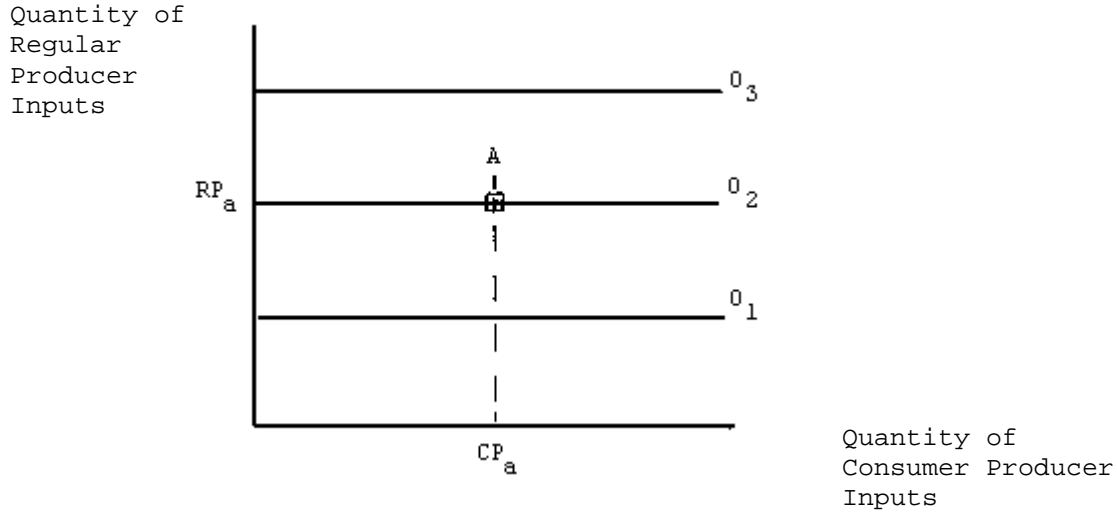
Quantity of
Regular
Producer
Inputs



Quantity of
Consumer Producer
Inputs

Figure 2

Technical Relationships in the Production Activities
of Consumer Producers and Regular Producers

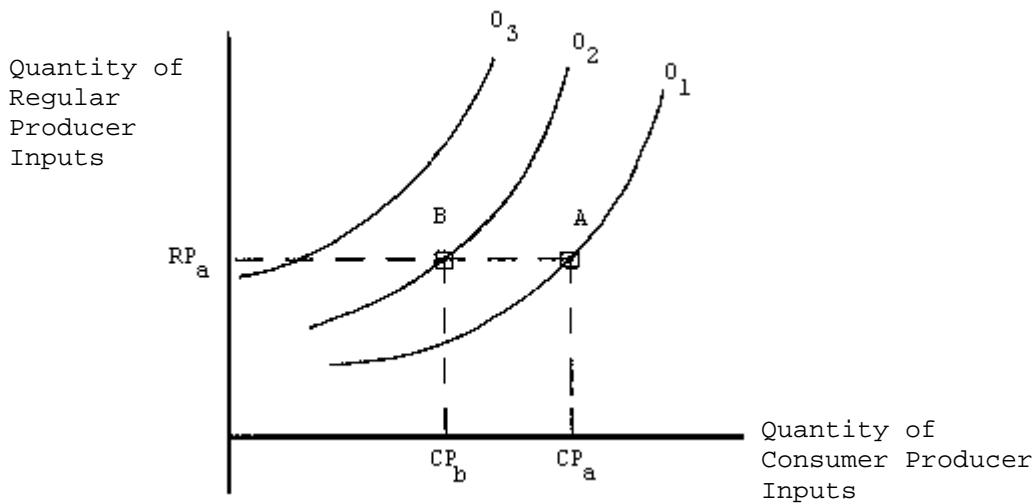


Technological constraints on coproduction are a matter for debate, since our knowledge of the production functions for particular services is so incomplete. Advocates of consumer involvement in production stressing the need for consumer producers, often argue that technology gives production relationships of the form in Figure 1. Output O_2 , for example, will not result unless at least CP_1 units of consumer producer inputs are used. Fewer consumer producer inputs result in production below O_2 . Advocates of regular production, on the other hand, argue a production function of the form in Figure 2, where the consumer inputs are redundant, or even of the form in Figure 3, where consumer inputs hamper production by regular

inputs.⁷ Reduction of consumer inputs below CP_a while maintaining regular inputs at RP_a increases output from O_1 . Less interference by consumers in the production process yields greater levels of output.

