CONSUMPTION EXTERNALITIES AND ECONOMIC WELFARE

Randall G. Holcombe
Florida State University

and

Russell S. Sobel
West Virginia University

INTRODUCTION

In a market economy, almost every action undertaken by an individual or business firm will either directly or indirectly affect the welfare of other nonconsenting parties. These third-party effects, generally called externalities, often serve as a call for corrective action by the government. In the case of externalities between business firms, previous literature has shown that for public policy purposes there is an important distinction between technological and pecuniary externalities. The case of *Sturges v. Bridgman*, made famous in Ronald Coase's [1960] article, "The Problem of Social Cost," involves confectioner Bridgman's machinery emitting noise and vibration that interfered with Dr. Sturges's ability to use his consulting room, thus lowering Dr. Sturges's profits. This is an example of a technological externality because the noise and vibration from the machinery directly affected the production process of Dr. Sturges. However, consider an alternative scenario in which a new doctor opened up next door to Dr. Sturges and began competing with him for business, *equivalently* lowering Dr. Sturges's profits. This would instead be an example of a pecuniary externality that in no way caused a market inefficiency. Thus, despite both types of externalities resulting in equivalent welfare losses to Dr. Sturges, only the technological externality interferes with efficiency and is thus potentially a concern for corrective government policy.

While technological externalities can create market failures and violations of Pareto efficiency, pecuniary externalities can not. In fact, the presence of uncorrected pecuniary externalities is *necessary* for the efficient operation of markets. This distinction is therefore of the utmost importance in the conduct of policy. Despite this apparently clear distinction between technological and pecuniary externalities in production, no such clear distinction is currently present with respect to externalities in consumption, or externalities between individuals. A smoker, for example, may lower the utility of a nonsmoking companion not only by the potentially harmful effects from the second-hand smoke, but also by a concern for their health or the lost years

Randall G. Holcombe: Department of Economics, Florida State University, Tallahassee, Florida 32306-2180. E-mail: holcombe@garnet.acns.fsu.edu

Eastern Economic Journal, Vol. 26, No. 2, Spring 2000

together if the smoker's life should end earlier. The distinction may be more clear in a case where the smoker was an "enemy" or "rival" so the earlier death may actually create a positive benefit to the other individual. Should these two effects be treated equally? More importantly, would either (or both) potentially constitute a case for government intervention for the sake of efficiency?

The ambiguities in these cases can be greatly reduced by applying the distinction between technological and pecuniary externalities to the model of individual utility. This is the purpose of this paper. Not only does this distinction have policy relevance, it also has important implications for the application of the Pareto efficiency criterion. The standard Pareto criterion for welfare improvement is apparently straightforward. If at least one person is made better off while making no one else worse off, the action is a Pareto improvement and is consistent with efficiency. In practice, however, the standard is not so easily applied. In theoretical models, utility often is assumed to be a function only of the goods and services individuals consume, and in this setting few problems arise. However, when individuals are assumed to be the best judges of their own well-being, and when one person's utility can be affected by the actions of others, the Pareto criterion does not fit so well with the welfare judgments that economists often want to reach. In some instances, the consensus of opinion seems to be that the effects of the actions of some on the utility of others should count for welfare purposes, while in other instances economists will argue against accounting for the effects that one person's actions have on another's utility.

Using the distinction between technological and pecuniary externalities helps clarify when these consumption externalities should and should not count for purposes of evaluating economic welfare. There is good reason to account for some consumption externalities when evaluating social welfare while ignoring others. Specifically, as with production externalities, technological externalities are relevant for welfare purposes, but pecuniary externalities are not. In addition, however, externalities some economists have argued should be accounted for actually should be ignored, because they are merely pecuniary.

