GEOG590-002/EVPP741-002 Fall 2006: Public Goods*

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Recall the concept *exclusivity* that we discussed several weeks ago: all benefits and costs accrue to the owner of a resource. We discussed this idea at one point with respect to the garden that I maintain (although "maintain" may be a strong term at this point in time) in my front yard. I hypothesized that this garden produced external benefits for those who drove by. Note that this example has a couple of other important characteristics. First, enjoyment of the view is (right now) *non-excluable*. I can't decide that some driving by can enjoy the view while other's can't. It is also *non-rival*, meaning that someone else's enjoyment of the view does not in any way diminish mine, and as well, my enjoyment does not diminish theirs. (See Table 5.4 in Perman et. al for a nice discussion of these two factors.)

Now, let's change my example a bit. The fence between my yard and my neighbor's yard has a nice flower bed all along her side, and nothing much along my side at this point. I enjoy her nice flower bed, and she appreciates any work that I do on my side. In effect, my decision to work on my yard has a positive external benefit for her, and the work she does has a positive external benefit for me. As well, note that a given marginal effort has multiple marginal benefits (some for me, and some for her).

Now, assume that Fairfax, VA was a bit more like Davis, CA, and that the city purchased buffer strips between properties to create greenbelts and transportation corridors. Transportation benefits aside, the city might want to know what the optimal level of landscaping in each of these buffer strips is. They also might want to know how much each neighbor (in terms of effort or money) might be willing to contribute for this landscaping, and whether this contribution would result in the socially optimal level of landscaping.

Because the landscaping in the buffers is (more or less) non-rival and non-excludable, this landscaping is a *public good*. The quick answer to my questions follow from some standard theoretical results related to public goods: 1) The socially optimal level of provision of the public good occurs when the marginal cost of production is equal to the *sum* of the marginal benefits. 2) The free market will not provide this level of benefits, since individuals only consider their private benefits when making their decisions about how much to contribute, although their action may have broader benefits to society. You can probably already see that the concept of a public good is a natural extension of the externality concept. Now, the rule for social optimality is:

$$MPC = MPB_1 + MPB_2 + MPB_3 \ldots MPB_N$$

where there are N people benefiting from the public good.

Let's go back to the market equilibrium example that we used in Week 4 of the class, but this time we will assume that the good being produced has public good characteristics. Specifically, it represents landscaping for public spaces that every resident has equal access to. The first thing that we will do is construct the social benefit curve for landscaping. We do this quite differently than we constructed the private benefit, or market demand, curve. Specifically, since each unit produced benefits everyone, we sum the willingness to pay for each unit to find the benefit for each quantity. We sum the demands *vertically*, as opposed to *horizontally*, as we did before.

Recall that the demand curves of the two consumers were:

$$P = 18 - 3Q_d^1 \quad (1)$$

$$P = 6 - \frac{3}{2}Q_d^2 \quad (2)$$

For any given quantity, we add the willingness to pay for each consumer. In short, we add the two prices. Notice that I'm assuming, unlike before, that each consumer consumes the same quantity Q.

$$\text{Marginal Social Benefit} = P_1 + P_2 = (18 - 3Q) + P + (6 - \frac{3}{2}Q) = 24 - \frac{9}{2}Q$$

Assume that the marginal cost curve is given by:

$$MC = Q + 8$$

This socially optimal level of landscaping is obtained by setting the marginal cost equal to the social marginal benefit.

$$Q + 8 = 24 - \frac{9}{2}Q \Rightarrow Q_{PG} = \frac{32}{11}$$

Note that this outcome differs from the free-market outcome, obtained by setting the new marginal cost curve equal to the market demand curve (see week 4):

$$Q + 8 = 10 - Q \Rightarrow Q_{FM} = 1$$

Now, in this case the socially optimal provision of the good is higher than the market level. So certainly that is a problem. Notice also that given this cost structure, the first consumer would never voluntarily purchase any of the good. But the problems with public goods go beyond this point, and many are more subtle. (To notice this, try redoing this problem with the original supply function from the Week 4 example. Things now are not so simple.) There are two main problems with public good provision that we can discuss rather informally here. The first is that public goods often involve large fixed costs (as in this example). This implies that the free market will always under supply these goods. The second problem is

that public goods should be funded by, in principle, having each consumer pay differentially according to the benefits they obtain. This leads to a complicated problem of how to figure out what benefits consumers obtain (revelation) and of potentially unequal taxation (big political problems!) There is also a third important issue–the free-rider problem. This is covered by a nice example in the Perman book, which I will go over in class, and you can review again on your own.