Figure 3

Technical Relationships in the Production Activities
of Consumer Producers and Regular Producers



The debate is unresolved, because observation of the production function for service production is extremely difficult. Service outputs cannot be easily measured, as they are in the production of tangible, readily unitized goods. Observation of service delivery technologies does not indicate, at least not at present, how changes in regular and consumer input combinations affect output. We are left, therefore, to select among production strategies without knowing what the actual production functions look like.

Economic Considerations

Whatever the production function, coproduction also depends on the relative costs of the consumer and regular producer inputs. To the extent that consumers can choose the input combinations, consumers have an incentive to compare the relative costs of regular and consumer producer inputs with the relative productivities of the inputs. Consumers can reduce their costs by selecting input combinations that favor the lower priced inputs, unless the higher priced inputs are sufficiently advantaged in productivity to compensate for their higher prices.

If consumers determine the coproduction mixture, they can decide whether to pay for the service outputs with money or with time. When the consumer sacrifices more value in the form of foregone opportunities with each hour devoted to the production of a service than would be sacrificed when the consumer pays someone else to produce the good, minimizing the costs of production tends to require greater use of regular producer inputs. When the payments to regular producer inputs involve greater sacrifice than results from devoting consumer time to production of a service, minimizing costs tends to require greater use of consumer producer inputs. Proper assessment of costs cautions against the temptation of a money illusion. Substitution of unpaid consumer producer inputs for regular producer inputs almost invariably reduces money costs of production, but real sacrifices may actually increase when the value of consumer time is relatively high. Reliance on consumer production methods would then cause service delivery costs to be unnecessarily high.

Consumers of security from crime, fire protection, education, litter-free environments, and other services might be able to reduce the real

costs of consumption by shifting from paid production methods toward greater consumer production, if the costs of consumer time are less than public service employees' wages. There would be an economic argument for shifting down the vertical axis in Figure 1 and to the right on the horizontal axis. Coproduction would still result, but consumer producer inputs would gain relatively in the production process. The opposite may be true, if the costs of consumer time and effort are greater than public service employees' wages. The ultimate effect on the costs of public services, however, is determined only within the context of a particular production function showing the relative productivities of the two sets of inputs. Decisions regarding the use of consumer and regular inputs must consider both technological and economic constraints before results can be translated into effects on the costs of service delivery.

Institutional Considerations

Incentives to take advantage of technological and economic gains depend on the relationship between the distribution of the gains and the distribution of the authority to make production decisions. Production gains resulting from substitution among different types of inputs become an incentive to make the substitution only if the gains accrue to the individuals who can make the substitution. Similarly, the cost savings from substituting among inputs with different relative prices create incentives to make the substitutions only if the savings accrue to the individuals who control the substitutions. But institutional arrangements can easily remove these incentives so that decision makers, minimizing

production costs to themselves, use input combinations in production that are unnecessarily expensive or are less than optimally productive. Public managers minimizing management costs, for example, might use only regular inputs, because they perceive these inputs to be cheaper to acquire and manage than consumer inputs, even though some consumer inputs are required for efficient production. Police and fire officials might employ only union members as full-time workers to reduce management costs in dealing with union leaders and to avoid the added costs of stimulating, coordinating, and overseeing volunteer personnel (consumer inputs).