Consider some examples in which there is likely to be widespread agreement on externalities that should be taken into account, but should be ignored for welfare purposes. Suppose an individual is trying to enjoy a backyard picnic with his family but cannot even carry on a conversation because his next-door neighbor is playing loud music. Economists typically will recognize this as an externality and recommend some method for internalizing it to enhance welfare. Now consider an individual who has a distaste for people of certain ethnic groups, is adversely affected by the fact that a family belonging to one of those ethnic groups moves into the house next door. Economists seem reluctant to argue in favor of policies to limit this externality. Indeed, in the first case, public policy often works to make the creation of such an externality illegal (disturbing the peace) while in the second case, public policy actively works to stop people from trying to prevent the externality (antidiscrimination laws). This paper argues that the generally accepted opinion in both of these cases is correct. The neighbor making the loud noise is creating a technological externality which should be internalized for efficiency, while the person of a different ethnic group who wants to move next door is creating a pecuniary externality, which should be ignored by policymakers.

A related issue that arises when utility can be a function not only of the goods and services that people consume, but also a function of the actions of others, is the treatment of jealousy and fairness considerations to economic welfare. When an action leaves some individuals better off while not helping others, or when the gains are unequally distributed, the relative losers often claim to be worse off than if the action did not take place. Frank [1985] argues that once people's basic needs are met, utility comes from how people perceive their consumption opportunities relative to their peer group, rather than from their absolute levels of consumption. Experimental studies have found that many individuals would prefer an outcome where no one is made better off to an outcome where the welfare of only some is improved, or an outcome where the gains are distributed very unequally.[1] Thus, using revealed preference as a benchmark, the decline in their relative well being produces a loss of utility to individuals as they subjectively measure it, even in some cases where their consumption opportunities are enhanced. Public policy examples include tax cuts in the 1980s that targeted the rich and recent economic reforms in China that have concentrated improvements in welfare only in certain coastal areas. Both cases have led to claims by those "left behind" that the outcome was unfair. At first, one might be tempted to simply dismiss these claims as being outside the realm of economic analysis. However, economic methodology rests on a foundation of methodological individualism, assuming each person is the best judge of his or her own welfare. If the Pareto criterion is strictly applied, and individuals are accepted as the best judges of their own well-being, the effects of the actions of others on a person's utility must be taken into account.

The effects of the consumption of some on the utility of others have important implications for both equity and efficiency analysis. The analysis of equity in these cases has led to a recent literature that defines of fair outcomes as being only those that are "envy-free."[2] Following this line of reasoning, an individual is treated fairly based not only on how that individual is treated, but also based on the treatment accorded others as well. Another well-recognized issue is the problem of interdependent utility functions described by Hochman and Rodgers [1969], who argue that forced redistribution is Pareto optimal because of the public good nature of charitable giving. Taking this approach, the existence of interdependent utilities has efficiency implications because it creates a market failure that is on par with any other efficiency failure, such those caused by the existence of a monopoly or externality.

This paper addresses the issue of consumption externalities by drawing an analogy between production externalities and consumption externalities. An important issue in this comparison is whether consumer utility is analogous to firm profit or to firm output. Despite the apparent similarity of indifference curves in utility functions and isoquants in production functions, a comparison of production and consumption externalities is problematic because the subjective nature of utility is difficult to compare to objective measures of firm output. Insight into the issue is provided by adopting a household production framework in which household production is analogous to firm output, while utility is analogous to firm profit. In this manner one can separate the effects on the utility function as affecting either household production directly or the value of household production to the consumer. The firm-level analogy is that the actions of some firms can directly affect another firm's production function (i.e., the

amount of output that can be produced with a given level of inputs), or may only affect the value of the output to the firm (i.e., the firm's profit). There is a direct and insightful analogy to the literature on pecuniary versus technological externalities that allows the efficiency effects of cross-consumer effects to be more precisely modeled and defined. Using this approach, interdependent utility effects that only affect the value of consumption to the individual are analogous to pecuniary externalities such as one firm lowering the profits of another through competition, and are thus similarly not relevant to social welfare within the Paretian framework. In contrast, cross-consumer externalities that directly affect the level of household production holding inputs constant are analogous to technological externalities across firms, and are Pareto relevant.

