Economic Appraisal 7: Applications to Development

Economic Appraisal, Shadow Prices, and Applications to Development

Introduction

Any economic appraisal must necessarily estimate flows of benefits and/or costs. For a cost-benefit analysis, one seeks to estimate the magnitudes of both benefits and costs of a project (relative to some well-defined counterfactual) in order to establish whether or not going ahead with the project would increase social welfare. That judgement would turn on whether NPV is positive, bearing in mind that the calculation may be one that makes use of distributional weights. For a cost-effectiveness analysis, where we are comparing alternative ways (or options) of achieving some desired outcome, cost information alone is sufficient: we are trying to find which option achieves the outcome at least social cost.

The kinds of comparisons being made here are between flows of values. Benefits, for example, might consist of time saving, lives saved, additional numbers of children educated to particular benchmark standards, and the like. But to convert such flows into value forms, prices are needed. A question then arises as to which price (or prices) should be used in economic appraisal exercises.

What is a shadow price?

The prices that we should be using for these kinds of exercises are shadow prices. Attaching a meaning to, or definition of, a shadow price is relatively simple. Dreze and Stern (1990, page 4) define a shadow price in the following way:

"The shadow price of a commodity is defined as its social opportunity cost, i.e. the net loss (gain) associated with having one unit less (more) of it. The losses and gains have to be assessed in terms of a well-defined criterion or objective, which is referred to as 'social welfare'."

This notion of a shadow price is in line with that we have been using throughout this course. Suppose that a project generated one additional unit of education. The value of that additional unit of education to the recipient country is given by the increase in welfare that the society in question would obtain from that additional unit. Exactly the same principle carries over to inputs as well as outputs. Hence, for example, the shadow price - the opportunity cost in this case - of one worker employed on a project is given by the reduction in social welfare that would result from his or her employment in the project. That opportunity cost would vary, of course, depending on whether the worker employed in the project was drawn from employment elsewhere or would otherwise have been unemployed.

How do we obtain shadow prices?

Whilst it is relatively easy to define a shadow price, it is far more difficult to obtain reliable estimates of shadow prices. In practice, imperfect information along with the high

(and perhaps prohibitive) costs of obtaining additional relevant information mean that short cuts need to be taken and simplifying judgments made.

This topic will provide one or two useful short-cuts, but will also attempt to explain some of the fundamental principles involved so that the appraiser will be in a better position to assess the validity of short cuts and judgements that might be made. Some of the pages that follow below are relatively technical; the reader may prefer to skip these if the content looks to be a little too daunting, although I would urge that you do give at least a quick skim read of all the pages. But I would strongly recommend that you read carefully Part B and Part C: Part B because it gives practical guidelines for obtaining shadow prices in two very common cases; and Part C because it has been (at least until recently perhaps) part of the standard toolkit of any development economist involved in investment appraisal.

Shadow Prices in Some Alternative Contexts

1. Shadow Prices in an Undistorted Economy

Let us define an undistorted economy as one in which market prices are identical to shadow prices. (This is how the seminal paper by Dreze and Stern defines distortion.) In that case obtaining shadow prices is straightforward: they are identical to market prices.

Unfortunately, this insight is of little practical usefulness, because in such an undistorted economy there would be no rationale for public sector intervention. An undistorted economy would be one in which resource allocation was Pareto efficient (and so the economy is on its production possibility (or utility possibility) frontier AND one in which the distribution of wealth is socially optimal as judged by the relevant social welfare function. Hence there would be no efficiency-based or distributional-based justification for intervention, so shadow prices would not be required.

Note that the absence of distortion here does not only require that technology and institutional conditions required for a Pareto efficient allocation of resources are satisfied (i.e. that there are no uncompensated external effects, there are no public goods, property rights are fully defined, and so on) but also that wealth is distributed in a socially optimal way. We shall return to this matter shortly.

2. Shadow Prices in a First-Best Context

Now consider a world in which

1. in the main resources are being allocated in an efficient way, but there is one or more source of Pareto inefficiency (for example, there might be an uncompensated external effect or a public good may not currently be provided to its efficient amount);
2. there is no absolute or binding constraint making any of those sources of inefficiency ones that cannot be mitigated by appropriate public sector action; and
3. government has available a set of **non-distortionary tax and transfer arrangements** so that it can fund any activity that it wishes to do, and it can bring about any redistribution of wealth that it desires to achieve, via taxes and transfers which cannot be altered through the behaviour of agents.

In such a world, there can be a rationale for project or policy intervention, on either efficiency or distributional grounds, or both. With non-distortionary taxes and transfers available, distributional and efficiency considerations become separable. Government can

correct the market failures, thereby bringing the economy to its utility possibility frontier. Then, appropriate (non-distortionary) taxes and transfers can allow the policy maker to select the social welfare maximising point on that frontier.

Moreover, the prices to be used in project appraisals can, in this first-best setting, be market prices. Note that market prices here will not actually be shadow prices because the existing (pre-project) distribution may not be socially-optimal. However, if distributional weights are used that reflect preferences embodied in the SWF, then **market prices multiplied by relevant distributional weights** will correspond to shadow prices.

Part A of this topic sketches out some relevant theory that provides the foundation for thinking about contexts 1 and 2 above. in doing so, it defines and explains the concepts of first-best and second-best allocations of resources.

3. Shadow Prices in a Second-Best Context

Now consider a world in which there is one or more factors that make the fulfilment of the necessary conditions for Pareto optimality extremely difficult, if not impossible, to obtain. One example could be the presence monopoly power in one or more sectors of the economy, arising from increasing returns to scale and product differentiation. Even where it is not **technically** impossible to attain the necessary conditions for Pareto optimality, there may be political or institutional constraints that make the achievement of Pareto optimality impossible. An example (see Ng) here could be the existence of an uncompensated externality; while a lump-sum tax/transfer arrangement might exist that could generate a Pareto efficient outcome, lump sum taxes might be regarded as politically infeasible.

The constraints that we are referring to here prevent the first-best rule that MRS equals MRT for every pair of goods from being satisfied. Given this, what is the best that can be done for the rest of the economy? The answer to this question impacts on the process of economic appraisal. the general theory of second best tells us that if the MRS = MRT cannot be satisfied for some parts of the economy then neither should it be satisfied in any other part of the economy.

In this second best world, market prices may give very misleading signals as to what shadow prices for project appraisal should be. There is a substantial literature that discusses how second-best shadow prices can be obtained. But the results obtained from that literature, while useful in some specific contexts, tend to give robust guidance about how to obtain shadow prices only in very restrictive circumstances. We certainly do not have any 'magic bullet' available by which one can obtain valid second best shadow prices in all particular instances. So, as a practical matter, in all but the most simple settings it is far from easy, if not impossible, to obtain theoretically valid shadow prices.

Having said that, there are some results that do emerge from second-best theory that allow us to make good approximations to shadow prices in a number of important special cases (such as where inputs or outputs are subject to indirect taxes, and where inputs are drawn from factor markets in which there is less than full employment). Part B of this Topic provides a little more explanation of the second best literature, and examples a few important special cases for which we do have reasonably robust results.

4. Shadow Prices in a Heavily Distorted Context

Many economies are so heavily distorted that the existing structure of market prices gives very unreliable guides as to the shadow prices of inputs and outputs. The final part (C) of this Topic deals with two well-established, and institutionally supported attempts, to create a feasible general framework for establishing shadow prices in heavily distorted economies.

Part A: Shadow Pricing - First Best and Second Best Settings and Allocations

A.1 First-best conditions

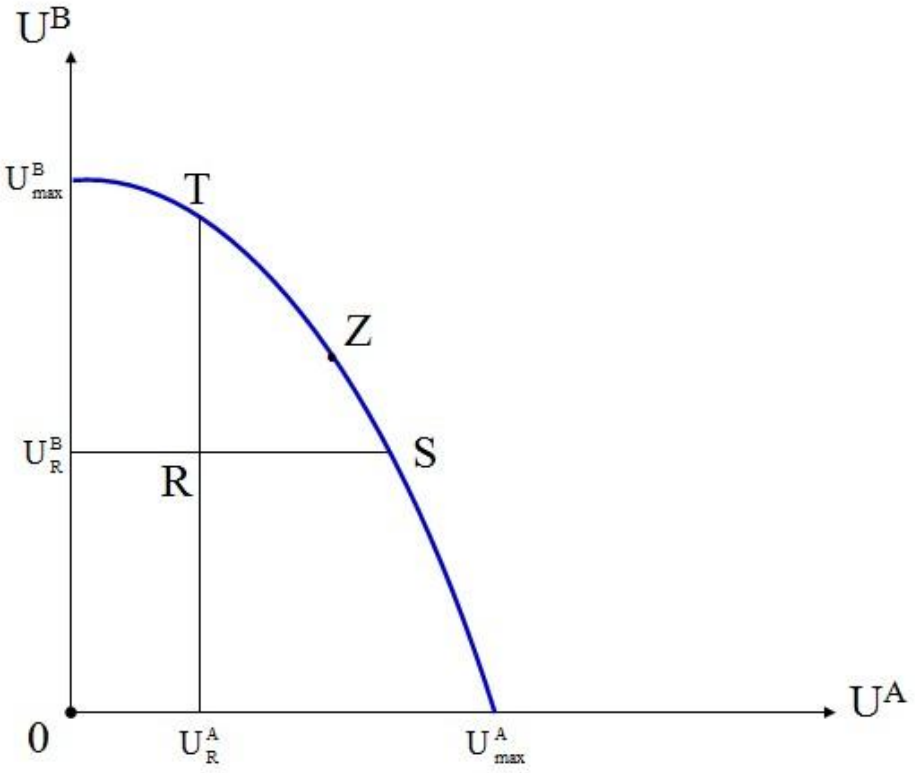
On this page, I shall take participants briefly through some relevant theory, keeping the presentation as easy to comprehend as possible. Some of this material has been covered earlier in Topic 2 of this Economic Appraisal course. There we established, using general equilibrium analysis, a set of conditions required for a 'first-best' Pareto-efficient allocation of resources.

The concept of 'first-best' will be defined later on the next page. In this section, whenever we refer to an 'efficient allocation' of resources we shall have in mind a first-best efficient allocation of resources.

An efficient allocation must satisfy three requirements: efficiency in consumption; efficiency in production; and product-mix efficiency. These conditions are usually stated in terms of equalities between marginal rates of utility substitution; marginal rates of technical substitution; and marginal rates of transformation. (See equations 5.3, 5.4 and 5.5 in 'Technical Appendix 1: Welfare economics: intratemporal efficiency and market failure'.

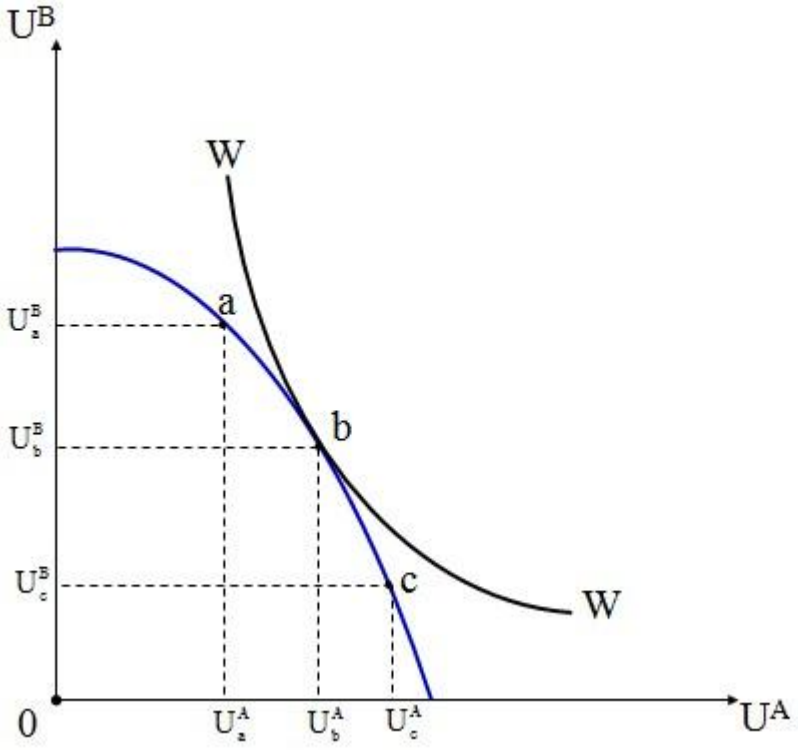
There - for simplicity using a two-person special case - we used the device of a utility possibility frontier to portray the locus of all possible combinations of U^A and U^B that correspond to efficiency in allocation. This frontier shows the U^A / U^B combinations that correspond to efficiency in allocation – situations where there is no scope for a Pareto improvement. There are many such combinations. The relevant graphic is reproduced below for convenience.

