**Efficiency Benefit-Cost Analysis**

- Deals with the overall net benefits of the project irrespective of who gains and loses.
- Measures the economic efficiency of the project: if net benefit is positive, the project is a more efficient allocation of resources than the alternative (the world “without” the project).

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**The distribution of net benefits is not relevant in efficiency benefit-cost analysis**

- the project net benefit, as measured by the efficiency analysis, will accrue to various groups in various forms:
  - the private sector proponents of the project, in the form of profits
  - the public sector, in the form of taxes or charges
  - the general public, in the form of employment benefits, rents, pollution costs etc.

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**What is the standard methodology?**

The efficiency benefit-cost analysis is based on the “with and without” approach.

In measuring project benefit ($X$) and project opportunity cost ($Y$):
- ALL project outputs and inputs must be valued
- the prices used in the valuations must accurately reflect value or opportunity cost to the economy

In attempting to measure value or opportunity cost, it is natural to look to the private market system. However:
- some project outputs or inputs may not be traded in markets e.g. pollution, outdoor recreation
- in some markets, the market price does not accurately measure the value of an output or the opportunity cost of an input.

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**Summary**

In conducting efficiency benefit-cost analysis we will be faced with two kinds of problems:
- missing markets, e.g. pollution, recreational fishing
- markets in which market price does not measure value to the economy, e.g. non-competitive markets, markets distorted by taxes or regulations

We deal with these two problems using:
- non-market valuation techniques, e.g. contingent valuation
- shadow-pricing techniques – adjusting observed market prices to make them reflect marginal benefit or marginal cost to the economy.
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When markets are distorted (by regulations or taxes) or are non-competitive (because of monopoly or monopsony), in effect, there are two prices corresponding to the equilibrium quantity traded – one reflecting demand conditions and one reflecting supply conditions.

There is a pricing rule telling us which is the appropriate price to use in benefit-cost analysis.

We now consider the pricing rule and why it is required.

Suppose a small quantity of labour is to be hired to undertake a project with output valued at $B.

There are two possibilities regarding the opportunity cost of the labour:
1. the labour would otherwise have been employed at wage $w_m$;
2. the labour would otherwise have been unemployed with an opportunity cost of $w_a$.

- In the first case the net benefit is $B - w_mL$.
- In the second case the net benefit is $B - w_aL$; in this case, if $w_m$ was used to cost the labour, the project net benefit would be understated by $(w_m - w_a)L$, which is the value of the jobs (the employment benefits).
Figure 5.1: The Efficiency Benefit-Cost Analysis Pricing Rule

<table>
<thead>
<tr>
<th>ITEM TO BE VALUED</th>
<th>VALUED AT EQUILIBRIUM POINT ON A:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demand Curve</td>
</tr>
<tr>
<td>Output</td>
<td>Satisfies Additional Demand</td>
</tr>
<tr>
<td></td>
<td>• gross of tax (F.5.12)</td>
</tr>
<tr>
<td></td>
<td>• net of subsidy</td>
</tr>
<tr>
<td>Input</td>
<td>Sourced from an Alternative Market use</td>
</tr>
<tr>
<td></td>
<td>• gross of tax</td>
</tr>
<tr>
<td></td>
<td>• net of subsidy</td>
</tr>
</tbody>
</table>

What is the logic of the efficiency pricing rule in the presence of distortionary indirect taxes or subsidies?

– When a project output meets additional demand, or when a project input is diverted from an alternative use, the appropriate price is a point on a demand curve. A point on a demand curve is the supply price plus indirect tax (i.e. gross of tax), or the supply price less subsidy (i.e. net of subsidy).

– When a project output satisfies additional demand from an alternative source, or when a project input is in addition to existing supply, the appropriate price is a point on a supply curve. A point on a supply curve is the demand price less indirect tax (i.e. net of indirect tax), or the demand price plus the subsidy (i.e. gross of subsidy).
What happens if the indirect tax or subsidy is a **corrective** tax or subsidy?

A corrective tax (subsidy) is intended to discourage (encourage) an activity that is at too high (low) a level as a result of market forces.

Example: the tax on tobacco. Suppose that a project is designed to satisfy additional demand for cigarettes. If the tobacco tax is **distortionary**, the pricing rule tells us to value the additional output at the price gross of tax (i.e. including the tax). If the tobacco tax is **corrective** (intended to discourage consumption), the pricing rule tells us to value the output at the net of tax price.

Now consider an input which is subject to a corrective tax: for example, suppose the tax on diesel fuel is set at the level of the marginal cost of the air pollution resulting from use of diesel.

If the fuel used as an input to the project is sourced from additional supply, the pricing rule under distortionary taxation is to use the net of tax price as a measure of opportunity cost.

If the diesel fuel tax is corrective, we would use the gross of tax price to measure opportunity cost: the price net of cost measures the marginal production cost, and the tax measures the marginal external cost.

When an output (input) is in addition to current demand (supply) and is subject to a corrective tax, we use the net (gross) of tax price to measure benefit (cost).

In the same circumstances, if there was a corrective subsidy (designed to encourage demand or supply), we would use the unsubsidized price to measure benefit and the subsidized price to measure cost.

If the output (input) satisfies existing demand from an alternative source (is sourced from an alternative market use), there is no need to modify the pricing rule to account for corrective taxes or subsidies, as the level of the external benefit or cost does not change.