PECUNIARY VERSUS TECHNOLOGICAL EXTERNALITIES

To accurately apply the distinction between pecuniary and technological externalities to individual utility requires a clear understanding of this distinction within the more traditional framework of the business firm. The terminology that distinguishes technological from pecuniary externalities was first used by Scitovsky [1954], who defined technological externalities as existing when the production function of one firm is directly affected by the production level or input usage of another firm. If firm i produces output q_i using inputs $(x_i, y_i...)$, firm 1 has a production function

$$q_1 = f(x_1, y_1,...; q_2, x_2, y_2,...). \tag{1}$$

If any of the terms to the right of the semicolon have a non-zero impact on q_1, then a technological externality exists. In other words, a technological externality exists when actions taken by firm 2 directly affect the physical level of output of firm 1, holding constant firm 1's level of input usage.[3]

Continuing with Skitovsky's definition, a firm's profits, Π are also a function of its inputs and output, so firm 1's profits can be represented as

$$\Pi_1 = g(q_1, x_1, y_1,...; q_2, x_2, y_2,...). \tag{2}$$

If any of the terms to the right of the semicolon in equation (2) has a non-zero effect on Π_1, then an externality exists, but if it is not a technological externality because the terms to the right of the semicolon in equation (1) have no effect on q_1, then the externality is pecuniary. In other words, firm 2 can take many actions that could affect firm 1's profit, and are thus externalities, but only those that also directly affect the production function are technological. External effects that are present only in the profit equation, and not directly in the production function, are pecuniary externalities.

Because firm 1's profits are equal to the firm's revenues minus its costs, pecuniary externalities can occur through either revenues or costs. For example, changes in input prices directly affect firm 1's profits through changes in its cost of production.

Because the actions of firm 2 that affect input prices would not directly affect firm 1's production function, the terms to the right of the semicolon in equation (1) would have no effect, but because the actions of firm 2 would directly affect firm 1's costs, and thus its profits, the terms to the right of the semicolon in (2) would have non-zero effects on Π_1.

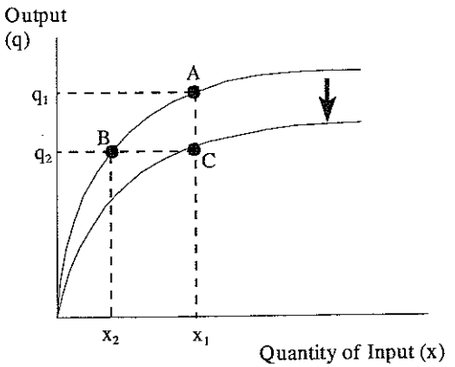
Pecuniary externalities may also occur because firm 2's actions directly affect the revenues of firm 1. For example, firm 2 may compete with firm 1 in the output market, driving down the price that firm 1 can charge for its output. This would also be a pecuniary externality, but now occurring through the revenue side of the equation. Thus, changes in either the prices the firm must pay for inputs or the price it can receive for its output are pecuniary externalities, while technological externalities occur only when the actions of firm 2 directly affect the amount of output firm 1 can produce, holding constant firm 1's usage of inputs.

A competitor opening up next door and lowering the firm's profits, either through reduced prices, or higher input costs, is a pecuniary externality. The actions of the new firm have affected the value to the other firm of its own output (measured by its profits), but have not directly affected the amount of output the firm can produce with a given amount of inputs.

In the case of externalities, the end result of firm 2's actions on the profit or input usage of firm 1 is not sufficient to distinguish the externality as pecuniary or technological. It is possible to construct scenarios in which firm 1's profit falls by the exactly the same amount from either a pecuniary or a technological externality induced by firm 2. Legitimate competitive actions by firm 2 may also result in firm 1 optimally reducing its output, or its usage of inputs in a manner that might be indistinguishable from the effects of a technological externality. Indeed, one might illustrate the difference between a technological and pecuniary externality within the context of firm 1's production function, shown in Figure 1. An action on the part of firm 2 that shifts firm 1's production function upward or downward would be considered a technological externality. A negative technological externality is illustrated by the downward shift in the curve (movement from point A to point C) because the actions of firm 2 have reduced the amount of output that firm 1 can achieve with its given current level of inputs (from q_1 to q_2 at the current level of input usage, x_1). A negative pecuniary externality (such as a competitive price cut by firm 2) might alternatively result in firm 1 responding by optimally moving along the original production frontier from point A to point B (producing less output and thus using less inputs).