Figure 5.5 The utility possibility frontier.



If we are willing to introduce a social welfare function into the analysis (which describes society's ethical judgements about the distributions of income and wealth and so allows a social ranking of different feasible allocations of resources) one is able to identify a socially optimal allocation of resources. This social optimum will have the property that resource allocation is Pareto efficient **and** that the particular allocation selected is that which maximises social welfare. A graphical representation of this welfare optimum was given in Figure 5.6, reproduced below for convenience. Note that at the welfare optimum, point b, the relevant social welfare indifference curve WW has an identical slope to that of the utility possibility frontier.

Figure 5.6 Maximised social welfare.



This equality can also be represented algebraically by the equation 5.7 below which requires the equality of the slopes of a social indifference curve and the utility possibility frontier:

$$\frac{W_A}{W_B} = \frac{U_X^B}{U_X^A} = \frac{U_Y^B}{U_Y^A} \qquad (5.7)$$

Efficiency given ideal conditions

Our analysis in Topic 2 then proceeded to show that there exists a set of circumstances such that, if agents behaved rationally, a system of free markets would sustain an efficient (although not necessarily welfare-maximising) allocation of resources. The 'institutional arrangements', as we called them, included the following:

1. Markets exist for all goods and services produced and consumed.
2. All markets are perfectly competitive.
3. All transactors have perfect information.
4. Private property rights are fully assigned in all resources and commodities.
5. No externalities exist.
6. All goods and services are private goods. That is, there are no public goods.
7. All utility and production functions are 'well behaved'. Among other things, this rules out the presence of increasing returns to scale.

In addition to these institutional arrangements, it is necessary to assume that the actors or agents act rationally. By this we meant that agents always strive to do the best for themselves that they can in the circumstances that they find themselves in; all agents are maximisers. A formal treatment of why such a set a circumstances would generate an efficient allocation in a market economy was provided in Appendix 5.2.

Partial equilibrium efficiency conditions

General equilibrium analysis is used in welfare economics theory to derive, and state in a general form, analytical results about efficiency and social welfare optimality. But someone whose work involves carrying out economic appraisal must, as a matter of practicality, think and act in terms of partial equilibrium concepts, dealing with prices in particular markets rather than relative price ratios for the economy as a whole.

Fortunately, and as we showed in Topic 2 of this course, one can translate the various general equilibrium efficiency conditions into their analogues for individual markets. A well-known example is the so-called efficient pricing rule - that price should be equal to marginal cost. I will leave participants to re-read relevant parts of Topic 2 to see how the general equilibrium efficiency conditions translate into partial equilibrium (single market level) analogues.

Implications

Three key implications follow from what we have said so far:

1. If an economy were to exist in which all the 'ideal conditions' described above existed, then there would never be a need for public intervention in the economy on **efficiency** grounds.
2. The presence of the 'ideal conditions' will guarantee efficiency; but it will not guarantee that a social welfare maximum is obtained. However, if a non-distortionary tax/transfer package were available, then government could choose whatever distributional outcome was desired without any efficiency loss.
3. If the 'ideal conditions' were departed from because of the existence of (uninternalised) externalities and/or because of the presence of public goods, and/or because of the presence of increasing returns to scale, then with non-distortionary tax and transfer instruments available, first-best Pareto efficient resource allocations can be achieved so that the economy lies on its utility possibility frontier.

These implications warrant a little more explanation. First, it is self-evident that if an economy were to exist in which all the "ideal conditions" were already satisfied, then there would be no need for public intervention in the economy on **efficiency** grounds. The economy would already be on its efficiency frontier.

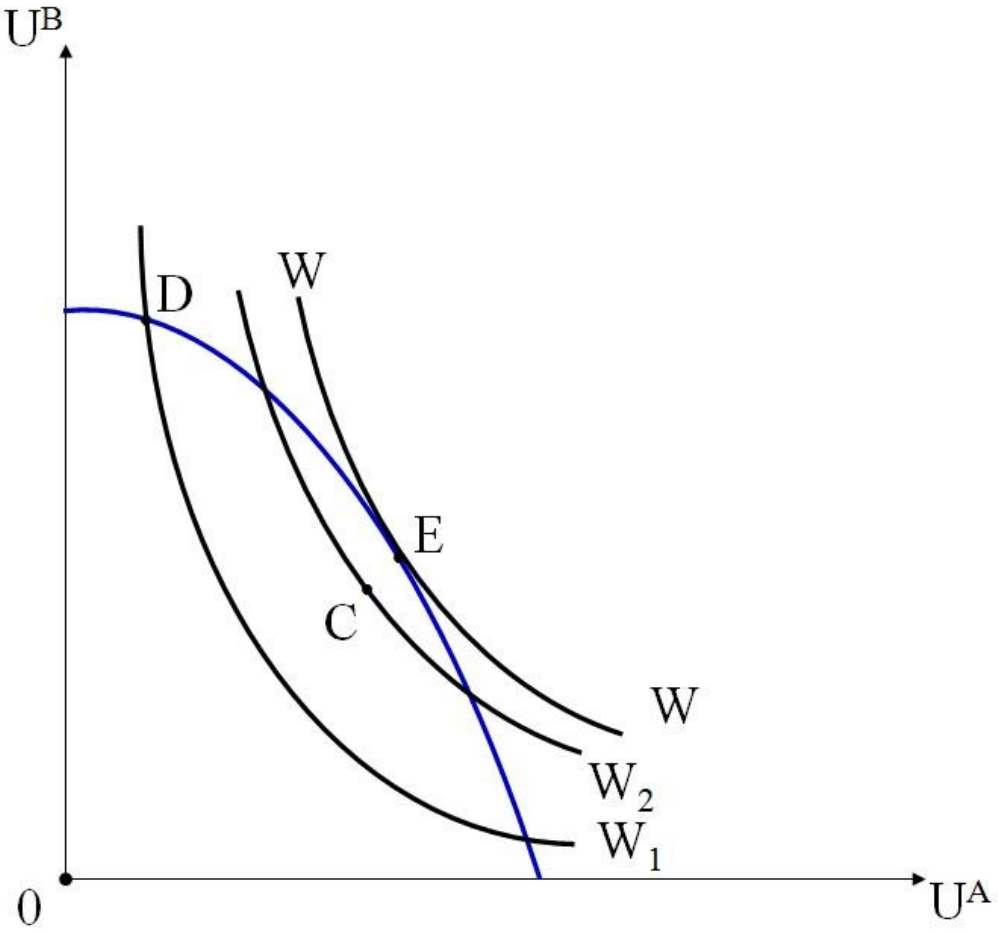
However, intervention might be warranted for distributional reasons. Look at Figure 5.6 again. Suppose that the economy is currently at point a. Resource allocation is already "first best" Pareto efficient and so there can be no **efficiency-based argument** for intervention. But clearly point a is not welfare maximising. For **distributional reasons**, policy makers may prefer point b to point a. (Indeed, point b is welfare optimal in this case). If government had available, and could use, a non-distortionary tax and transfer package, then it could (by definition) choose an appropriate non-distortionary tax and transfer package to shift the economy from a to b. The important point here is that if such a non-distortionary package were in fact available, then for any given utility possibility frontier, it could choose whatever distributional outcome was desired without any efficiency loss.

Two points are worth making here that have a bearing on what we discuss later:

1. If the rationale for an intervention were purely distributional, and redistribution of income or wealth could be brought about by lump sum taxes and transfers, then there is no need for an economic appraisal to take place (at least not in the usual sense of that term). A lump sum-based redistribution will not change incentives facing economic agents and will not have result in any efficiency gain or loss. Whether the redistribution that takes place is desirable or not should be judged only using the social welfare function.
2. If lump-sum transfers were to take place, and so the wealth distribution were to change, the pattern of relative prices of goods and services in general would change, as the structure of demands in the economy would have changed.

More remarkable, perhaps, is the implication that relates to departures from some of the ideal conditions. This is particularly important as those ideal circumstances constitute a very stringent set of conditions which do not accurately describe any actual market economy. Suppose, for example, that there is a non-internalised negative externality present. This will generate an efficiency loss which will lead the economy to be at a point such as C in Figure 5.7b below. But it is a well known that if government does have access to non-distortionary tax and transfer arrangements (which in effect mean the ability to costlessly use lump-sum taxes), then the externality can be corrected without any efficiency loss, and policy intervention can return the economy to its efficiency frontier, and so reach point E (perhaps with the use also of some lump sum taxes or transfers).

Figure 5.7b Welfare and efficiency.



Before going any further with our analysis, it is best to think a little more carefully at what is meant by first and second best resource allocations. We do so on the following page.

A.2 Shadow Pricing Theory: First-Best settings

Here we look at the notion of a shadow price as one component of the solution to a constrained optimisation (welfare maximisation) problem. The problem can be thought of as

Maximise a differentiable objective function of n variables

$F(x_1, x_2, \ldots, x_n)$ (1)

subject to a differentiable constraint on the n variables

$G(x_1, x_2, \ldots, x_n) = 0$ (2)

Ignoring corner solutions, the necessary (first-order) conditions for a constained welfare maximum are

$F_i/F_n = G_i/G_n$ (i = 1, ... , n-1) (3)

where a subscript after a functional notation denotes a partial derivative, so that $F_i = \partial F/\partial x_i$, and so on.

Equation (3) defines a first-best allocation of resources, where the only constraint on the objective function is a production constraint (reflecting the initial endowments of resources and production possibilities given by the prevailing production functions).

Using Equation (1) above, we obtain the shadow price of good i as $\partial F/\partial x_i$, evaluated at the social welfare maximum (as this shows how much the objective, social welfare, changes as the quantity available of good x_i changes by one unit, all else remaining equal.

Equation (1) can be interpreted as a social welfare function, where the n variables represent the allocation of Q goods to J individuals (i.e. n = Q * J) and so

$W = W(U^1, \ldots , U^J) = F(x^1_1, x^1_2, \ldots , x^1_Q; x^2_1, \ldots , x^J_Q)$

Equation (2) can be interpreted as a production constraint of the form

$G(\Sigma x^j_1, \ldots , \Sigma x^j_O) = 0$
where each of the summations is over J individuals

Equation (3) specifies of equality of the MRS and the MRT (i.e. the marginal rate of (utility) substitution and the marginal rate of transformation) for any two goods, i and n.

Equation (3) is also equivalent to the results we found in 'Technical Appendix 1' in Topic 2 ('Rationale for Intervention'), and corresponds specifically to Equations (5.5) and (5.7) there for the two-person two-good special case.

A.3. Shadow Pricing Theory - Second-best conditions

Continuing on from the previous page, now suppose that there is an additional constraint (or constraints) that can be expressed in the form

$F_i/F_n = kG_i/G_n$ (for $k \neq 1$) (4)

These additional constraints (additional in the sense that they are over and above the scarcity or production constraints given by equation 2 on the previous page) are those we referred to earlier as being factors that make the fulfilment of the necessary conditions for Pareto optimality extremely difficult or impossible to obtain (such as monopoly power in one or more sectors of the economy, arising from increasing returns to scale and product differentiation) or political or institutional constraints that make the achievement of Pareto optimality impossible (such as the non-feasibility of lump sum taxes that prevent Pareto efficient internalisation of externalities).

