

Labor-Surplus Project Appraisal Methods: Didactic and Operational Differences, and Value Judgements Between OECD and UNIDO**

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Introduction

Choosing the appropriate project appraisal method for a labor-surplus economy should in principle be an easy task, since among the plethora of methods that are now available only two fully account for the special problems arising out of labor market disequilibrium¹. They are: the procedure recommended by the Organization of Economic Cooperation and Development, written by Little and Mirrlees (1968, 1974) (hereafter OECD), and the one

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¹ In addition to the 'labor problem,' many of the well-known methods are considered inappropriate for other reasons as well. For example, general equilibrium measures such as the Rate of Return on Capital (RRC) and the Domestic resource Cost (see Bruno, 1967) can be used only in conjunction with economy-wide intertemporal optimizing models, which in general do not generate realistic shadow prices. Partial measures such as the Effective Rate of Protection (ERP) measure (see Balassa and Schydrowsky, 1968, 1972) deals mainly with trade distortions; the Harberger (1972) criterion is seriously limited in a labor-surplus economy due mainly to its assumption of saving adequacy or government's ability to legislate the optimum saving rate; both the UNIDO/IDCAS (1980) measure and the Effect Method (see Prou and Chervel, 1970) are deficient in allocative efficiency for failing to use a full set of 'second best' shadow prices. By the same token, variants of the OECD measure, such as Squire and van der Tak (1975) and of the UNIDO criterion, such as Hansen (1978), are admissible; while the excellent adaptation of the Harberger criterion by Roemer and Stern (1975) is not since it does not deal with the critical issue of saving inadequacy.

proposed by the United Nations Industrial Development Organization, written by Dasgupta, Marglin and Sen (1972) (hereafter UNIDO).

However, the process of selection, even when properly restricted to these two measures, remains difficult. Aside from various claims and counterclaims to superiority, the main difficulty seems to stem from what appears to be confusing if not contradictory conclusions reached by previous comparative analyses. For example, Dasgupta (1972), on the one hand, asserts that the two procedures make the same recommendations if the Office of Central Project Evaluator (OCPE) is powerful, and different ones otherwise. On the other, he gives two cases where the OECD measure would make the wrong recommendations, essentially for technical reasons. Similarly, Lal (1974), after a long demonstration whose purpose was to show that both procedures were theoretically identical (save for the difference in numéraire) went on nevertheless to pick OECD as the *the general* procedure.²

It is the contention of this paper that by putting undue emphasis on the power of OCPE and on technical details, both analyses left out the difference in value judgment which constitutes the main distinguishing characteristic of the two procedures, and thereby failed to address the question of appropriateness, which should be at the heart of the selection process. The paper is divided into three sections. As both methods appear intimidating to practitioners, the first section will attempt to reduce them to their basic expression so as to stress their common theoretical lineage, to enhance understanding and to guide the discussion. Section II will examine differences that are numéraire-dependent, and which should not matter in theory, although they may have a practical significance. Section III will focus on that I call, for lack of a better word, the 'paradigmatic' difference which should be, in my view, the main consideration in selecting the appropriate method for a

² It should also be pointed out that both methods have received praises and criticisms from participants in the symposium sponsored by the Oxford Institute of Economics and Statistics in 1972 and in the one organized jointly by the United Nations Industrial Development Organization and the Inter-American Development Bank in 1973. On the other hand, both are flawed, according to Helmers (1979), and OECD is deficient according to Sjaastad and Wisecarver (1977). But in these latter two cases, the criticisms seem to stem from misinterpretations of the basic arguments. For more on this, see Lal and Squire (1980), for example.

labor-surplus country's aims and policy.

I. The Rationale and Basic Formulations

Both the OECD and UNIDO methodologies are some sort of streamlined versions of Lewis' (1954, 1958) and Sen's (1968) labor-surplus models. It is quite appropriate therefore to start by recalling the basic principles on which the labor-surplus economy operates.

A. Preliminaries

Starting with Sen's two-sector model, the analysis focuses mainly on the modern sector (industry) which produces a homogeneous output, $Y (= f(K, L))$, under constant returns to scale by means of non depreciating homogeneous capital (K) and labor (L). Both agriculture and services are lumped together in the so-called 'backward sector', which is kept in the background. But the wage rate there, call it z , is by definition lower than the wage rate (w) in industry. It is usually assumed that the backward sector is the only source of industrial labor. That is, industry faces a perfectly elastic supply curve for labor, which presupposes that the terms of trade between the two sectors are fixed by international trade or by some other mechanism. Since the industrial output (Y) is homogeneous, it can be divided between consumption ($C > 0$) and capital formation ($I > 0$). Also, in its most pristine form, the labor-surplus model assumes that workers consume all their wage income, and capitalists invest all their profits income. Then by virtue of the constant returns to scale assumption, all flows can be expressed in terms of the labor-capital ratio, $\ell (= L/K)$. That is:

$$(1) \quad Y = f(\ell) K$$

$$(2) \quad C = (w - z) \ell K > 0$$

$$(3) \quad I = \frac{dK}{dt} = [f(\ell) - w\ell] K > 0;$$

eq. (1) represents output; (2) represents net consumption, after deducting the consumption loss to the backward sector due to the transfer of a worker to the modern sector; and (3) is the capital accumulation equation.