Beyond their definition, pecuniary externalities often receive little attention in the literature.[4] This is probably because the costs or benefits they create do not result in resource misallocations. In a market system, the activities of some people often cause demand shifts, change relative prices, or affect the value of assets, which create benefits for, or impose costs on, third parties. Because these effects are merely pecuniary, however, they do not imply economic inefficiencies. Once it was shown that these effects should not be considered in the Pareto efficiency criterion, they were usually ignored in further economic analysis.

FIGURE 1
Technological versus Pecuniary Externalities



EXTERNALITIES IN CONSUMPTION

This framework for distinguishing technological and pecuniary externalities in production can also be applied to consumption externalities. The extension to consumption externalities has not previously been clear because it was never made explicit whether utility, hereafter denoted U, is analogous to output, q, in equation (1) or to profit, Π, in equation (2). If the analogy between firms as profit maximizers and individuals as utility maximizers carries over to this analysis, then it becomes apparent that U is analogous to Π.

The analogy between production and consumption externalities becomes clearer if one adopts the household production approach to consumption pioneered by Lancaster [1966]. To maintain notation similar to that used earlier, individual 1 uses goods as inputs into household production to produce output $h_{11}, h_{12}, \ldots h_{1n}$, so for individual 1,

$$h_{1k} = f(q_{11}, q_{12}\ldots; h_{21}, h_{22}\ldots, q_{21}, q_{22}\ldots) \tag{3}$$

for all k household products, where h_{ik} denotes the ith individual's household production of k and q_{ij} denotes the ith individual's use of good j as an input in household production. In this framework, household production (h) is analogous to output (q) for the firm. A technological externality would exist whenever terms to the right of the semicolon have non-zero effects on h. Analogous to the case of firm production, a technological externality is present only if the actions of person 2 directly affect the physical level of household production of person 1. If the actions of person 2 affect the prices person 1 must pay for inputs in the production process, but do not change the level of output that person 1 could produce with a given level of inputs, then the externality is pecuniary.

For example, let h_{ik} be the production of an evening watching a videotaped movie, with inputs such as a television, a rented videotape, electricity, a sofa, etc. Actions

taken by person 2 that affect the rental price of the videotape, or any of the other input prices, would only indirectly affect the household production of person 1. Just as in the case of the firm, the above equation is a production function, and not the optimized or chosen values of the variables. Thus, when only the prices of inputs change, the terms to the right of the semicolon would have no effect on h, implying that these input price changes are only pecuniary effects, because the same level of output could still be produced by person 1 with the same level of inputs. A technological externality might occur, for example, if person 2 was having a loud party next door, making it more difficult for person 1 to hear the television.

The individual gets utility from consuming household production, so

$$U_1 = g(h_{11}, h_{12}\ldots, q_{11}, q_{12}\ldots; h_{21}, h_{22}\ldots, q_{21}, q_{22}\ldots). \tag{4}$$

Here, utility (U) is analogous to profit (Π) for the firm.[5] A pecuniary externality would exist whenever terms to the right of the semicolon in equation (4) have non-zero effects on U but terms to the right of the semicolon in equation (3) have no effect on h. In this framework, a person's action that affects the value of other individuals' utility, but not the ability to combine inputs into outputs in household production, is a pecuniary rather than a technological externality. Only when a person's actions directly affect others' household production functions is the externality technological.