Maximising (1) subject to (2) and (4) allows us to form the Lagrangian function

$L = F(x_1, x_2, \ldots, x_n) - \lambda G(x_1, x_2, \ldots, x_n) - \mu(F_i/F_n - kG_i/G_n)$ (5)

with Lagrange multipliers λ and μ.

The necessary conditions for an optimum can now be written as

$$\frac{F_i}{F_n} = \frac{G_i}{G_n} \cdot \left[\frac{1 + \frac{\mu}{\lambda G_i}(Q_i - kR_i)}{1 + \frac{\mu}{\lambda G_n}(Q_n - kR_n)} \right] \qquad (i = 2, \ldots, n-1) \qquad (6)$$

where $Q_i = (F_nF_{1i} - F_1F_{ni})/F_n^2$ and $R_i = (G_nG_{1i} - G_1G_{ni})/G_n^2$, with double subscripts denoting second order partial derivatives (so that for example $F_{1i} = \partial^2F/\partial x_1\partial x_i$).

In general, the term in square parentheses in (6) above will not equal unity. Hence the conditions for second best optimality differ from those for first best optimality. And they do so even for variables that are not subject to the additional constraint(s). This implies that if we are unable to equate MRS and MRT for some pair of goods, it is better to deviate from this equality for all pairs of goods except when the bracketed expression happens to equal unity.

This result is usually known as 'The General Theory of Second Best'. In the original exposition of this theory (R. G. Lipsey and Kelvin Lancaster, Review of Economic Studies, Vol. 24, No. 1 (1956 - 1957), pp. 11-32), the authors expressed the result slightly differently:

"It is well known that the attainment of a Paretian optimum requires the simultaneous fulfilment of all the optimum conditions. The general theorem for the second best optimum states that if there is introduced into a general equilibrium system a constraint which prevents the attainment of one of the Paretian conditions, the other Paretian conditions, although still attainable, are, in general, no longer desirable. In other words, given that one of the Paretian optimum conditions cannot be fulfilled, then an optimum situation can be achieved only by departing from all the other Paretian conditions. The optimum situation finally attained may be termed a second best optimum because it is achieved subject to a constraint which, by definition, prevents the attainment of a Paretian optimum."

Finally, note that it remains true that using Equation (1) above, we obtain the shadow price of good i as $\partial F/\partial x_i$. But in a second best world, evaluating this derivative at the second best optimum (that is, taking into account the additional constraint(s)) will lead to different shadow prices from that evaluated at the first best optimum. First-best and second-best shadow prices will differ from one another.

Implications

Those ideal circumstances that characterise first-best conditions constitute a very

stringent set of conditions which do not accurately describe any actual market economy. Most actual economies at most times are not in circumstances where first-best conditions are relevant.

One particular reason why first-best conditions do not apply in practice is that government rarely, if ever, has access to non-distortionary tax and transfer arrangements (which in effect mean the ability to costlessly use lump-sum taxes).

Second best theory implies that the standard first-best efficiency condition that MRS = MRT for any pair of goods is not applicable. It follows from this that a set of single market corollaries (such as price = marginal cost) are no longer valid efficiency conditions. However, the magnitude of the divergences from first-best conditions is not clear a priori. So it is difficult to know 'how far wrong' one would be in practice in using first-best shadow prices in second-best circumstances.

Ng (2004) demonstrates that calculating second-best efficiency conditions (and their associated shadow prices) will typically be very difficult, and in many cases simply cannot be done with the amount of information available or that one could reasonably acquire. He writes (page 192):

"Unfortunately the second-best conditions (Equation 6 above) are generally very complicated, involving not only first-order derivatives but also second-order, cross-partial derivatives. In economic terms this means that the second-best conditions depend not only on the values of (ratios of) marginal costs and marginal rates of substitution, but also on the degrees of complementarity or substitutability between goods in the constrained sector and those in the free sector, and the effects of increased production of a good on the marginal costs of another."

He goes on to argue (page 193) that

"It seems that, to make any improvement at all, we must analyse the whole economy and take everything into account. We must leap right to the summit to be sure of an improvement, but it is clear that this would be epistemologically, administratively and politically impossible."

How can the second-best dilemma be escaped from?

Fortunately, there are some ways of escaping this conundrum. I consider three such ways.

A. First-best rules can be best (allocatively efficient) even outside a first-best environment; but only when information is extremely poor.

First, as Ng shows himself, in a state of 'information poverty' (where little or no information can be obtained at reasonable cost to help us identify the magnitude of the term in square brackets in Equation (6)) then conventional first-best policy rules are the best ones to follow anyway. First best rules will, under informational poverty, maximise the expected value of efficiency gains from policy or project choices that we are confronted with.

The proof of this proposition is too complicated to go through here; you will need to read Ng (2004) to follow his proof. But it clearly does help us out of the worst-case dilemma: that which arises when we have no idea how the second-best and first-best allocations divergence.

The second and third 'escape routes' apply in circumstances where information is scarce, but is better than under conditions of information poverty.

B. For some special cases, approximate second-best rules can be obtained and used at relatively little effort and cost.

We shall cover this particular circumstance in the page that follows, Part B of this topic.

C. For developing economies that are heavily distorted, two standard shadow pricing methodologies exist (one developed by UNIDO and one by the World Bank) that will substantially improve upon the performance of economic appraisal compared to using existing market prices as proxies for shadow prices. These methodologies have been codified and are relatively easy to implement.

We shall cover this particular circumstance in the final part of this topic, Part C.

Part B: Economic Appraisal in "Relatively Undistorted" Economies

In practice, where does the person (or team) tasked with carrying out an economic appraisal get shadow prices from? Conventional economic appraisal, as normally applied in developed countries, has started from the price system as it is, departing from it only where there are considered to be externalities that dictate an economic (or shadow) price different from the price in the market, where adjustments are thought necessary to deal with the presence of taxes or subsidies, or where an input or an output (commonly the main output of the project such as a reduction in the probability of contracting HIV or AIDS) has no market price because it is not for sale. That this is the conventional practice in developed economies is made clear in the extract below from the Treasury Green Book.

VALUING THE COSTS AND BENEFITS OF OPTIONS (Treasury Green Book, Chapter 5)

5.11 Costs and benefits should normally be based on market prices as they usually reflect the best alternative uses that the goods or services could be put to (the opportunity cost). However, market prices may need to be adjusted for tax differences between options.

5.12 Wider social and environmental costs and benefits for which there is no market price also need to be brought into any assessment. They will often be more difficult to assess but are often important and should not be ignored simply because they cannot easily be costed. Annex 2 provides more information on how to take into account the wider impacts of proposals.

Estimating costs

5.14 Costs should be expressed in terms of relevant opportunity costs. It is important to explore what opportunities may exist. An example of an opportunity is to use land in a different, more valuable, way than in its current use. Another is the alternative use of an employee's time. Full

time equivalent (FTE) costs should be used to estimate the costs of employees' time to the employer1, and should include pensions, national insurance and allowances, as well as basic salaries.

Estimating the value of benefits

5.26 Real or estimated market prices provide the first point of reference for the value of benefits. There are a few exceptions where valuing at market prices is not suitable. If the market is dominated by monopoly suppliers, or is significantly distorted by taxes or subsidies, prices will not reflect the opportunity costs and adjustments may be required and specialist economic advice will be needed. An example of this is the effect of EU subsidies on the market for agricultural land.

Valuing costs and benefits where there is no market value

5.30 Most appraisals will identify some costs and benefits for which there is no readily available market data. In these cases, a range of techniques can be applied to elicit values, even though they may in some cases be subjective. There will be some impacts, such as environmental, social or health impacts, which have no market price, but are still important enough to value separately.

5.31 Box 10 summarises the main techniques that can be used to elicit these values. Annex 2 describes these techniques in more detail, and provides further information on how they are being applied in practice.

It is worth looking at paragraph 5.11 in the extract above. Two points are being made there. The first is that market prices usually reflect the best alternative use to which goods and services could be put. Given what has been written earlier in this lesson, one has to say that this proposition is at the very least contentious; in many circumstances it may simple be wrong.

When it comes to developing countries, the proposition that market prices are good measures of social opportunity cost is particularly hard to justify in many circumstances. One of these circumstances is that in which the developing country's economy is heavily and structurally distorted. In those cases, market prices will be very poor guides as to social values of inputs and outputs. But as we deal with this case in detail in Part C, we shall say no more about it here.

But even in economies where the price mechanism is generally well developed, distortions of various kinds do exist and market prices will not be good proxies for shadow prices. One kind of distortion - referred to in Paragraph 5.11 of the Green Book above - relatives to the presence of distortionary taxes. How do we correct market prices to arrive at shadow prices in this case? We provide an answer below, based on one special case application of second-best theory.

A second kind of distortion arises where an economy suffers from substantial (and medium or long term) amounts of unemployment or underemployment. This raises the question of how we value labour inputs into a project, a matter we have touched upon before. Once again, we shall look at a simple application of second-best economics to the valuation of labour inputs.

Shadow prices in the presence of distortionary taxes

The exposition here draws heavily on Chapter 6 of Nas ('Cost-Benefit Analysis', 1996). Consider Figure 6.4 from Nas which is reproduced below.

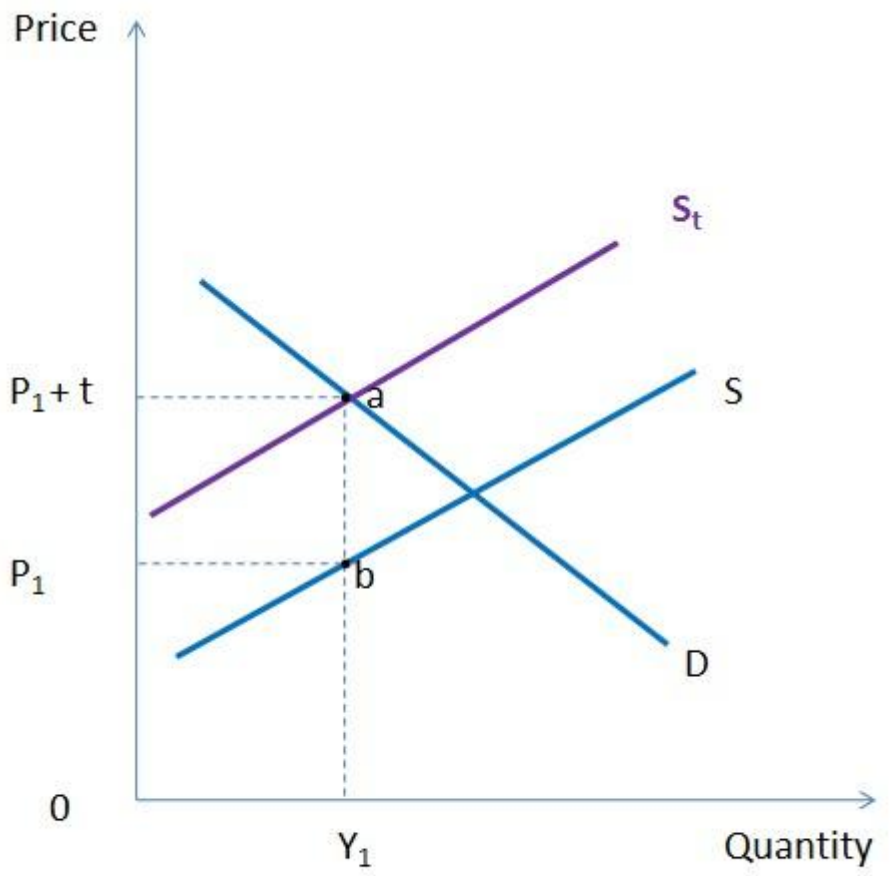


Figure 6.4 A distortionary tax on the production of good Y

Here S and D denote the initial supply and demand curves for good Y. A distortionary excise tax is then imposed on good Y at the rate t. As a result, the supply schedule shifts upwards to S_t. S is thus the supply schedule without the tax, S_t is the supply schedule incorporating the tax. Point a shows the intersection of the demand curve and the post-tax supply curve, and so the market price after imposition of the tax is $P_1 + t$. The equilibrium quantity traded at this price is Y_1.