Individuals, deciding whether to use regular producer inputs or consumer producer inputs in the production of public services, make these decisions within institutional settings where actions by one set of individuals affects opportunities for other individuals. These kinds of decisions are not made by isolated, self-sufficient individuals, and institutionally constrained interactions can prevent technologically and economically efficient coproduction of public services. Although Point A, say, in Figure 1 represents a technically and economically efficient combination of regular and consumer inputs, public officials may establish regular producer inputs at a level exceeding RP_a . Substitution by consumers between regular and consumer inputs will then be impossible, as consumers cannot reduce the regular producer inputs. Consumers can only add consumer inputs. The addition according to Figure 1 would increase output to O_2 or even O_3 , but would also increase real costs, perhaps beyond the willingness or ability of consumers to pay. In multiple level bureaucracies or in collective bargaining arrangements, consumers of police services, municipal fire protection, public education,

and sanitation services generally do not possess authority to reduce public agency employees. Increased consumer inputs into these services do not reduce public sector budgets, but merely add consumer costs in time and effort to consumer tax payments.⁸

Institutional arrangements, likewise, prevent managers of regular producer inputs from controlling the level of consumer inputs. Public sector managers cannot always require that consumers increase or decrease their inputs in the production process to improve the productivity of the regular producer inputs. Consumers of security from crime and fire damage cannot easily be forced to work with the police and fire fighters. Parents cannot feasibly be required to help their children with schoolwork or to participate in parent-teacher organizations. Consumers can be required to change the level of consumer inputs only if institutional arrangements grant public officials this kind of authority. Public sanitation is an area where such authority sometimes exists, as when consumers are required to add consumer inputs to the production of clean environments by packaging household waste and carrying it to the curbside for pickup by the sanitation department. And, even if such coercive authority is granted to public officials, there is no guarantee that their decisions will lead to increased efficiency, reflecting the costs of consumer inputs.

Institutional factors probably complicate the measurement problem discussed above, for institutional arrangements determining involvement by consumers in production also affect information about public sector production. A history of consumer inactivity in police service delivery, fire protection, educational services, environmental protection, and

other services can leave consumers largely ignorant of service levels and service production technologies. Consumers do not know how much security from crime, fire protection, education, and other public services are actually supplied. Further, consumers, and public officials for that matter, cannot know the technical and economic effects of increased consumer involvement. Knowledge concentrates instead on regular producer inputs, and production processes grow increasingly biased against consumer production.

Measurement difficulties present another problem for institutional arrangements. If we cannot readily discern the relative contributions of regular and consumer producer inputs to output, we cannot know how to assign the rewards of the output among the input contributors so as to encourage their continued participation. This is especially troublesome when the production function for services is of the form where the inputs are interdependent. Efforts by regular inputs affect the productivity of consumer inputs and efforts by consumer inputs affect the productivity of the regular inputs. The value in production of one is determined in part by the value in production of the other. In police services the value of police employees partly depends on consumers installing protection devices, taking safety precautions, reporting crimes, and helping to apprehend suspects. The value of fire fighters partly depends on consumers clearing away flammable materials and calling for fire protection services. The value of educators depends in some measure on consumers studying on their own, working with their children's studies at home, and creating home environments conducive to scholastic achievement. And, the value of sanitation employees depends in part on consumers packaging their household trash and making it easy for the employees to pick up.

But as Alchian and Demsetz (1972) argue in another context, these kinds of interdependent production relationships create incentives for those contributing inputs to shirk. Interdependence among inputs obscures the effect of any single input contributor on production. If one input contributor decreases its effort, the decreased output is not easily traced to that input, and the contributor continues to share in the proceeds along with the other inputs. Decreases in service delivery resulting from reduced effort by regular inputs can be falsely blamed on the consumer inputs, and decreases in service delivery from reduced effort by consumer inputs can be falsely blamed on the regular inputs. Money payments to the regular inputs and in kind payments to the consumers in the meantime continue, albeit somewhat diminished. Decreases in payments per input are less than the decreased efforts by any single shirker. Police, fire, education, and sanitation services probably diminish as consumers withdraw from production, but depending on interdependent production functions, the decline in service delivery to consumers does not match the decline in consumer efforts. The result is general service deterioration and widespread inactivity by consumers in the production process.

