# Economic Analysis of Trade-offs in Development Practice



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*By V Santhakumar*

## 1. Introduction

A development practitioner may be interested in an analysis of costs and benefits of his/her actions – the revenues received as well as the benefits to society or to the group targeted for the development action. If a set of children get an education or people in a village get healthcare through the action, these benefits should be considered as part of the analysis. How do we calculate such social benefits[1]?

## 2. Valuation of social benefits: Some basic ideas from economics

Let us consider a case where people (consumers) buy a certain commodity from the market. What is the `benefit' of this exchange? When a private company tries to produce something or expand existing production, it needs to think about the possible demand by customers, that is, it should have some information on how much of the additional quantity will be bought at different prices. This is called the demand schedule. A company is presumed to have information on the cost of supply (quantity they can supply at different prices).

If only a few units of an item are available, people would be willing to pay a much higher price. As more and more

quantities are available, the price that people would be willing to pay may come down (or as the price declines, people would be willing to buy more quantities). Consider the demand and supply schedules given in Table 1.

Table 1: Demand and supply schedule

| Price per unit Rs | Quantity that firms are willing to supply | Quantity that consumers are willing to buy |
|---|---|---|
| 10 | 20 | 100 |
| 20 | 40 | 80 |
| 30 | 60 | 60 |
| 40 | 80 | 40 |
| 50 | 100 | 20 |

The demand and supply schedules meet when the price is Rs 30, in this example. If the exchange takes place at this point, there will not be any excess demand and excess supply. Here, the price per unit that consumers are willing to pay becomes equal to the additional cost of producing one unit. Customers buy 60 units at a price of Rs 30 (per unit). However, they were willing to buy 20 at Rs 50 per unit, 20 more at Rs 40, and another 20 at Rs 30. Thus, when they buy all 60 units at Rs 30, they gain Rs 20 per unit for 20 units and Rs 10 per unit for another 20 units. Thus, they gain Rs 600. This is called the `consumer surplus'.

Similarly, there is a 'producers' surplus' when the firm could sell all 60 units at Rs 30 per unit, in addition to the revenue, which is equal to the quantity sold multiplied by the price, per unit. They were willing to sell 20 units at Rs 10 p/u, another 20 at Rs 20 p/u, and 20 more at Rs 30 p/u. When they sell all 60 at Rs 30 p/u, they gain Rs 20 p/u for the first 20 units, another Rs 10 p/u for the next 20 units. Thus, the producers' surplus in this example is also Rs 600.

Hence, producers and consumers not only exchange some

quantities of a commodity/service at a particular price in the market, but they also gain a surplus from the process of exchange. Therefore, the absence of a market for a particular service is costly – and that cost is measured in economics as the potential surplus (both consumers' and producers') that is not generated in the economy. All the suffering that people have to bear due to the absence of a service is expected to be reflected in this consumer surplus forgone. These ideas of consumers' and producers' surplus are important to understand the benefits and costs of social actions (including those of development practitioners).

Whether a product is bought and sold in a market is important for its valuation. If there are well-defined markets for a product or an item, one can assess the increase in (consumers and producers) surplus as a way of measuring the benefit of the increased supply of this output. However, there could be several products of social actions which are not traded in a well-defined market. For example, the output of a drinking water project (drinking water) delivered at home or to a community location is not normally traded in markets. (Of course, mineral or bottled water is traded, but that is a product with a different quality). If there is no (well-functioning) market for the output of a development practice, we may have to create a `hypothetical market' to assess the potential surplus.

There are two ways of developing such a hypothetical market. One, if a product is not traded in a market, it may still be used in the production of other products for which there exist well-defined markets, and this may give us some idea of the value of the product of a development intervention. The water (which is not traded usually in a market) that is made available through an irrigation project is used in the cultivation of farm products which have well-defined markets. The `value' of irrigation may then be inferred from the surplus created through the demand for and supply of farm

products.

Similarly, a new park may be created as part of a development intervention. There is no market for the park to assess its benefit. However, there could be a market for houses/land-parcels, the price of which reflects the view of the park. Hence, the value of the park can be inferred from the market value for these houses or their plots.

The second way of creating a hypothetical market is to ask people the amount that they are willing to pay for a product made through development practice. Based on this information, we may have to prepare a (hypothetical) demand schedule as mentioned. However, the basic principle of valuation based on the hypothetical market is the same as that of real markets. We try to estimate the `surplus' in these (hypothetical or real) markets.