A wedge - equal in value to the tax rate t - has now been driven between the consumer price, $P_1 + t$, and the producer price, P_1. The market for good Y is now distorted. In equilibrium, the market price (equal to the consumer price in this case) exceeds the marginal cost of production (shown by the initial supply curve) by the amount ab, an amount equal to the tax rate levied. If there were to be a marginal change in the production of Y, the income change as measured by the market price would differ from (and exceed) the change in production costs. So under distortionary conditions, market prices are not proper measures of costs or benefits in social opportunity cost terms.

Now suppose that a project, if implemented, would increase the demand for good Y by an amount ΔY. We represent this in Figure 6.5.

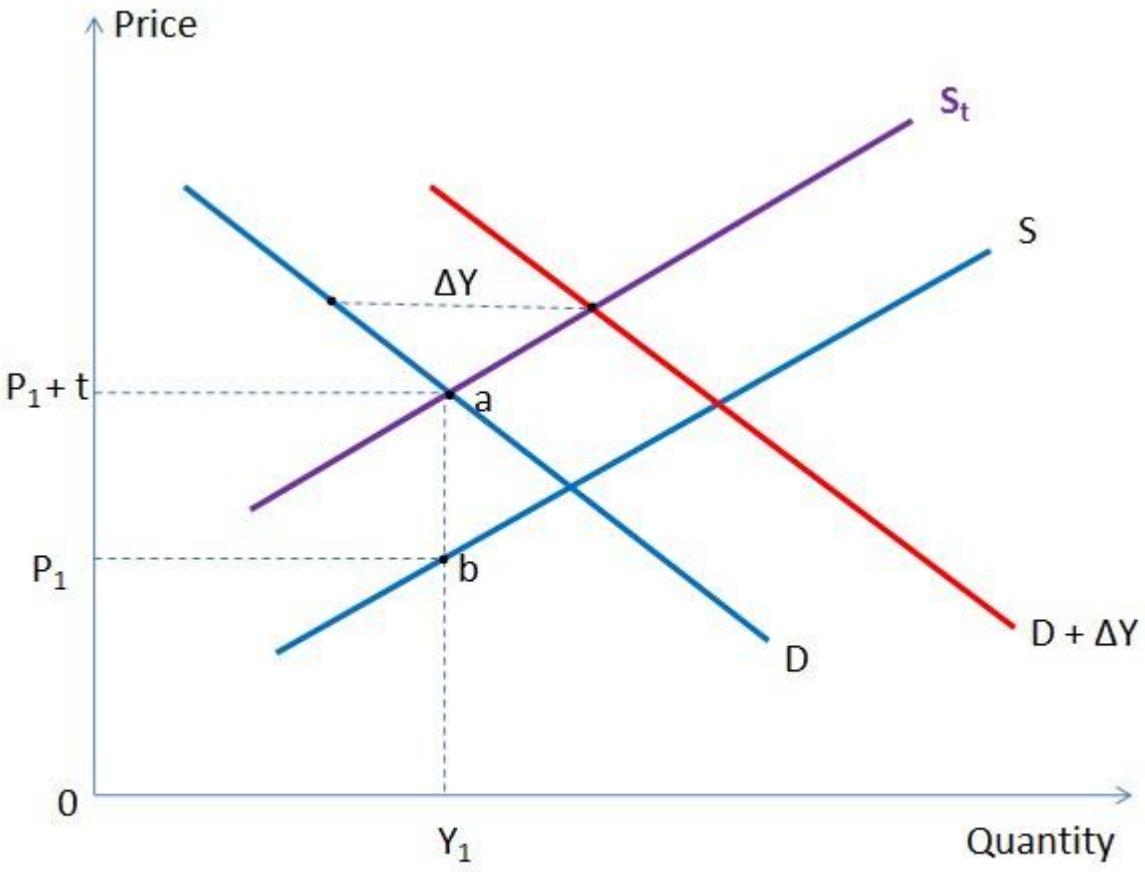


Figure 6.5a Derivation of a shadow price for good Y

Question: What is the shadow price of good Y? Try and deduce this for yourself. Using Figure 6.5a as a basis, extend this diagram so that it portrays the answer graphically, and on the basis of which the shadow price of Y can be deduced.

Answer: Use the button at the foot of this page labelled 'F6.5' to see the correct answer and its derivation.

HINT: The shadow price of good Y will be a weighted average of producer and consumer prices, with the weights given by the proportions of ΔY obtained at the expense of increased production or reduced consumption. See also the 'Key Result' that follows.

A Key Result

In the presence of taxes on expenditure, to obtain shadow prices for (taxed) project inputs it is necessary to identify the main sources from which the project inputs are obtained, and so to determine the allocational impact that the project has.

Valuing the Cost of labour

Obtaining the opportunity cost (shadow price) of labour employed on a project can make use of the shadow price equation we obtained in the previous example. There we found that the shadow price of a produced good used as a project input could be obtained as a weighted sum

$P^* = P_p \, \Delta S/\Delta Y + P_c \, \Delta D/\Delta Y$

where in that case it was a weighted sum of producer and consumer prices, with weights given by the proportions of total use of good Y obtained from increased gross production of Y and decreased consumption elsewhere of Y.

Where labour markets are distorted and a significant part of the labour force is unemployed or underemployed, but where some of the labour requirement for a project will draw workers from employment elsewhere, an equivalent weighted sum can be constructed.

Tasks:

1. Write out what you consider to be an appropriate expression for such a weighted sum that might be used to obtain the shadow price of labour employed. Then check your answer against that suggested by the expression on the page found by clicking the "Shadow Price of Labour' button below.
2. When you are happy that you have an appropriate expression, discuss what this expression implies about the shadow price of labour in the two special cases of (a) an economy with full employment (b) a project in which all labour is drawn from the ranks of the unemployed.
3. Does it make any difference to the answers you have given to 1. and 2. above whether unemployed workers are voluntarily unemployed or involuntarily unemployed? Does it make any difference to the answers if those not fully employed are unemployed or underemployed?
4. Now return to the previous case in which we obtained an expression for the shadow price of taxed commodity used as a project input. Under what conditions would:
    - the shadow price be identical to the producer price (in this case the market price minus tax)?
    - the shadow price be identical to the consumer price (in this case the market price including tax)?

Please post your answers to the Discussion Forum for Topic 7, accessible via this link.

F6.5

A project, if implemented, would increase the demand for good Y by an amount ΔY. In Figure 6.5 below, the demand for Y shifts from D to D + ΔY. (The horizontal shift in the demand function is equal in magnitude to ΔY).

We are asked to calculate the shadow price of good Y used in the project. Figure 6.5 below contains the information to answer this question.

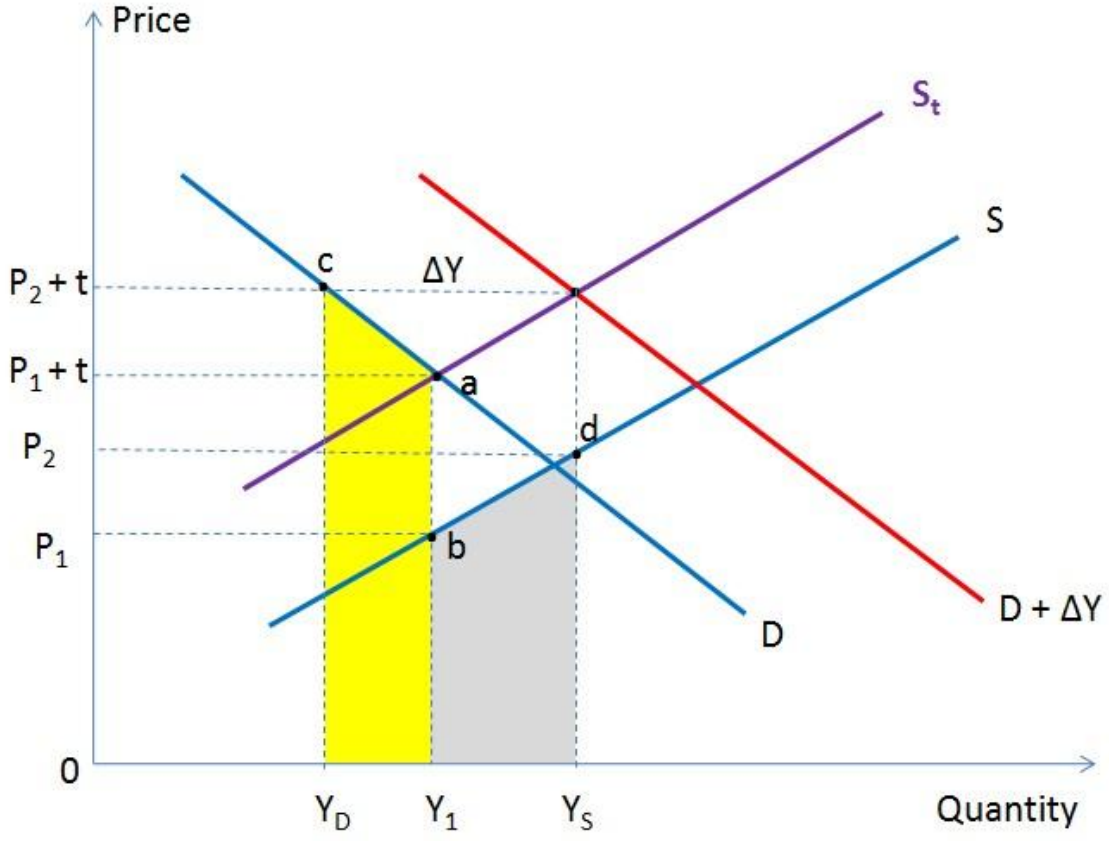


Figure 6.5 Derivation of a shadow price for good Y

After the demand increase, the market price (which here equals the consumer price) rises from $P_1 + t$ to $P_2 + t$. Notice that the new producer price is P_2; the wedge between consumer and producer price remains at t, just as it did before the demand increase.

The amount of Y used in the project is given by ΔY. Where does this amount come from? It comes from two sources:

1. Part of the increase comes from additional supply of good Y. Call this ΔS. This is shown in the figure by the increase in total production of Y from Y_1 to Y_S.
2. Part comes from a switch of Y that was being used in other ways into use in this project. Call this ΔD. That amount is shown in the figure as $Y_1 - Y_D$.

Hence we have:

$\Delta S = Y_S - Y_1$
$\Delta D = Y_1 - Y_D$
and
$\Delta Y = \Delta S + \Delta D = (Y_S - Y_{1)} + (Y_1 - Y_D) = Y_S - Y_D$

The welfare loss arising from the use of good Y is made up of two parts:

- One part is a loss in value of good Y to those consumers who post-project consume less of it than they did pre-project. This loss is measured by the willingness-to-pay for those lost items. It is represented by the yellow shaded area in the figure, that is the area formed by the shape caY_1Y_D .
- A second part of the loss is the production costs of the additional output that the project generates. This loss is measured by the area under the pre-tax supply curve, as this indicates the marginal cost function for good Y. It is represented by the grey shaded area in the figure, that is the area formed by the shape bdY_SY_1.

The shadow price of good Y is a measure of the value lost in using good Y for a change of one unit of Y. To obtain this, we need a weighted sum of producer and consumer prices, where the weights denote the shares of total use of Y in the project that come from additional production and reduced consumption elsewhere respectively.

We obtain this weighted sum as:

$P^* = P_p \Delta S/\Delta Y + P_c \Delta D/\Delta Y$

where

- P^* is the shadow price of good Y
- P_p is the producer price
- P_c is the consumer price
- ΔS, ΔD and ΔY are as defined above

Notice that in the diagram two producer prices exist (and also two consumer prices exist). So this appears to beg the question of whether it is the pre-demand increase or post-demand increase producer and consumer prices that should be used to obtain a shadow price.