The analogy to externalities between firms helps to clarify this distinction. Firm 2 competing with firm 1 might lower the price firm 1 can charge for its output, thus lowering the profit (or value) to firm 1 from a given level of its own output, without directly affecting firm 1's production function. This is a pecuniary externality that should be ignored for efficiency and public policy. Similarly, when person 2's actions affect the utility person 1 gets from his own household production, but does not directly affect the level of household production that can be accomplished with a given level of inputs, the externality is also pecuniary and has no efficiency implications, nor does it require corrective government policy. Actions by other individuals that simply change the utility people get from their own household production are analogous to actions by one firm that affect the profits of other firms.

For example, a neighbor digging in his garden might get dirt on a person's car, which creates a technological externality. More inputs, in the form of more frequent car washings, are now necessary to produce the same household output, and without the use of more inputs, utility will be lowered because the person will have a dirtier car. Now assume that the person enjoys the car not only as transportation, but because he gets utility out of having the nicest car on the block. If the neighbor buys a nicer car, the neighbor's nicer car also lowers the utility derived from the person's car, but the effect is purely pecuniary because the same household output can still be produced with the same inputs. Thus, within this framework, jealousy effects, or relative consumption utility effects clearly fall out as analogous to pecuniary rather than technological externalities.

INTERDEPENDENT UTILITY AND PECUNIARY EXTERNALITIES

The case is often made that people have interdependent utility functions, and while this is undoubtedly true, the interdependency does not affect the production of h in equation (3), but rather the value of U in equation (4). In other words, the effect on utility from interdependent utility functions is a pecuniary externality, not a technological one, so a consistent application of the externality argument implies that no inefficiency is created from interdependent utility functions, and utility interdependencies should be ignored for welfare purposes. Following this approach, an efficiency framework would strive to maximize household production opportunities rather than utility.

Utility remains relevant to the allocation of resources in the same way that prices and profits are relevant to the allocation of resources in firms. Following Becker [1981, 8-9], individuals allocate their household resources by maximizing their utility based on shadow prices that equal the cost of producing household output. Thus, household inputs and outputs are determined by utility-maximizing household choices based upon income and the relevant shadow prices, in the same way that firm inputs and outputs are determined by profit-maximizing choices based on relative prices. However, for welfare maximization, efficiency-enhancing public policy should be targeted at eliminating those technological externalities that directly affect the household production function, not externalities that only affect these shadow prices or the value of household production to individuals, and do not directly affect household production.

The idea that interdependencies in utility functions should be ignored for public policy purposes is sufficiently at odds with some of the existing literature that it deserves some additional discussion. At the same time there is a substantial body of literature that is consistent with the idea of ignoring pecuniary externalities in consumption for policy purposes. So further exploration can shed some light not only on the theoretical idea of pecuniary externalities but on the broader subject of welfare-maximizing public policy.

First, note the difference between individual welfare-maximizing behavior and public policy. Just because public policy aimed at efficiency should ignore pecuniary externalities does not suggest that individuals should ignore them. Individuals might allocate resources for gifts to others, and for charitable contributions, without implying that public policy should mandate income transfers. Similarly, on the production side, firms will sometimes assist other firms by offering lines of credit or loans at interest rates below the market rate, by lending them employees for specific projects, or even by buying their stock to provide them with additional financial resources. When positive pecuniary externalities exist, firms may find it in their interest to provide unilateral transfers to other firms as a profit-enhancing strategy in the same way that individuals may find gift-giving and charitable contributions to be a component of utility-maximizing behavior. But when such transfers are in response to pecuniary externalities, the same arguments against designing public policy to take account of pecuniary externalities in production also apply to pecuniary externalities

in consumption. Resources are allocated optimally when public policy ignores pecuniary externalities.