As all interdependent inputs confront such counterproductive incentives, institutional arrangements must create new incentives by establishing some kind of monitoring system. The monitoring system needs to generate information about public service delivery by measuring the efforts (not the output) from each of the inputs. The monitoring system needs also to adjust payments to input contributors to encourage their continued effort in production. Public employees must be penalized when they shirk, and

consumers must be penalized when they shirk. We are not proposing any particular monitoring system, and we do not underrate the tremendous problems for establishing an effective system. We merely wish to raise at this point an important institutional problem for achieving viable coproduction in public services.

Theoretical and Empirical Analysis of Coproduction

Advanced understanding of coproduction and its implications for public service delivery requires a greater comprehension of the technological and institutional constraints on coproduction. Several research efforts to achieve greater understanding of coproduction are presently underway at the Workshop in Political Theory and Policy Analysis at Indiana University. The research includes efforts to develop a general theory of institutions, to construct alternative models of coproduction, and to conduct empirical studies of coproduction of public services.

A theory of institutions is developing from a view that institutional arrangements are decision mechanisms directing interactions among individual decision makers (V. Ostrom, 1977; V. Ostrom and E. Ostrom, 1978; E. Ostrom, 1967; and L. Kiser, 1980). The mechanisms are defined by general sets of rules common in one form or another to all institutional arrangements. A conceptual apparatus results from this perception of institutional arrangements, permitting the comparison of one arrangement with another. The conceptual apparatus facilitates a general theory of incentives flowing from the rule configurations that distinguish among institutional arrangements. Development of an institutional theory is still in the early stages,

but ideas are already being adapted to models of coproduction. These models are supporting a wide variety of empirical analyses of coproduction in the delivery of police and other public services.

Coproduction of security from crime is being investigated with data from the Police Services Study, conducted jointly by the Workshop in Political Theory and Policy Analysis at Indiana University and the Center for Urban and Regional Studies at the University of North Carolina at Chapel Hill. Data were collected through interviews with residents of 60 urban neighborhoods located in three metropolitan areas: Rochester, New York; Tampa-St. Petersburg, Florida; and St. Louis Missouri. Findings from this study show that residents in these metropolitan areas are coproducing public safety and security with police agencies through individual/household actions (e.g., putting extra locks on doors, installing alarms and window bars, purchasing a weapon or watchdog) and to a lesser extent through participation with crime prevention groups (Percy, 1980). Using this data Sharp (1978, 1979) has studied how neighborhood organizations mobilize residents for participation in collective responses to crime. Pennell (1978) has used this same data to study differences in attitudes about crime and police among residents selecting private and collective strategies to fight crime. In a dissertation currently in progress, Percy (1980) is examining factors impinging on citizen decisions about the amount and forms of coproduction of public safety. This analysis using the Police Services Study data will focus on fear and exposure to crime, neighborhood social and physical conditions, individual and household characteristics, and the organization and activities of local police agencies as influences on citizen coproduction.

Kiser, Wilson, and a group of colleagues at the Workshop are currently studying the coproduction of services in high density housing arrangements. This study derives directly from the conceptual apparatus for institutional analysis. Managers of apartment complexes and condominiums in Bloomington, Indiana, have been surveyed, permitting institutional comparisons among housing arrangements. Residents in some of these housing arrangements will be surveyed regarding methods used to produce security, yard care, snow removal, pest control, and painting, with special attention to resident involvement in the production. The data will be analyzed to study relationships between institutional arrangements and regular versus consumer production of the services. Other studies by Workshop colleagues include coproduction in day care and public education.