That is actually a misleading question. Shadow prices are prices for marginal changes in quantities; what we have in Figure 6.5 are clearly not marginal changes as that term is usually meant. If the project had only a marginal impact on the demand for Y, then the difference between P_1 and P_2 (or between $P_1 + t$ and $P_2 + t$) would be trivially small, and the apparent problem would disappear.

For non-marginal changes, a single shadow price would be inappropriate. We should instead use the analysis as shown in the diagram, evaluating the total losses as indicated by the shaded areas above.

A Key Result

In the presence of taxes on expenditure, to obtain shadow prices for (taxed) project inputs it is necessary to identify the main sources from which the project inputs are obtained, and so to determine the allocational impact that the project has.

In our example there were just two sources: additional production and reduced consumption. In different circumstances, there might be others (such as changes in imports and/or exports) that have to be evaluated appropriately.

Valuing labour inputs

1. Write out what you consider to be an appropriate expression for such a weighted sum that might be used to obtain the shadow price of labour employed. Then check your answer against that suggested by the expression on the page found by clicking the "Shadow Price of Labour' button below.

An appropriate expression would be the weighted sum

$W^* = W_d \Delta E/\Delta L + W_S \Delta U/\Delta L + RC$

where

- W^* is shadow price of labour employed on the project
- W_d is the market wage rate
- W_S is the supply price of labour, reflecting the amount of compensation that must be paid to induce a potential worker to enter employment
- ΔL is the labour requirement for the project
- ΔE is the reduction in employment elsewhere as a result of the project
- ΔU is the reduction in unemployment as a result of the project (which may need to be defined slightly differently depending on whether the people in question were previously involuntarily unemployed, voluntarily unemployed, or heavily underemployed)
- RC is relocation costs for a representative worker (which may be zero); this is not a term we have mentioned previously, and it is in here for completeness.

2. Discuss what this expression implies about the shadow price of labour in the two special cases of (a) an economy with full employment (b) a project in which all labour is drawn from the ranks of the unemployed.

Inspection shows that in case (a) $W^* = W_d$ as $\Delta E/\Delta L = 1$. In case (b) $W^* = W_S$ as $\Delta U/\Delta L = 1$. In both cases, the shadow wage will have to include RC where appropriate.

3. Does it make any difference to the answers you have given to 1. and 2. above whether unemployed workers are voluntarily unemployed or involuntarily unemployed? Does it make any difference to the answers if those not fully employed are unemployed or underemployed?

Nas (page 102) reasons as follows:

"Note that W_s is subjective, so it is difficult to estimate. As an approximation, the market wage net of tax could be used as a measure because this will be close enough to induce involuntarily unemployed workers to enter the labour force. In the case of voluntary unemployment, Ws could be any value between zero and the net of tax wage, because information about workers attitudes towards leisure and work is unavailable. However, in the case of mild unemployment, it may be sufficient to use the net of tax wage to estimate Ws for both voluntarily and involuntarily unemployed workers."

But these conclusions are contentious. If Ws is close to Wd, then the shadow price of labour will be close to the market wage irrespective of where labour is drawn from. One may doubt, though whether Nas is correct in arguing that the net of tax wage is a good approximation to Ws, not least because Ws will not be a fixed quantity but rather will

tend to become smaller the higher is the amount of unemployment. If at high levels of involuntary unemployment workers value their leisure time much lower than the net of tax wage - which seems plausible - then Nas's approximation does not look to be a good one.

Similarly, one may also doubt whether Nas's implication that Ws will be lower for voluntarily unemployed as compared with involuntarily unemployed individuals is a correct ranking.

Part C: Applications and Extensions of CBA for Development

The remainder of this topic deals with some enhancements of, or new techniques within, cost-benefit analysis that were designed to allow appraisers to reflect the special circumstances and aspirations of developing economies. Among the circumstances for which allowance was made were the informal sector of household enterprises and distortion by policy of the price system. The special aspirations were for faster growth – presumed to follow from higher investment – and greater equalization.

We begin by considering why it was considered desirable (or even necessary) to modify conventional economic appraisal to take account of conditions in developing countries.

Next, we present the main differences between the approaches adopted by the two pioneering studies to the central problem of widespread price distortions and the aspiration to faster growth; and we expound the principles, in their developed form, of the appraisal method that became standard in the lending and aid decisions of the World Bank and a number of other international and national providers of project finance to developing countries. This involves questions relating to:

- the numéraire;
- the discount rate for time used to represent the shadow-price of capital;
- the discount for consumption or premium for investment;
- the weighting of consumption benefits according to the poverty of the people who receive them;
- the shadow wage-rate;
- and general revaluation for appraisal purposes of inputs and outputs.

In outlining the elaborations introduced into cost-benefit analysis, we distinguish two levels of appraisal:

- efficiency appraisal
- social appraisal

It is important to be aware of the fact that these two terms are used in various (and different ways) in the welfare economics literature. Moreover, a third term will be introduced below: economic appraisal. Hence there is much potential for confusion about what precisely each means. The distinction between efficiency and social appraisal as it is being drawn here in this lesson has a very particular basis. Specifically:

- Efficiency appraisal treats units of income generated by a project alike regardless of the purpose for which the income will be used or who receives it.
- Social appraisal allows the possibility of treating some units of income as more valuable than others: for example, income destined for investment more highly than income destined for consumption, or 'uncommitted social income' more highly than income available to the private sector, or income passing to poor consumers more highly than what goes to the rich.

The material in this lesson is drawn largely (with permission) from one chapter of a new textbook on development economics written by three development economists at the University of Strathclyde. Details of the text: Development Economics, by David Forsyth.

Mozammel Huq, and Anthony Clunies-Ross. McGraw Hill, 2009. For further details of this excellent development economics text, please use the following link to the publishers web page for the text:

http://www.mcgraw-hill.co.uk/html/0077114531.html

Adapting economic appraisal for developing countries

Two groups of economists, working independently at about the same time, made the pioneering moves to render economic appraisal more relevant to the special needs of developing countries. They were Ian Little and James Mirrlees (LM), in a publication for the OECD (1968), and Partha Dasgupta, Stephen Marglin, and Amartya Sen (DMS), reporting for UNIDO (UNIDO, 1972). Their insights were similar, though the operational solutions they proposed were different, as we shall see, in two respects.

It can be said that their work was designed to make development economics operational. They showed how the bearing of some of its insights in particular cases could be jointly quantified in order to help illuminate policy choices and to guide with a degree of consistency the decisions made.

The Little–Mirrlees (LM) proposal, which was the more radical, saw the light first. It formed the foundation of the method that has come to be most widely used. LM moved from their original publication, brief and lucid, to a longer book (1974), which introduced new elements. The expanded ideas of this later version were condensed, with the idea of making them more readily applied, by Lyn Squire and Herman van der Tak (1975), in a short book commissioned by the World Bank. It is this version – 'Little-Mirrlees-Squire-Van der Tak' (LMST) – that has been used and promoted by the World Bank, the Inter-American Development Bank, and other international lenders and providers of project aid. A useful manual on the method, with a number of case studies, is Powers (ed.) (1981), with a lucid introduction by the editor to the theory in its first 60 pages. [The Powers book, drawn on extensively here, was formerly (and is possibly still) distributed free of charge by the Inter-American Development Bank.]

1. Why economic appraisal was deemed to need adaptation

There are four main reasons prompting the new project-appraisal methods, two of them leaning toward descriptive generalizations about the world, and two toward value judgments.

1. The price system was held to be so heavily 'distorted' in many developing countries by government duties, subsidies, and restrictions, coupled typically with considerable over-valuation of the countries' currencies, that it formed a poor starting-point for the relative valuation of project inputs and outputs.
2. Structural features of many developing economies – such as the dualism between formal and informal sectors, and the predominance of household enterprises in traditional agriculture – combined with these policy distortions to have important implications for labour markets. There was often a high level of urban unemployment,

and also (arguably) of urban underemployment and of surplus labour in agriculture, which raised complex questions about the effective opportunity-cost of unskilled labour and hence about the appropriate shadow wage-rate for appraisers to use.
3. The prevailing view that the rate of economic growth needed to be increased was held to imply that the existing rate of investment, and consequently of saving, was sub-optimal and that policy needed to boost savings rates.
4. Income distribution was held to be too unequal, and direct redistribution was considered difficult. This could be taken to imply that extra consumption for poorer people should have a higher priority in the assessment of projects than extra consumption for richer people.

Considered individually, these peculiarities could have pushed project choices in opposite directions. A presumed need to increase the savings rate could have favoured capital-intensive methods because they would shift income toward corporations and richer people, who would be expected to have higher saving-rates than the average. On the other hand, recognition that market wage-rates in the formal sector exceeded the marginal opportunity-cost of labour might have dictated greater labour-intensity than markets signalled, which would probably have shifted disposable income towards the poorer. By providing frameworks for quantifying these considerations, the OECD and UNIDO teams enabled them to be balanced against each other.

We proceed to outline key elements of the schemes. The exposition below of LMST draws heavily on Powers (1981), largely using his notation.

2. Efficiency accounting and social accounting: two levels of economic appraisal

This is a distinction absent in the original studies but introduced for essentially practical reasons by Squire and van der Tak and present in the later versions of LMST. Three matters can be thought of as relating in one way or another to "distributional considerations" or as involving value-judgements:

1. Income directed to consumption may be weighted less highly than the same amount of income directed to investment. This is a way of reflecting the judgment that the rate of economic growth is sub-optimal.
2. Income available without restriction to the state (‘uncommitted social income’) may be treated as more valuable than income available for private investment.
3. Income for consumption may be rated more highly the poorer the class of people to whom it will go.

What later came to be called ***efficiency accounting*** ignores the possibility of making any of these three distinctions. Efficiency accounting revalues the price system so as to reflect better the economic opportunity-cost of resources in production. That is, it deals with the first two of the four 'reasons' prompting the new project-appraisal methods listed on the previous page. But, having done this, efficiency accounting treats the income arising from projects as homogeneous, regardless of who will use it or for what.

Social accounting (with the ‘social’ used here in a more restricted sense than it is often used in other contexts) does allow for the possibility of making distinctions between equal amounts of income according to their probable use and according to their distribution among classes of people (and so allows for the possibility of making the three kinds of value-judgements listed above on this page).

Powers, writing in 1981 from experience in the Inter-American Development Bank, submitted that few developing-country administrations had at that time reached the point of consistently revaluing prices as required for satisfactory efficiency-accounting, and argued that, until that hurdle had been surmounted, it was better that they should not attempt the additional complication of social-accounting in this restricted sense.

Of the four issues that the extensions to CBA were designed to address (and listed earlier, ***efficiency appraisal*** deals only with the first two ('distortions' of prices, including that of labour). ***Social appraisal*** covers in addition the third and fourth (concerns over future growth and over distribution).

Numéraire

This term refers to the unit of value – the standard of value – in terms of which costs and benefits are to be counted. If the same goods were to be valued differently according to whether they would be destined for consumption or for investment, then a decision would have to be made over which was to be treated as the standard of value. But a prior question – important even if only efficiency-appraisal were to be attempted – was the choice of the foundation from which the system of relative prices of goods and services would be built up.

To both these questions the two teams gave different answers. On the second question, both envisaged a set of relative prices that might be substantially different from the set prevailing in the market. But there would need to be some objective starting-point: an actual set of relative prices – a set considered to approximate to relative social values or costs – in terms of which the rest of the price system could be usefully revalued.

In an ideal market system, with perfect competition and with all goods and bads priced, the ratio of two goods' marginal costs would be the same as the ratio of their marginal values. Then the actual price system would reflect adequately the relative costs and values at the margin of any pair of goods or factors, and any revaluation for economic appraisal would be unnecessary.