If the development intervention is to produce more vegetables by farmers in a village, the valuation of the project benefit is relatively straightforward. Here we can assume that the additional production of vegetables is not going to change their price in the (district) market (since the additional production is only a very small part compared to the total volume of each type of vegetable traded there). In that case, the additional revenue from the increased vegetable production is easy to calculate. The cost of this additional production of vegetables (for additional seed, fertilizer, pesticides, labour, etc.) may have to be deducted from the additional revenue to get a measure of the net benefit of the intervention. If the intervention is to create irrigation in a village, the increased revenue from additional crop production due to the availability of irrigation minus the cost of additional inputs (like seeds, fertilizer, pesticide, labour, etc.,) needed for that increase in production could be reckoned as the annual benefit of creating irrigation. The net benefit of providing irrigation is the total present value of the annual benefits during the expected lifetime of the

irrigation project minus the total present value of costs incurred (at different points of time) for constructing the irrigation project.

We will discuss some more specific issues and examples of cost-benefit analysis in the following section. However, carrying out such a cost-benefit analysis especially for large-scale projects would require specialized knowledge. Even when not doing a cost-benefit analysis, one should be concerned about the basic principles. One should also be in a position to identify the contexts where such a detailed analysis is needed and should enlist an expert to do the job. Where the cost of the intervention is substantial, it is important to take the help of an economist to carry out such an analysis.

We have highlighted that the increase in consumer surplus is a measure of social benefit or welfare. However, since we deduct all the costs from benefits, we need to calculate gross benefits first. These gross benefits include revenue from the sale of the output/product of intervention and the surplus (due to the increased availability of the output) retained by the consumers. Sales revenue is equal to the total amount sold multiplied by the actual price received per unit. Consumer surplus is the sum, across all consumers, of the differences between what they are willing to pay and what they have actually paid. This is relevant for a product (or parts of it) for which, what people actually pay could be lesser than what they are willing to pay. This is usually reflected in a situation where the downward sloping demand curve is valid.

Hence, the nature of the demand curve is important for the assessment of a social benefit. The estimation of consumer surplus requires the estimation of the demand curve – which requires expertise in economics and econometrics. Since the demand curve is not a simple graph representing the quantity consumed and the price, but a relationship between these two variables by keeping all other relevant variables constant,

econometrics is needed to estimate it. We will take up a few simple examples here for an approximate estimation of consumer surplus.

### 2.1 Some Examples[2]

1. Think about a new water supply project that is providing safe drinking water in a village. This provides 60000 litres per day to the village which has 120 families (thus supplying 1800000 litres per month). If the water supply is provided free of cost, all this water will be used by the villagers. We need to know the consumer surplus associated with the provision of water, in this case. The entire output is considered incremental and hence, it should be valued at the rate at which people are willing to buy it. How do we get information on this amount or the demand curve here? We may carry out a simple 'willingness to pay' survey, in which we assess the households' willingness to pay a monthly charge for the water supply (even if they don't have to pay a charge in reality). Through the survey, we may realize that 40 households are willing to pay Rs 100 per month. Hence, we know that if the monthly amount to be paid is zero, 120 households would use it, and if it is Rs 100, only 40 households would be using it. These are two points in the demand curve. (Figure 1). We can construct the demand curve if we assume a linear relationship. Through the extrapolation of the line passing through these two points, we can see that all households would stop using water supplied from the project if the monthly charge is Rs 150. Hence, the demand curve can be assumed to be a straight line connecting the following points in the graph: (Rs 150; 0 HH) and (Rs 0; 120 HH). The area of the triangle below this line which is equal to (150*120)/2 = 9000 (Rs) is the consumer surplus (per month) associated with the provision of the water supply in the village. It is an approximate value since we have made a number of assumptions here including that on the shape of the demand curve as a straight line (in

reality, it can be non-linear.)