Extensive empirical research conducted outside of the Workshop also bears upon the concept of coproduction, although the term coproduction seldom appears in the literature from that research. Researchers associated with the Reactions to Crime Project conducted at the Center for Urban Affairs, Northwestern University, have examined citizen behaviors taken in response to fear of and concern about crime (Skogan and Maxfield, 1979; Skogan, 1978; Maxfield, 1977; Lewis and Maxfield, 1978; Lavrakas and Lewis, 1979; DuBow, McCabe, and Kaplan, 1979). Mark Rosentraub and colleagues at the University of Texas at Arlington are undertaking a similar analysis of citizen coproduction of safety and security (Rosentraub and Harlowe, 1980). These projects and research by Clotfelter (1977), Conklin (1975), Heller (1975), Lavrakas and Lewis (1979), Nehnevajsa (1977), Yin (1976), and Washnis (1976) indicate that citizen coproduction of public safety is prominent in many urban areas.

More general analysis of coproduction is presented in Whitaker's (1980) description of alternative forms of coproduction between citizens and public service agencies and Sharp's (1980) comparison of the coproduction concept with traditional models of public administration. Bjur and Siegel (1979) have considered the public finance aspects of coproduction by proposing citizen production of public services as supplements and substitutes for tax payments. And Rich (1977, 1978) has examined the prospects for neighborhood associations to facilitate and coordinate citizen coproductive activities.

The concept of coproduction appears to be a fruitful way to consider the production of goods and services in the public sector. But despite the wide-ranging research in the area of public services, analysis of coproduction has just begun. We hope others will join the endeavor. To that end references dealing with this topic are attached at the end of this paper.

Footnotes

¹The efforts to be reviewed concerning the reconceptualization of production and consumption are those undertaken by the authors with a group of colleagues at the Workshop in Political Theory and Policy Analysis at Indiana University, Bloomington, Indiana. We have formed an ad hoc "coproduction group" which has met at regular intervals to collectively explore definitions, applications, and implications of coproduction. One product of this group is Roger B. Parks, Paula C. Baker, Larry Kiser, Ronald Oakerson, Elinor Ostrom, Vincent Ostrom, Stephen Percy, Martha Vandivort, and Gordon P. Whitaker (1980) "Consumers as Coproducers of Public Services: Some Economic and Institutional Considerations," Working Paper W79-39, Bloomington, Indiana: Indiana University, Workshop in Political Theory and Policy Analysis. Various arguments in our paper have been adapted from the paper written by the coproduction group. The authors are very indebted to all members of the coproduction group who have assisted our thinking and understanding of the coproduction concept.

²Garn, et al. (1976) argue that in the case of service production (as opposed to goods production) the activities of consumers are a necessary and integral part of production. Thus, they contend that some level of consumer activity is required for there to be any level of service production whatsoever.

³Individuals in income earning, occupational roles can be thought of as the inputs of regular producers. In occupation roles, individuals perform transformations in order to derive a salary or wage and not to consume the output. Hence, individuals function as consumer producers only when acting outside of occupational, income earning roles.

⁴The officials who determine the activities and priorities of regular producers in the public sector usually do not seek to acquire monetary profit as do their counterparts in the private sector. Public officials in a democratic system are generally motivated to respond to the preferences and concerns of residents in the jurisdiction. In this sense, officials can be seen as acting to acquire electoral support, and perhaps prestige as well. In any case the activities of these public agencies by and large are not undertaken simply so that members of the agency can directly consume agency outputs, and for this reason their activities are classified as those of regular producers.

⁵This is not the only definition of coproduction that has been offered. Whitaker (1980) defines citizen coproduction as involving three broad types of activities: citizens requesting services from public agents, citizens providing assistance to public agents, and citizens and agents interacting to adjust each other's service expectations and actions. Other colleagues at the Workshop in Political Theory and Policy

Analysis prefer a more restricted definition of coproduction as instances where regular and consumer producers directly mix inputs under coordinated arrangements.

⁶The obverse case is also possible, where regular producer inputs are redundant and do not contribute to production.

⁷Advocates of regular producer inputs include those who favor the use of trained, professional personnel, potentially including labor officials and leaders of professional associations.

⁸Bjur and Siegel (1979) propose that citizen contributions of time to the production of public goods and services be credited against citizen tax payments.

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