Because we do not have such an ideal market system, and revaluation for economic appraisal is necessary, we have to look for some set of actual prices that reflects (more or less) either relative marginal (economic) values or relative marginal (economic) costs, and then revalue the rest so that their costs or values bear the right proportions to those in the original set.

The LM method: investment income (or uncommitted social income) at border prices as the numéraire

LM base their system of relative valuation on 'border' prices in convertible foreign exchange, with the standard unit of value a unit of income destined for investment. Their numéraire was described as investment income at border prices. Border prices are relative import and export prices as they would be without any tax or subsidy on importing or exporting (c.i.f. for visible imports, f.o.b. for visible exports). On the assumption that the home country is 'small' in the economic sense – that is to say that its own trade makes a negligible difference to the world prices that it faces – relative border prices for tradables represent a system of relative values outside the country's own influence that does show objectively the rates of exchange of various goods and services in its dealings with the rest of the world: how much of A it can get for each unit of B.

If the border price at import of a particular model of truck equals the border price at export of 40 000 T-shirts or 10 tonnes of coffee beans, it can be said that the truck and the 10 tonnes of coffee and the 40 000 T-shirts are of equivalent value for the country, regardless of what taxes or subsidies the government may actually impose on them.

However, if the truck had to pay a 100 per cent import duty while shirts and coffee could be sold in the country without duty, its market price would be equal (just 'inside' the border) to that of 20 tonnes of coffee or 80 000 T-shirts. That set of market prices would greatly exaggerate the truck's marginal opportunity-cost for the country (the resources required – what sacrifice would need to be made – to import it), and consequently, if the 100 per cent duty were not assumed to be an unavoidable fixture, would also exaggerate the marginal value of producing it domestically instead of importing it. If in these circumstances a vehicle-building project for the country were to be appraised with the trucks produced valued at their market prices, then, other things being equal, the economic value of the output of the project (the number of T-shirts it could release to pay for imports of other things through reducing the need to import trucks) would be exaggerated by 100 per cent. That appraisal might declare the project economically profitable, while one at border-prices might indicate (correctly) that it was wasteful.

Similarly, the border price of a litre of petroleum, whether imported or exported, might be the same as that of a T-shirt. If, however, the government subsidized the domestic use of petroleum by 50 per cent, and a project to produce T-shirts with petroleum as a fuel were to be appraised at market prices, the cost to the country of the petroleum used (what the country would have to pay to import the petroleum, or alternatively what it could have earned for exporting it), in relation to the value of the T-shirts produced at border prices, would be greatly under-rated, and again the project might wrongly be judged as economically profitable.

The border prices do not need to be expressed in foreign currency. Whether we call the unit – which might be the border-price of a litre of petroleum – one pound, or 200 yen, or 2000 won – is immaterial. It is the relative values and costs that are of interest. Expressing them in the domestic currency is probably the most convenient way.

Where final or intermediate goods or services, or factor services such as certain forms of skilled labour, are directly imported or exported, there is no difficulty in assigning them border prices. And there will be some items which, while not actually imported or exported at the time, are of kinds that are tradable: there are prices at which they could be bought or sold internationally. If the reason that they are not traded internationally is simply the existence of price distortions arising from some act of policy, then these potential prices at which they could be imported if there were no distortions are the ones to use for the appraisal.

The difficulty arises with goods or factor services of a kind not likely to be tradable abroad in any circumstances (cooked meals, the services of garage mechanics), or at least not under current (even undistorted) price-cost conditions. An extreme example, and key to much else, is the unskilled wage-rate, considered in more detail below. One solution would be to fix on the most relevant estimate of the marginal product per worker-year of this kind of labour and express this as the amount of some good or basket of goods that has a border price. This might be a quantity of a staple foodgrain of which there are (or, if distortions were removed, would be) either imports or exports. It might be a basket of tradable crops in the proportions in which they are produced.

Once border-price equivalents have been given in this way to a few non-tradable inputs, then, with the help of known input–output relationships in the economy, rough border-

price equivalents can in principle be allotted to the non-tradables, by sector if not by individual product.

A ratio could then be found for the total output of each sector between its value at border prices and its value at market prices. The average of these ratios, weighted by their importance in final goods, would give a consumption-conversion-factor (CCF). The CCF would be the factor by which a value in market prices would have to be multiplied to give its rough working equivalent in border prices.

To specify that the numéraire is investment income (or that it is consumption income) is relevant if investment is to be rated more highly per unit than consumption. Income for consumption will in that case be valued at a discount, and that is the essence of the original LM approach. The later version of the LM numéraire, however, specified that the standard should be uncommitted social income, that is public-sector income freely available to the state for spending. This would allow for the possibility that income committed to private investment might be rated less highly than income that was available to the state and free to be used for any social purpose.

It may be said that the LM method proceeds primarily from the side of relative costs.

The UNIDO alternative for numeraire: *consumption income at domestic market-prices*.

The UNIDO method could by contrast be said to start from relative values rather than relative costs. Its numéraire is consumption at domestic market prices. A rationale here is that, from society's viewpoint, the purpose of production is ultimately consumption, so that the amount of consumption should be the ultimate measure of value produced, and that the relative marginal social value of the various consumer goods is their relative marginal value to consumers, which, unless the goods are quantitatively rationed and sold at centrally fixed prices, will be reflected by the relative prices at which they sell, even if those prices have been distorted by taxes and subsidies. (A consumer will buy each of them up to the point at which their relative marginal values to herself are proportional to their relative prices, however those prices have been doctored.)

Of course this method does not simply use all market-prices undoctored. To remove the effect of the 'distortions', however, applying as they typically do particularly to foreign trade, translates the foreign-exchange border prices by a shadow exchange rate (SER) to their approximate equivalents in domestic-currency prices for consumer goods. This is analogous - in fact the direct converse – to the way in which the LM method converts domestic market prices by the consumption-conversion factor (CCF) approximately to border prices. The SER is reached by a similar weighted-averaging process of sectoral ratios. (Both the shadow exchange rate and the consumption-conversion factor – ideally each other's reciprocals – are short-cuts involving a degree of approximation.) In the UNIDO system a preference for investment over consumption will be expressed by a premium for investment rather than a discount for consumption.

Does the difference in numéraires matter?

The difference between the two versions on this last point is purely a matter of expression. However, starting from domestic market-prices of consumer goods rather than border prices of tradables could make a difference in particular cases. The fact that relative domestic market prices differ from relative border prices is after all one main reason for using shadow prices. That an argument can be made for either as a starting-

point, and that neither is ideal, is comparable to an index-number problem. The choice between the two is analogous to that between weighting a consumer price index by the initial and by the final composition of consumption.

Balance of advantage between the two versions of the numéraire

Both teams doubtless started with the hope that the analysis itself would help to shift practices away from the distorting policies by making their implications more obvious. The stronger the expectation that this will happen, it might be argued, the stronger is the case for border prices as the standard, since it will mean that the standard remains fairly constant while relative market prices change. Reform involving reduction of distortions will after all not alter border prices, at least if the economy is 'small', but will bring domestic market prices into closer correspondence with them.

Example 1: The equivalence 'in principle' of LM and UNIDO methods for appraising a car-production project

The example that follows, based on a 1982 Ghanaian case, supposes that a local project for car production is to be appraised to determine whether it is economically valuable and ought to be supported. The figures show per vehicle, in present-value terms, first the cost in **market prices**, second the **shadow** (accounting) cost under the **LM** method, and third the **shadow** cost under the UNIDO method, of building the car. Figures are in local-currency units, with import prices translated at the official exchange-rate. The **value** of the car is based on the cost of an equivalent imported model.

The example is simplified to the extent that the only adjustment made between market- and shadow- prices is on account of the discrepancy between domestic and border prices.

- Consumption-conversion-factor (CCF) under LM is taken as 0.625.
- Shadow-exchange-rate(SER) under UNIDO is taken as 1.6 times the official rate of domestic to foreign currency. (Note 1.6 = 1/0.625.)

Table 1 Economic net-benefit estimates of car production (Values in cedis '000)

	Market price	Shadow price: LM method	Shadow price: UNIDO method
Total imported cost	18.750	18.750	30.000
Total domestic cost	5.000	3.125	5.000
Total cost	**23.750**	**21.875**	**35.000**
Value of car	26.000	16.250	26.000
Surplus (NPV) (= value - total cost)	+2.250	- 5.625	- 9.000

Whereas market-prices would give a yes to the project with a positive surplus, which would denote financial profitability, both shadow-price systems give it a no. Since figures in the third column are all in the same ratio (1.6) to those on the same row in the second column, it is inevitable that the two shadow-price methods in this simplified example will give the same sign to the surplus and therefore the same answer on whether the project is economically valuable.

Accounting-price ratios

Accounting-price ratios (APRs) in LMST are ratios of accounting prices (also known as shadow prices) to market prices of goods or factors. The CCF is a form of aggregate APR: a weighted average of APRs covering the range of final goods.

The accounting price of capital

The accounting price of capital is the discount rate used in the appraisal, in effect the economic cost set on time. Both LMST and UNIDO virtually say that in practice the discount rate will have to be determined by trial-and-error but, for the sake of understanding, and of consistency with other elements in the system, both consider the bearing on the question of the marginal productivity of investment and the public's rate of discounting the future. LMST uses the terms 'accounting rate of interest' (ARI) and 'consumption rate of interest' (CRI), beside the concept of the marginal product of investment (MPI).

- The MPI is the marginal product of public investment in efficiency-accounting prices: in effect an (economic) internal rate of return on the marginal project.
- The CRI is the rate at which people – in their capacity as consumers – discount future consumer benefits.
- The ARI is simply the discount rate, however derived, used in the appraisal.

The UNIDO Guidelines calls the CRI the 'social rate of discount' and supposes that it will also be in principle the rate to be used in the appraisal (1972, ch. 13); it would ideally be used as what LMST calls the ARI.

The logic of determining the CRI

People may discount future benefits for one or both of two reasons.

1. They expect to be richer in the future and therefore, because of diminishing marginal utility of consumption as consumption rises, rate future incremental units of consumption less highly than present ones. This may be regarded as a 'rational' argument for discounting.
2. The other is described as pure time preference. This is arguably irrational – due simply to shortsightedness – but it may have something to do with uncertainty about the future and the idea that a bird in the hand is worth two in the bush.

Because of the intrinsic difficulty of even defining operationally the rate at which people in the aggregate discount the future – let alone the practical difficulties of determining it

on whatever definition – giving it a value, insofar as that is necessary, must come into the category of a 'decision-makers' valuation', involving a degree of value judgement. However, the appraiser may push the determination of the first of the two components further back by saying that it depends logically on two relationships:

1. the expected rate of growth (g) of average consumption, and
2. the elasticity of marginal utility to the level of average consumption (-n).

Fixing the magnitude, n, of the elasticity will again be largely a matter of value judgement, but consistency will demand that it should be given the same value in this context as in the determination of distribution weights discussed below. The CRI (i) is then given by

$$i = ng + r \quad (2)$$

where r is the rate of pure-time-preference.

LMST recommends the pragmatic solution of determining the ARI (the discount rate for time to be used in the appraisals) by trial-and-error so as to give, as near as possible, positive NPVs to a set of public-sector projects whose aggregate capital costs equal the discretionary public resources available for investment in total – and to no others. In other words, choose the discount rate so that it will give just enough positive NPV results to use all the resources available for investment. The ARI used might thus vary over time. (The UNIDO Guidelines proposes something probably similar in practice, with the estimated CRI – the 'social rate of discount' – used, but probably only as one of several rates that between them – with simultaneous variation of other key parameters – will point to the economic return on the project and enable it to be compared with that of others.)