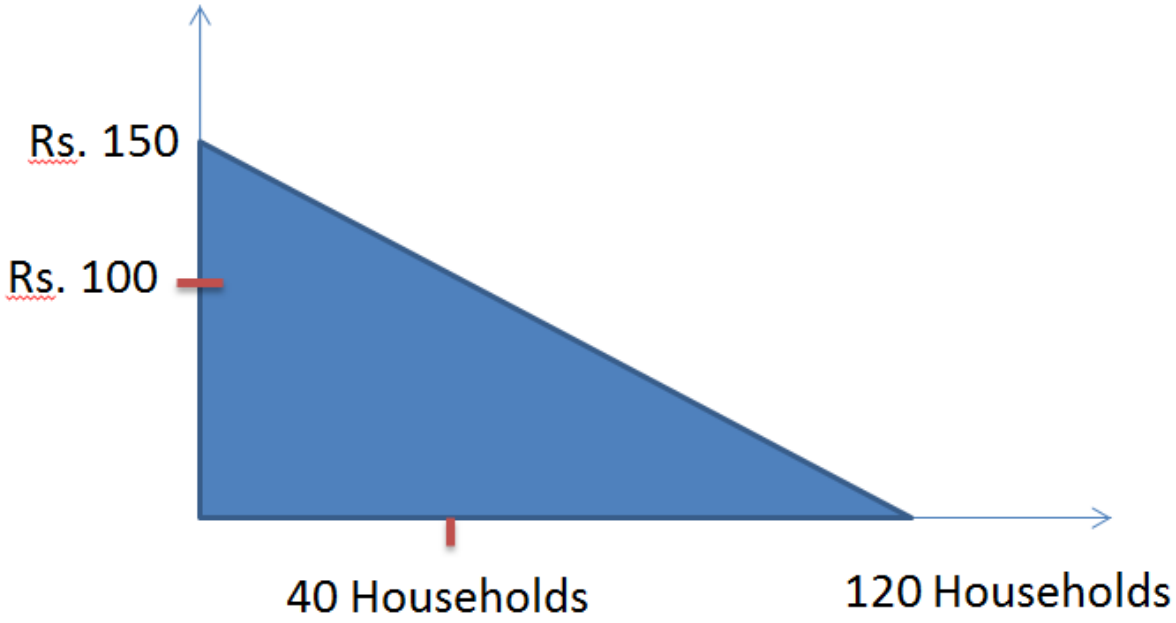


Fig 1

2. A development organization is interested in starting a health clinic in a village, primarily because the private health facility in the nearby town is affordable to only about 10 percent of the villagers. This is due to the costs of transport and consultation (we may leave out the opportunity cost of time for visiting the clinic). A survey indicates that there are 600 people in the village, and on an average, each person may need to visit a hospital about five times a year (this does not imply that they actually visit the hospital when there is a need). All these are out-patient visits. Each visit to the private clinic in the town costs Rs 200. Only 60 people can afford such visits. What is the benefit (or consumer surplus) of creating a healthcare facility for the 540 people in the village who cannot afford to visit the private clinic in the town? This can also be calculated through a simpler or an approximate procedure. When Rs 200 is charged, none of the 540 people will visit

the health facility even if it is located in the village. This is evident from their non-visit to the private clinic in town at the same cost. On the other hand, when there is no charge, all these 540 people may visit the healthcare facility five times in a year, on an average. This is equal to 2700 outpatient visits. This information can be used to draw a demand curve as in Figure 2. At a price of Rs 200, there are 0 visits by these 540 people. At a price of Rs 0, there are 2700 visits. The straight line connecting these two points represents an approximate demand curve. The benefit of providing health facility for those who cannot use the private clinic in town is roughly equal to the area under the demand curve. This is equal to (200*2700)/2 = 270000 (Rs) per year. We need to note that, in this example (as well as in the previous example), the users may not be paying any charge in reality. In the previous example, we have used what people have quoted as their willingness to pay to estimate the benefit (consumer surplus), whereas in this case, what some people spend in an alternative facil _ity is taken as an indicator of price and this is used to estimate the surplus.