A good example of the application of pecuniary externalities in consumption to public policy is in Hochman and Rogers [1969]. They argue that because utility functions are interdependent, wealthy people desire income redistribution to poor people, but that government intervention is required to avoid some wealthy people free-riding off the charitable activities of others. Applying the above notation to the Hochman and Rogers idea, but simplifying to create one composite household production good for each individual yields

$$U_i = f(h_1, \ldots, q_{i1}, q_{i2}, \ldots; h_1, h_2, \ldots, h_{i-1}, h_{i+1}, \ldots, h_n). \tag{5}$$

Because of free riding in charitable giving, Hochman and Rogers [1969] argue that less than the optimal amount of household production (and therefore consumption) occurs for some individuals, so maximizing U_i requires government-enforced transfers. Once the distinction between technological and pecuniary externalities is made, however, it should be apparent that the interdependency is merely pecuniary, that the effects are caused only by those variables to the right of the semicolon, and the actual Pareto optimal policy is to have no government redistribution.[6] That the externality is pecuniary rather than technological is apparent because the externality does not affect the amount of household production that any individual can attain with a given amount of inputs. Rather, the argument for redistribution is simply that some individuals should be given more household inputs with which to produce more household output.[7]

Once the production of utility is disaggregated into household production and the utility that is gained from household production, except for individuals who know each other personally, interdependencies of utility are probably a function of household production rather than the utility produced by household production. Charitable individuals want to help less fortunate individuals to have greater consumption opportunities, not utility. It is hard to imagine, for example, that a wealthy individual would rather transfer more to a poor person who is sullen and unhappy than to another equally poor person who is more content amid hardship. In more disaggregated form, then, people may favor transfers to enhance consumption opportunities more than to enhance utility. This explains why public policy tends to favor in-kind transfers over cash transfers even though the cash may provide more utility (and in the neoclassical framework, cannot provide less).

Interdependent utility functions are analogous to interdependent profit functions, and the above line of reasoning could be extended to the case of firms by allowing the profit of one firm to depend positively on the input usage and profits of other firms. In this case of this interdependence, each firm would now care about the profit level of other firms. Suppose that the profits of tire manufacturers depended upon the profit level of auto manufacturers. Would this suggest subsidizing auto manufacturers to internalize this spillover? Would public policy recommendations that follow from this interdependence parallel the case where pollution produced by an auto manufacturer interfered with a tire manufacturer's production function? Just as one would not call

for government intervention to internalize a pecuniary externality in production due to interdependent profit functions, there is also no argument for public policy measures to internalize pecuniary externalities in consumption that occur due to interdependent utility functions.

UTILITY EFFECTS FROM THE BEHAVIOR OF OTHERS

Extending the analysis of interdependent utility functions, Frank [1985] has argued that once their basic needs are met, individuals derive utility from their status relative to others, so U_i might then decline as h_p h_p... go up. If, for example individual i cares not only about the absolute quality of his car but also how nice his car is compared to others in his neighborhood, if individual i's neighbor buys a new car that is nicer than i's car, this could lower the utility of individual i. However, it is apparent that the neighbor's purchase does not affect i's household production, even though i's utility may be affected, so the externality is pecuniary and should not be taken into account for public policy purposes. Of course, individual i may take the neighbor's behavior into account and buy a new car, in the same way that a McDonald's might make improvements to its restaurant in response to a Burger King opening up nearby, but while individuals and firms might respond to the actions of their neighbors, in neither case is there any reason for a public policy response. They are pecuniary externalities.

Rawls [1971, 30-1] discusses the case of offensive tastes as a case where interdependent utilities should be ignored, or even condemned. For example, assume that individual i dislikes certain racial minorities, so that if such a person were to move next door to i, i's utility would decline. If one accepts the idea that public policy should account for interdependent utility functions, the optimal public policy solution would be to tax those trying to integrate i's neighborhood, or perhaps to prevent integration altogether, in order to take into account the utility that i gets from racial discrimination. Anyone who rejects the idea that an individual's utility gain from racial discrimination should be weighted equally with the individual's utility gain for food or shelter would seem to be rejecting the notion that social welfare maximization is a function of utility maximization, lending support for the household production framework presented here.