Insofar as funds are freely available from abroad, it has been suggested that the real rate of interest charged internationally on these funds can be taken to set a lower limit to the ARI (Powers, 1981, p. 47). [*Powers indicates that the nominal rate will be LIBOR (the London Inter-Bank Offering Rate) plus a premium determined by the credit standing of the borrowing government, and that this will have to be deflated by an expected inflation rate in foreign-currency import and export prices to give the real rate.]*

However, there are snags in any attempt to treat as eligible all public projects that register positive efficiency or social NPVs when this international interest rate is used as the discount rate. This is because foreign loans have to be serviced in actual foreign exchange, whereas the benefits from public projects as appraised on efficiency or social grounds will naturally include as outputs elements that represent no cash inflow so that the projects' 'surplus' as assessed is not necessarily negotiable for servicing loans.

The discount for consumption (or premium for investment)

If q is the MPI, the efficiency equivalent of the internal rate of return on the marginal project, and both q and i (the CRI) are for simplicity assumed to represent rates constant for ever with no reinvestment of the additional income generated in future years, then switching one unit of income in year 0 from consumption to investment will give rise to an additional income stream of q per year, which will by assumption represent additional consumption, but the value of this stream to the consumers will be found by discounting it

at the rate of i per year. So there will be a constant stream of consumer benefits, amounting to q, each year, which will have to be discounted by (1 + i) in year 1, $(1 + i)^2$ in year 2, and so on.

The present benefit arising from the surrender to investment of a unit of consumption in year 0 will be the sum of a continuous stream of q values, each multiplied in order by a term of an infinite geometric series, $1/(1 +i)$, $1/(1 +i)^2$,..., $1/(1 +i)^n$,..., that adds up to 1/i. The discounted stream of additional consumer benefits will therefore have a present value (NPV) given by:

(3)

If q/i >1, transferring a unit of income at the margin from consumption to investment will benefit the consumer, increasing her present value by (q/i -1) units. It will imply that investment has previously been suboptimal; in other words it will fit the frequent judgement made about developing countries that investment needs to be increased by increasing saving. (On this reasoning, savings and investment ought ideally to be increased until q has fallen to the point at which it equals i, the CRI.) If q is 5 per cent and i is 3 per cent, then transfer of a unit of consumption to investment raises consumers' NPV by (1.05/1.03 -1) of a unit, that is roughly 0.02 of a unit. So investment income per unit is worth at the margin approximately 1.02 as much as the same amount of consumption income. Hence q/i gives the appropriate proportional premium factor to be applied to investment in the UNIDO method, or alternatively i/q is the appropriate discount factor for consumption in LMST.

If v represents the valuation-weighting of uncommitted social income at border prices in relation to that of consumption income at market prices,

v =q/i(CCF) (20.4)

where CCF is the consumption-conversion factor that has to be used to multiply aggregates in market prices to convert them to border prices (here appearing in the denominator because the conversion is in the opposite direction).

If we were to abandon the assumption of no reinvestment of the additional income stream and to suppose that there is reinvestment, at a constant proportion each year, s, of the extra income generated by the original investment, then, so long as q >i and i >sq, the premium factor to be applied to investment will be higher than q/i (or the discount factor applied to consumption lower than i/q). [This is demonstrated in Squire and Van der Tak (1975, p. 105).]

Distribution-weighting

Social (as distinct from efficiency) appraisal allows various bodies of income generated by a project to be evaluated differently, not only according to whether the income will be destined for public uses, private investment, or private consumption, but also according to whose private consumption will be augmented. This can be done by using different weighting factors, Dc, for the consumption of beneficiaries at different consumption or income levels. The consumption-weighting derived above from the CRI (i) and the MPI (q) can be taken to be the weighting for consumers at the average per capita consumption level $\bar{c}$, these being representative of the beneficiaries of the additional unit of investment.
The distribution weights might be fixed arbitrarily, but more satisfactory – because it

makes the implications of the decision more obvious – is to base them on a stated welfare function.

Because the reasoning for basing the distribution weights on a coherent welfare function may seem excessively mathematical to some readers, we transfer the continuation of the argument to Appendix 2, which is available as a short PDF document from the link embedded here.

Accounting wage-rate

The shadow wage-rate or accounting wage-rate (AWR) is clearly a highly important parameter of any appraisal. We shall consider it first for purposes of efficiency appraisal.

In efficiency appraisal

We need to distinguish unskilled, domestic skilled, and expatriate labour. The relevant efficiency accounting wage in the LMST system will be the opportunity cost in border prices of a unit of the labour concerned.

It has been put forward as a reasonable supposition for most developing countries that domestic skilled labour of most kinds is 'scarce' and will tend to be fully employed. In that case it will be adequate to use the market-wage converted to border-prices as the accounting wage-rate for that class of labour under LMST.

For expatriate labour, on the assumption that it is brought in because not enough comparable domestic workers are available, one simple solution would be to take the pay expressed in foreign exchange as the cost in border prices. However, insofar as some of the pay will be spent within the country, buying directly or indirectly non-scarce factors such as unskilled labour whose price is above its opportunity cost, and at domestic prices that possibly overstate costs in border prices, adjustments may be considered necessary for the part of the pay so spent.

The difficult question, however, is the price to put on unskilled labour. The aim will be to use its marginal opportunity cost – that is, the marginal product of the labour (MPL) forgone in alternative uses (in domestic prices), and to multiply this by the CCF to convert it to border prices. The significance of the value reached is this: the lower the AWR set on unskilled labour, the greater the extent to which the appraisal will be geared to increasing unskilled employment.

The practical challenge will be to set a realistic value on the marginal product. Is the relevant MPL the marginal product in traditional agriculture, or the marginal product in the urban informal sector? Insofar as an additional job in the urban formal sector draws one or more workers from the villages, should the cost of the additional urban infrastructure needed be added in? The Lewis model – devised at a time when, and in countries for which, the source of additional formal-sector workers was likely to be traditional household agriculture, in which the product of the marginal worker might be very low – would suggest an AWR well below the formal-sector wage. However, the Harris-Todaro model, apparently fitting evidence in East Africa in the 1960s and 1970s and, like the Lewis model, recognizing that the urban formal-sector wage was above the forgone marginal product per worker, nevertheless supposed that each extra worker employed at

these wages would draw more than one worker on average from the rural scene, so that the opportunity cost might well approach the actual wage-rate.

However, field evidence from Delhi assembled and analysed by Biswajit Banerjee (1983) indicated that a large proportion of labour migrants to the city came either with work pre-arranged or with fairly confident prospects of work through relatives or acquaintances, in either the informal or the formal sector. This, in contrast to the Harris–Todaro probabilistic model of rural–urban migration, suggests that on average each extra urban job will not attract more than one labour migrant and may even attract less because it may also draw workers from the urban unemployed. (The research also indicates that informal-sector – waged or non-waged – work is not necessarily a second-best for workers to jobs in the formal sector.) It seems that each country or region needs to determine the MPL to be used according to its own conditions at the time.

It would be ideal – but is only to a limited degree possible – to make an assessment, for each of the various types and locations of projects in a country, as to the sources from which their marginal labour is likely to be drawn. The efficiency wage-rate may be taken as the weighted average of marginal products of labour in several alternative activities, with appropriate accounting-price ratios attached to each according to the extent that its cash value represents international or domestic market prices.

Powers (ibid., p. 34) gives the expression for the efficiency wage as

$\Sigma\, a_i\, m_i\, \underline{APR}_i$

where

- a_i is the weighting factor for the importance of activity i as a labour source
- m_i is the marginal product forgone in activity i
- $\underline{APR}_i$ is the accounting-price-ratio for the price of the product of i.

He adds also a further term, s.CCF, to take account of any disutility to the worker of the extra labour or change of employment entailed, s being the measure of the disutility in market prices.

In social appraisal

The social appraisal adds an additional term to take account of

- (a) the effect on consumption of the additional payment made to the workers employed in the project (or in projects of the kind in general) over what they would otherwise have earned, and
- (b) the social cost per unit attributed to that additional consumption because of its implicit diversion of resources from ‘uncommitted social income’.

The term is C.(CCF - D)

where C is the additional consumption in market prices, and D is the distribution weighting for the consumption level of the benefiting consumers as defined above.

We can see that formula in this way: the whole of the additional consumption (in border prices), the (C.CCF) term, is first treated as a cost; then that cost is reduced by the (C.D)

term, which expresses the positive value of the extra consumption. D as defined equals CCF at the critical consumption level, c*.

So at that critical consumption level the expression in brackets, and hence the whole term, becomes zero, which fits with the fact that, for consumers at that critical level, extra consumption is treated as being of as high a priority as extra expenditure out of uncommitted social income.

If a term is included for the disutility of the additional labour, it will now be expressed as sD, rather than s(CCF). This is because any disutility of extra labour is taken to involve a greater social cost the poorer the worker.

The full expression for the social-accounting unskilled-wage-rate is then

$$AWR^u = \sum_i a_i m_i APR_i + \Delta c \,.\, (CCF - D) + sD \qquad (20.5)$$

where Δc is the increase in consumption per worker.

The second and third terms in the shadow unskilled wage expression have no analogues for skilled labour, and the social wage for skilled labour is thus the same as the efficiency wage.

Appendix 3, available as a short PDF document, takes you through a worked numerical example of fixing a shadow wage for unskilled labour.

Totalling the accounting costs of inputs and values of outputs

The formula given at the end of the previous page for the social-accounting price of unskilled labour can be taken as giving the general form for the social-accounting price of any factor input. It is the forgone output per unit at efficiency prices plus the net 'cost' of any extra consumption, distribution-weighted. We might add a further term if there seemed to be extra disutility involved for the providers of the factor input. For very large projects we might need to add terms reflecting costs on a macro scale, such as the cost of extra urban infrastructure if large numbers of people were likely to be drawn from countryside to cities.

The social-accounting value of any element of output is similarly its value at efficiency prices minus the 'cost' of the extra consumption, distribution-weighted.

Adding up the figures

Where inputs and outputs have financial prices attached, they have to be revalued to express them in either efficiency- or social-accounting prices, whichever form of appraisal is involved.

For the costs, the aim would be to divide these financial costs among a limited number of categories, to each of which an appropriate APR could be applied in order to convert it to an economic-cost equivalent. So the financial costs could be divided among

1. actual imports and other tradables (whose border prices would be given an APR of 1.0);
2. various domestic factors of production (such as unskilled, skilled, and expatriate labour, use of land, and entrepreneurial services, each of which would have its own APR); and
3. 'non-costs' – taxes together with pure profit and interest elements in costs – (all of which would be given an APR of zero).

Beside direct use of the factors and of tradables and payment of taxes, there would be intermediate inputs not directly tradable, which would have, if possible, to be reduced to their costs in the basic elements: tradables, domestic factors, and taxes.

To facilitate this operation, it would be highly desirable that the national planning body should have derived, by 'inverting' a national input–output matrix, the relevant proportions of these basic elements in the market values of the products of each industrial sector. (An input–output matrix shows in what proportions the value of the output of each each industry or industrial sector embodies

1. the costs of the products of each other industry or sector;
2. costs of the direct use of primary factors of production;
3. costs of imports; and
4. other 'costs' such as taxes and profits.

An arithmetical procedure known as inversion enables the market value of the output of each sector to be divided proportionately according to its direct and indirect dependence on imports; on the various primary factors; and on the 'other' elements regarded for the present purpose as 'non-costs'.) So, by dividing the intermediate-input costs for the project into sectors, the project appraisers should be able to allocate the costs in each sector approximately among a few basic elements. This would allow the total financial costs of the project to be divided among (direct and indirect) costs of tradables; of each of the handful of factors (possibly just unskilled, skilled, and expatriate labour); and of taxes, profits, and interest. Each total would then be multiplied by an appropriate conversion factor to convert it to border prices (by 1.0 for the tradables, 0.0 for the taxes and other 'non-costs', and perhaps the CCF for skilled wages, and so on). The numbers used for an efficiency appraisal would differ from those used for a social appraisal.

Alternatively the national planners might themselves use the input–output table to calculate APRs for each sector, so achieving the same effect but leaving one less step to be done by the appraisers in the particular case. [See, for the use of input-output tables in this way, Powers, 1981, pp. 61–121, where he also discusses abbreviated 'semi-input-output tables' specifically designed for deriving APRs nationally or for particular sectors. Examples are in later chapters of the same book and in Little and Scott, 1976, pp. 15–87 (chapters by Anne M. Forbes and Gordon Hughes).]