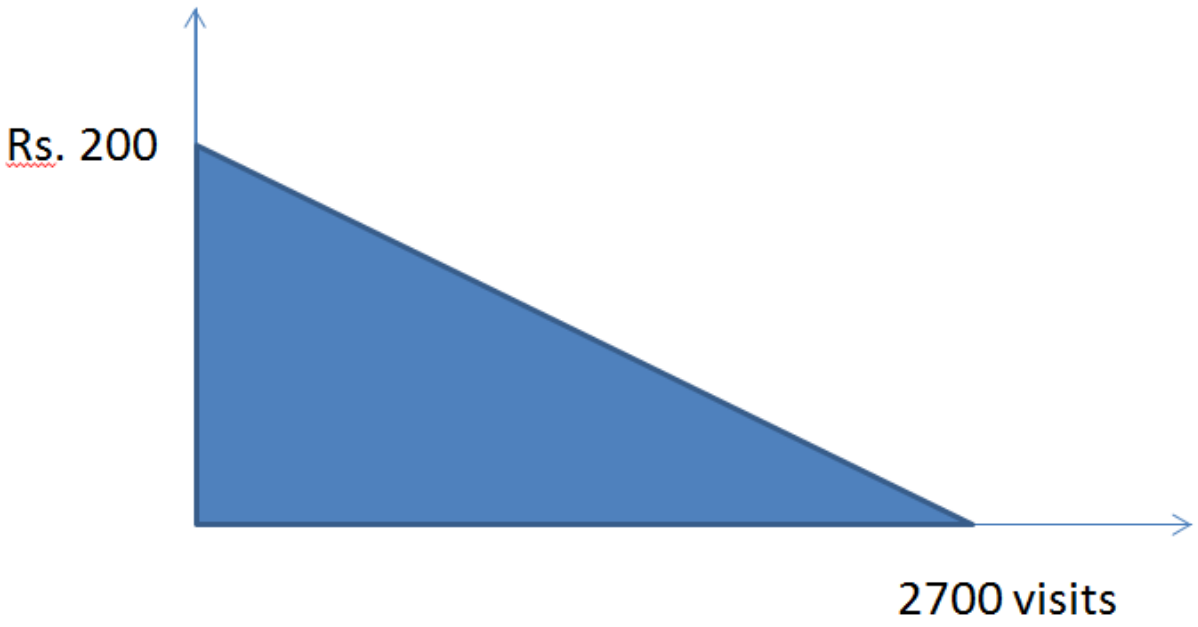


Fig 2

3. Let us think about another water supply scheme in a village where people spend more effort and money to get water from their own sources (during the wet season) and distant ones (during other seasons). Let us assume that people spend Rs 0.05 Rs for a litre of water. They are currently getting 10,000 litres of water. It is here that a centralized water supply scheme is built by a development organization. This scheme plans to supply water at a subsidized rate of Rs 0.01 per litre, even though the cost of supply could be higher. An important implication is that people who are using 10,000 litres at a cost of Rs 0.05/l will be using more water when it is supplied at Rs. 0.01/l. This increase in demand should be considered for fixing the capacity of the new scheme. Let us assume that the increased demand is 30,000 litres. In this case, there is a non-incremental part of 10,000 litres (which is to displace the existing sources of water that are costly) and an incremental part, which is the remaining 20,000 litres. Let us assume that the social cost of supplying water through the new scheme is Rs. 0.02 litres per supply. What is the social benefit of this water supply? We have noted that the incremental part should be valued at the rate that people are willing to pay for additional water. Here, we have indications that people who consume 10,000 litres at Rs. 05/l increase their demand to 30,000 litres when the price comes down to Rs 0.01/l. The consumer surplus for the incremental part is 20,000* [(0.05-0.01)/2] = 600 (Rs) per day. The non-incremental part should be valued by considering the reduced cost of its supply. There is an approximate gain of Rs. 03/l (i.e., 0.05/l was the average cost when people used conventional sources, and that cost has come down to 0.02/l when the new system is implemented). The gain in this regard is approximately 10,000* Rs. 03/l = 300 (Rs) per day. In addition, Rs.01/l is charged for 30,000 litres supplied every day and this provides a revenue equal to Rs 300 per day. Hence, the total gross benefit is 600+300+300 = 1200 (Rs) per day. It may be noted that people

are paying only Rs 300 even though the total social benefit is Rs 1200 per day.

4. Now let us consider a village where people use a jeep to go to the nearby town. The jeep charges Rs 50 per trip. Currently, on an average, there are 300 person-trips from the village per month. An organization plans to introduce a small bus. If the bus charges only Rs 10 per trip, the number of travellers would go up from 300 per month to 1500. The cost of a trip by the small bus is fixed at Rs 9. How do we calculate the social benefits of the introduction of the bus here? There are incremental and non-incremental parts in this – incremental is 1200 trips while the non-incremental part is 300 trips. The social gain of the non-incremental part is to be assessed through the reduction in the cost of the trip. This is approximately 300*(Rs. 50 – Rs 9.0) = 300* Rs 41 = Rs 12300 per month. The incremental part is to be valued based on the demand of consumers. They were willing to travel only 300 trips when the price was Rs 50/trip, and it has gone up to 1500 trips when the price comes down to Rs 10 per trip. The consumer surplus in this regard is 1200 * [(Rs 50 –Rs 10)/2] = 24000 (Rs) per month. In addition, the organization running the bus gets a revenue of Rs 10 per trip and this fetches Rs 15000 per month. The total social benefit from introducing the bus is 12300+24000+15000 = Rs 51300. It may be noted that out of this total (societal) gain, the organization running the bus gets only Rs 12000 per month.

It is not difficult to devise such examples or abstractions based on real cases. These may demonstrate to practitioners the basic ideas regarding the assessment of benefits of development projects.

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