Beyond a doubt, the activities of some people affect the utility of others. If the behavior of some negatively affects the household production functions of others, then there is a technological externality in consumption which may have implications for social welfare. Even here, as Coase [1960] has shown, the individuals may be able to internalize the externality themselves. However, if the behavior in question does not affect the household production of others, then there are no implications for social welfare, even if the behavior of some has a negative impact on the utility of others. There is no reason for public policy to be concerned about utility that results from the relative status of individuals, and the popular opinion that public policy should not try to mitigate against utility losses that arise because some people do not want to associate with certain racial or ethnic groups is correct, because the utility effects are merely pecuniary.

INDIVIDUAL UTILITY AND SOCIAL WELFARE

Neoclassical welfare economics typically assumes that individual utility is a function only of the goods individuals consume, so utility maximization amounts to the same thing as maximizing the consumer surplus from household production. Because of the way these models are constructed, in most cases pecuniary externalities due to interdependent utility functions are assumed away. However, the examples above show that in many cases where interdependent utilities play a significant role, analysts are willing to make a normative judgment that they should be disregarded, which calls into question the validity of the norm of utility maximization as a goal of public policy. This analysis shows that the norm of household production maximization is more consistent with generally accepted welfare norms (and the policy recommendations of economists) when individual utilities can be interdependent.

In many cases there will be little practical difference between utility maximization and the maximization of household production. Food stamps and housing subsidies provide inputs into household production as well as utility, for example. However, if one was strictly concerned with maximizing the utility of transfer recipients, cash would be better than in-kind transfers. Transfers in kind are more consistent with household production maximization, however, and illustrate that public policy is often more consistent with the enhancement of household production than utility more generally. While it is true that household production as a metric does not provide a good indicator of how much should be transferred from one group to another, neoclassical social welfare theory relies on interpersonal utility comparisons to do this, and economists have long considered interpersonal utility comparisons to be illegitimate. One should not let the search for a single determinate answer override basic economic principles, and it may indeed be the case that often there is not a single determinate answer to the question of what is optimal public policy.

Another approach that lends some support to the conclusions of this paper is taken by Sen [1982; 1993],[8] who argues that people's well-being should be measured in what he calls capability rather than utility. Sen views capability as the set of various "functionings" that a person can achieve, which is consistent with the household production approach, if functionings are viewed as analogous to household outputs. Sen wants to measure welfare as the capability to achieve certain ends rather than the utility gained in achieving them.[9] Sen's framework provides a good reason for rejecting what Rawls views as offensive preferences, and focuses on what people are able to produce rather than how they value that production. While Sen's approach differs in some respects from what is in this paper, it supports this analysis by focusing on what individuals are able to do with the resources available to them rather than on a measure of how they value those resources.

If one is willing to draw public policy conclusions based on interdependent utility functions, then one must be willing to accept all such policy conclusions that follow from the concept. If some of the conclusions from the application of the concept seem undesirable, such as including the value of racial discrimination in social welfare, then perhaps it is not interdependent utility functions that drive the redistributive public policy measures, but some other factor like equality of opportunity or equality

under the law, that can exist independently of interdependent utility functions. Such equality is consistent with the facilitating of household production, again pointing toward household production rather than utility as the object of welfare maximization.[10]

For efficiency, not all actions that lower a firm's profits should be prevented. Pecuniary externalities are a part of the process that produces economic efficiency. Likewise, not all actions that lower an individual's utility should be prevented either. Person A's utility may be lower because A is envious of B's new car. Most people would not view that as a reason for concern. Person C's utility may be lower because neighbor D plays his stereo excessively loud, interfering with C's activities in his apartment. More people would be concerned about this second case, because D is directly affecting person C's household production, while in the first case, B was not affecting A's level of household production, only A's value or utility from the consumption of household production.