Any increase in saleable output as a result of the project could have its financial value similarly allocated, and the components multiplied by the appropriate ratios, to convert it to the equivalent of border prices of tradables. The difficult part – and inevitably the main analytical preoccupation of traditional CBA – is valuing the non-marketable or non-marketed benefits. This is a huge question that we shall not attempt to broach here, but

which was touched on briefly in Topic 4. However, two points need to be made about the use of the LMST method in these estimates. One is that valuations made in market-price equivalents would have to be converted by the CCF to border prices. The other is that, with some projects in developing countries, the distribution of benefits may be central to their purposes. An example is the appraisal of a low-income housing project in Kenya (Hughes, in Little and Scott, 1976, pp. 43–87). An efficiency appraisal could miss the main point. The example also shows the complexity of assessing distribution in a case such as this and the ingenuity required for dealing with it.

BOX 3 SHOULD THE PROJECT ANALYSIS BE EXTENDED TO 'SOCIAL' AS WELL AS 'EFFICIENCY' APPRAISAL? (FROM POWERS' SUMMARY OF HIS 'OVERVIEW OF THE LMST SYSTEM')

'The focus of this chapter has been on how a national study should estimate the accounting prices for three broad economic categories: goods and services, labor, and capital. The national accounting prices (or parameters) are useful for general economic policy analysis, but their most immediate use is in project appraisal to value inputs consumed and outputs produced by public investment. It was argued that correct valuation of project benefits and costs in the public sector leads to improved resource allocation and contributes to higher economic growth.

'Concern about distributional equity for project beneficiaries may also be introduced into the accounting prices, although at an extra cost in terms of information, time, and manpower. Only the briefest outline was given on how the efficiency and distributional aspects are brought together to form social accounting prices. The emphasis placed on efficiency accounting prices is for practical rather than ideological reasons; few national planning offices in developing countries manage to estimate and use efficiency accounting prices correctly, yet it is important to master this phase before moving to the more elaborate social accounting prices. The two contexts of investment appraisal should not be viewed as wholly separate, however. Both efficiency and social accounting prices share a common theoretical framework, and much of the data and experience obtained in the efficiency context can be put to good use in the latter as well.'

Source: Terry A. Powers (ed.) (1981), Estimating Accounting Prices for Project Appraisal, Inter-American Development Bank, Washington, DC, p. 59.

Appendix 4, available as a short PDF document, takes you through a hypothetical worked numerical example of the processes involved in an LMST appraisal.

Use of project appraisal in policy

We make several points

1. Though the aim in devising the methods and parameters of project appraisal is to signal by a positive NPV that a project should be undertaken, and by a negative NPV that it should not, a government's new-project spending will not be determined to anything like that extent by project appraisal. At most we can hope that a systematic appraisal

will be of some help toward greater rationality and fairness. When it gives a clear negative answer, this may provide ammunition against a wasteful project of a pork-barrel kind or one that does disproportionate favours to some sector of the population: a project that may well have powerful interests behind it or be a pet scheme of some politician or influential person. A clear positive, on the other hand, will provide international project-lenders with a strong prima facie case for considering a project presented to them for funding.

2. It is quite likely that the allocation of funds among major spending heads such as transport and health will be made independently of project appraisals. So comparison among projects on the basis of appraisal may often have to be within these sectors rather than between them. The choice might be between different patterns of trunk roads or routes for oil pipelines, or between different strategies for dealing with AIDS or malaria. It might be a choice between the modest and the spectacular: between new main highways and rural feeder roads or a programme of road maintenance; between a new major hospital and rural clinics or a major additional training programme for ancillary medical staff. The more spectacular venture is likely to appeal to the politicians, with the risk that more modest but more valuable projects are overlooked. The appraisal might come down clearly on one side. This will be especially valuable when it is the side that has less political appeal. Though the projects for appraisal would naturally arise from the sectoral departments, which would need to inform any appraisal, it would probably be best for the appraisal to be done by a body independent of the unit that has put the project forward.
3. Because the parameters used in appraisal are inevitably controversial, it is useful if each result can come with a sensitivity analysis, allowing for variation not only of projections of observable outcomes (optimistic, middle, and pessimistic projections, say) but also of the key parameters such as the discount rate, the shadow price for unskilled labour, and any distribution-weighting system or discount for consumption. If all or almost all of the variants leave the verdict positive, or all or almost all leave it negative, the case, whether plus or minus, is very strong.
4. Nevertheless, there need at any one time to be standard parameters laid down that will be used for the central estimates across all appraisals in the country. These would include discount rate and shadow unskilled-wage-rate, and, where they are available, accounting price ratios for the various industrial sectors. They may well be changed over time.
5. Investment projects whose benefit depends on additional future recurrent spending, as on maintenance or staffing, need to have those recurrent costs, discounted of course for time, included in the appraisal.
6. Sometimes the financing method needs to be included in the appraisal. This will be so when the project comes with a particular financial package attached, as will be the case with a project-tied international concessional loan. The projected financial inflows and outflows in a case such as this should be added to the benefits and costs of the project for each period – at their full value if they are in foreign exchange and the appraisal is being conducted in border prices.
7. Yet also, as hinted above, the straight financial implications for future cash-flows of any international loan to the government need also to be considered in the light of other debt obligations – and independently of the project to be financed unless the two form an inseparable package with each a condition of the other. This is because projects, even if they are appraised as having clear net social benefits, will not necessarily generate negotiable foreign-exchange surpluses that can be used in the servicing of international loans.
8. More generally, it will be a consideration for public-financial management that projects that correctly show a positive economic NPV will not necessarily yield a surplus for the government finances over any period short enough to be of interest. Because there are almost always fiscal constraints, it will be tempting to finance ministers to choose projects that are expected to yield a financial return over those that are not – even if the latter show higher economic NPVs. There may well be difficult choices.

9. One of the aims of the new methods was to make policy-generated distortions of the price system more obvious and so encourage their removal. The outcome sought has to an extent been realized in the behaviour of governments in a number of countries, though it is not clear how critical the contribution of the new CBA has been.

Place of the methods in the changing policy context

The LM and UNIDO methods were devised at a time when it was still widely assumed that the choice of industries, and hence often of 'industrial projects', would be largely made by governments. Funding might be sought from the World Bank or the regional development banks or from overseas governments. Governments and foreign or multilateral funders needed to make judgements about the suitability of industrial projects. For privately owned industrial enterprises there were often very high rates of protection through tariffs or import quotas. So, two important policy questions were industrial-project selection and judgements on appropriate levels of protection. For both these purposes, economic/social methods of appraisal were needed. They provided a method for a rational critique of industrial and trade policy.

However – in part, perhaps, because of the promulgation of these methods, which helped to make some of the ideas of development economic operational – the policy context through the course of the 1970s and 1980s changed. High protection and direct industrial investment or industrial-project choice on the part of governments went increasingly out of fashion. The methods and their logic remained as a rampart against capricious project choice and undue trade restriction, but the actual choice of projects and industries has been increasingly left to private enterprises.

As a result the role of social project appraisal in developing countries has come closer to that typical in rich countries: deciding among potential infrastructural or environmental projects or social-welfare outlays. Policy-driven price distortions are generally less important than in the 1970s, though traditional agriculture and the urban informal sector are still prevalent enough, especially in the poorest countries, to justify special treatment of unskilled wages. And inequality retains its particular seriousness (in the absence of comprehensive social safety nets) in most low-income and low-middle-income countries, so as arguably to call for distribution weighting, which is probably not used much in appraisals conducted in rich countries.

Summary conclusions

- The methods used for economic, as distinct from purely financial, appraisal of public or publicly supported projects were extended around 1970 to take account of the particular conditions and aspirations of developing countries.
- The special features specifically addressed were the widespread 'distortion' by policy of market prices; labour-market conditions, involving apparently extensive unemployment and underemployment, arising from the structure of the economy; the aspiration for increasing the rate of economic growth; and the perceived need to use project-choice decisions to improve income distribution.
- It was found useful, when the methods came to be applied, to distinguish two levels of appraisal: efficiency appraisal, which dealt with only the first two of these four features; and social appraisal (in a special narrow sense of 'social'), which dealt with all four.
- The two teams of economists that pioneered the developments of the method worked on essentially the same theory and objectives but framed the procedures that they

recommended somewhat differently. The differences between them are not likely to have had much impact on the answers generated. The procedures devised by Little and Mirrlees and developed by Squire and van der Tak came to be standard, in part through their adoption by the World Bank. The World Bank's emphasis on the need for economic appraisal of projects to be funded has made it inevitable that many developing countries should attempt it.

- Both of the two procedural systems aimed to embody a coherent theory and an explicit welfare function in their development of standard cost–benefit methods.
- Both probably embodied the hope that making the policy-based distortions more obvious would lead to their progressive elimination: a process which, for that or other reasons, has to an extent occurred.
- A reasonable hope has been that project appraisal which specifically takes account of the conditions and aspirations of developing countries – reinforced by the influence of the international lenders – will help make public-investment decisions more rational: both more efficient and fairer.
- The types of project ('directly productive activities' – as distinct from infrastructure – undertaken by government agencies) for which the new twists to social appraisal were particularly designed have become much less prevalent in developing countries since the early 1970s – a change that the LMST and UNIDO manuals may have played some part in bringing about – but the existence of the systems embodied in those manuals provides some fortification against high protection and capricious project choice, and some of their features designed particularly for developing countries retain their relevance.

  The results of a social project-appraisal are unlikely to be the sole determinant of project choice. But quantification of the factors considered to be economically/socially important in the decision allows them to be balanced against each other and tends to weaken the case for particular choices that are based on caprice or favouritism. Quantifying special considerations operating, or held to operate, in developing countries is a check on their overuse as arguments for the defence of sectional interests.

Additional reading

- Meier, G.M. (1984, 1989) Leading Issues in Economic Development, 4th and 5th editions, Oxford University Press, New York and Oxford. The 4th edition, pp. 637–706, and the 5th edition, pp. 467–510, each gives a series of extracts (the two sets, of course, overlapping) on project appraisal. Either is well worth at least browsing for items of interest.
- Powers, T.A. (ed.) (1981) Estimating Accounting Prices for Project Appraisal, Inter-American Development Bank, Washington, DC. The first 60 pages of text in this book contain a clear and concise exposition (largely drawn upon here) by Powers of the logic of the LMST method. The book is published by the Inter-American Development Bank, which used to distribute copies free of charge. If it no longer does so, there should still be copies on the second-hand market. The rest of the book deals with actual appraisals conducted in the Americas.
- Sugden, R. and A.Williams (1978–83) The Principles of Practical Cost-Benefit Analysis, Oxford University Press, Oxford. This is a standard introduction to 'conventional' CBA with the focus principally on developed countries.
- Hanley, N. and C.L. Spash (1993) Cost-Benefit Analysis and the Environment, Edward Elgar, Aldershot, Hants. Environmental costs and benefits broadly considered raise the main evaluation problems in affluent countries, where the re-pricing that is the central subject-matter of the UNIDO and LMST studies is less important. But environmental costs and benefits of course have also to be valued in developing countries.

Papers/Books/Technical Information

UNIDO *Manuals* on preparing industrial feasibility studies and evaluating industrial projects are available (by subscription) on a CD-Rom. This contains six UNIDO publications:

1. Manual for the Preparation of Industrial Feasibility Studies
2. Manual for Small Industrial Business e s:Project Design and Appraisal
3. Guide to Practical Appraisal - Social Benefit-Cost Analysis in Developing Countries
4. Manual for the Evaluation of Industrial Projects
5. Practical Appraisal of Industrial Project Applications - Applications of Social Cost-Benefit Analysis in Pakistan
6. Guidelines for Project Evaluation

Also included is a trial version of the UNIDO software COMFAR. Details are available at: http://www.unido.org/index.php?id=o3698