The distinction between technological and pecuniary externalities helps to clarify when the actions of one person that affect the utility of another should be a matter of efficiency and thus public policy concern. Those that affect household production are technological externalities that result in inefficiencies, whereas those that result from one person receiving utility or disutility from another's consumption are pecuniary externalities that should be ignored from the standpoint of public policy.[11] Looked at in this way, the normative goal of public policy would be to enhance the household production capabilities of individuals rather than to maximize their utility. While normative goals are value judgments and cannot be defended in the same way as positive analysis, the normative implications of this analysis of pecuniary externalities are consistent with the exceptions that economists are often willing to make to the normative goal of utility maximization.

NOTES

The authors gratefully acknowledge helpful comments from the editor and anonymous referees of this *Journal*, Dennis Coates, James Cobbe, Kislaya Prasad, Richard Stroup, and Dan Sutter.

1. See Camerer and Thaler [1995] for a discussion of this idea and references to the literature on the subject.
2. The envy-free outcome, sometimes known as Baumol fairness, is directly addressed and debated in Baumol [1982] and Holcombe [1983; 1997].
3. It is important to hold firm 1's level of input usage constant in the comparison, because it may be the case that the actions of firm 2 change the price that firm 1 must pay for its inputs, which would change the input usage chosen by firm 1, and thus firm 1's output. This, however, would be a pecuniary, not a technological, externality because firm 1 could still produce the same level of physical output with the same level of physical inputs. Of course, it would now be more costly for firm 1 to produce the same level of output using the same level of inputs, but this is a pecuniary effect that does not affect the technological relationship between inputs and output. Because equation (1) represents the production function, and not the reduced-form or optimized value of production, the terms to the right of the semicolon that have a non-zero effect on q_1 represent the direct effects on the level of production and not indirect effects occurring through changes in market prices.
4. For example, Rosen [1995, 91], in his leading public finance textbook, discusses pecuniary externalities only in a footnote, saying that "...because such effects are a part of the normal functioning of a market, this is a confusing appellation. It is mentioned here only for the sake of completeness and is ignored henceforth."
5. More precisely, net utility (subtracting the cost of inputs utilized in household production) would be analogous to profit. The usual neoclassical model allows the firm to chose its level of cost, but does not allow the consumer to chose the level of expenditures, or total budget. Thus a consumer maximizing utility by allocating a fixed budget over commodities to be used in household production is equivalent to the firm maximizing profit by allocating a fixed level of total cost over inputs to be used in the firm's production process.
6. One could envision a case where redistribution is demanded due to a technological externality. This would be the case if, for example, rich people walking about town had to step over poor people who were sleeping on the street, thus impairing the ability of the rich to walk on the street, but this example is not in the spirit of Hochman and Rogers.
7. See Lee [1990] for an alternative argument as to problems with the public-goods justification for redistribution.
8. These two references are representative, but Sen has advocated this idea consistently in many other works since he originally developed it.
9. Note that if one accepts Sen's concept of functionings as the relevant measure of welfare, one can be a liberal welfare maximizer, even though, as Sen [1970] argues, it is not possible to be a Paretian liberal.
10. Note that while pecuniary externalities should be ignored for public policy purposes, they are just as real as technological externalities. They are just different. If a MacDonald's opens up next door to a hamburger joint, it would take customers away from the existing restaurant, inflicting real harm, and may even cause the old restaurant to go out of business. But this is a pecuniary externality that does not warrant a public policy intervention. Similarly, if a person buys a new car and gets lots of utility from it, and then the person's neighbor buys a nicer car, diminishing the utility the first person gets from his car, there is a real utility loss, but again due to a pecuniary externality that does not warrant a public policy response.
11. This distinction might also help clarify what constitutes a nuisance in the common law. A technological externality is a nuisance, whereas a pecuniary externality is not. If this notion of a common law nuisance is accepted, then whereas the political system does not clearly distinguish technological from pecuniary externalities, the common law legal system does. Technological externalities are common law rights violations but pecuniary externalities are not. People holding a loud party are disturbing the peace and are violating the rights of their neighbors, whereas misers who free-ride off the charitable activities of others are not violating anybody's rights. While this is an interesting way of analyzing the distinction, it does open additional questions about how rights are defined, which are beyond the scope of this paper.

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