The basic problem in the labor-surplus economy is to maximize employment and consumption in the modern sector. But both happen to conflict with investment and growth beyond a certain level of employment as shown in Fig. 1-a. A utility maximizing government would never choose employment levels below or at l_1 nor at or beyond l_3 , for the following reasons. Below l_1 , both consumption and investment increase concomitantly with employment; hence there is nothing optimal about being in that range. The point l_1 (or the Galenson-Leibenstein (1955) point), where investment reaches its maximum, as indicated by differentiating (3) with respect to l (i.e. $f'(l) = w$), would never be chosen either since it would imply that consumption is valueless in the eyes of the government; clearly if that was the case, the basic problem itself would cease to exist. The range extending from l_3 and beyond is equally non optimal. At l_3 , investable surplus is zero, and being there would imply an equal social valuation for consumption and investment, as recommended by the social marginal productivity theorists (see Khan, 1951; Chenery, 1953); clearly this is untenable for it would imply that the saving rate is optimal. Finally, employment beyond l_3 would even be worse, for it would imply consuming the installed capital stock.

The socially feasible range of employment is between l_1 and l_3 , but to be there the government must influence the choice of production technique with employment subsidies so as to reduce the effective wage rate w . Because if the perceived rate is lower than w , capitalists would be encouraged to increase employment beyond l_1 , possibly until labor's marginal product is driven down to the level of wage (z) prevailing in the backward sector; foreign aid or a lump-sum tax on the backward sector are the possible sources of the subsidy. The important question here is where exactly will employment end up between l_1 and l_3 ? The answer, of course, depends on the relative social valuation placed on consumption and investment in the modern sector. This is, I believe, a fair summary of the main preoccupation of the government in a labor-surplus economy.

B. The OECD Methodology in a Nutshell

The OECD framework uses free foreign exchange in the hands of the government as its unit of account. It can then be represented by Fig. 1 (a, b, c, d) if all variables are measured in foreign ex-

change. The output curve (Fig. 1-a) is drawn so that its slope at ℓ_3 (full-employment) is just equal to the slope of oq , given by the constant marginal product of labor in the backward sector (z), introduced in (2) above. As shown, at ℓ_2 , workers' consumption exhausts total output, but production can still be increased to its potential maximum at ℓ_3 if consumption is subsidized by taxes raised in the backward sector.

Formally, the problem faced by planners in this economy is to maximize welfare (W) generated by net consumption, subject to the employment restrictions and capital accumulation. Using (2) and (3), we have:

$$(4) \quad \text{Max. } W = \int_0^T U[(w - z)\ell K] dt,$$

subject to:

$$(5) \quad \ell_1 < \ell < \ell_3, \text{ and}$$

$$(6) \quad \frac{dK}{dt} = [f(\ell) - w\ell] K.$$

The Hamiltonian of the problem is:

$$(7) \quad H = U((w-z)\ell K) + \Pi(f(\ell) - w\ell)K,$$

where Π is the social valuation placed on additional capital formation, and U is the utility function, conveniently described by

$$U(C) = \begin{cases} \frac{b^\eta C^{1-\eta}}{1-\eta} & \text{for } \eta \neq 1 \\ \log(C) & \text{for } \eta = 1; \end{cases}$$

the constant nonnegative quantity (η), the elasticity of the marginal utility (U_c) with respect to consumption, is a characterization of the optimal growth path (about which I will say more later on).

From the static optimality conditions:

$$(8) \quad \frac{\partial H}{\partial \ell} = U_c (w-z) + \Pi [f'(\ell) - w] K = 0$$

$$(9) \quad \frac{\partial H}{\partial K} = \frac{\partial \Pi}{\partial t} = U_c (w - z)\ell + \Pi [f(\ell) - w\ell] = 0$$

From (8), $U_c(w-z) = \Pi(w-f'(\ell))$; substituting this expression in (9), we have:

$$(10) \quad -\frac{\partial \Pi}{\partial t} = \Pi[w - f'(\ell)] \ell + \Pi[f(\ell) - w\ell] = \Pi[f(\ell) - f'(\ell)] \\ = \Pi\rho,$$

where $\rho = \partial Y/\partial K$

Eq. (10) says that the change in asset price over time, in an optimal situation, is equal to the marginal productivity of capital. If, for ignorance, ρ is assumed constant over time, then

$$(11) \quad \Pi(t) = \Pi_0 \exp(-\rho t).$$

Turning now to the rate at which marginal utility of consumption changes over time, we first apply (as per custom) a pure time discount factor λ to U_c to account for the entropy of the planning process. Then it can be shown that the rate of decrease of U_c over time is the consumption rate of interest in the OECD terminology or simply the social rate of discount (i_c):

$$(12) \quad i_c(t) = -\frac{d[U_c(t)]e^{-\lambda t}}{dt[U_c(0)]} = -\left(\eta \cdot \frac{dC}{dtC} + \lambda\right);$$

suppressing $e^{-\lambda t}$ wherever possible for simplicity, and assuming that i_c stays constant over time, a convenient assumption to cover planners' ignorance about the future path of aggregate consumption, then:

$$(13) \quad U_c(t) = U_c(0) \exp(-it).$$

From (8), it was shown that the shadow price of investment $P^*(t)$ is the ratio of $\Pi(t)$ over $U_c(t)$, and that ratio was equal to the net consumption ($w-z$) divided by the decrease in investable surplus ($w-f'(\ell)$). Therefore, the social value of investment or simply the shadow price of investment $P^*(t)$ goes from an infinite value at ℓ_1 to unity at ℓ_3 (Fig. 1-d). If we now combine (11) and (13), we may write the value of $P^*(t)$ at any time t :

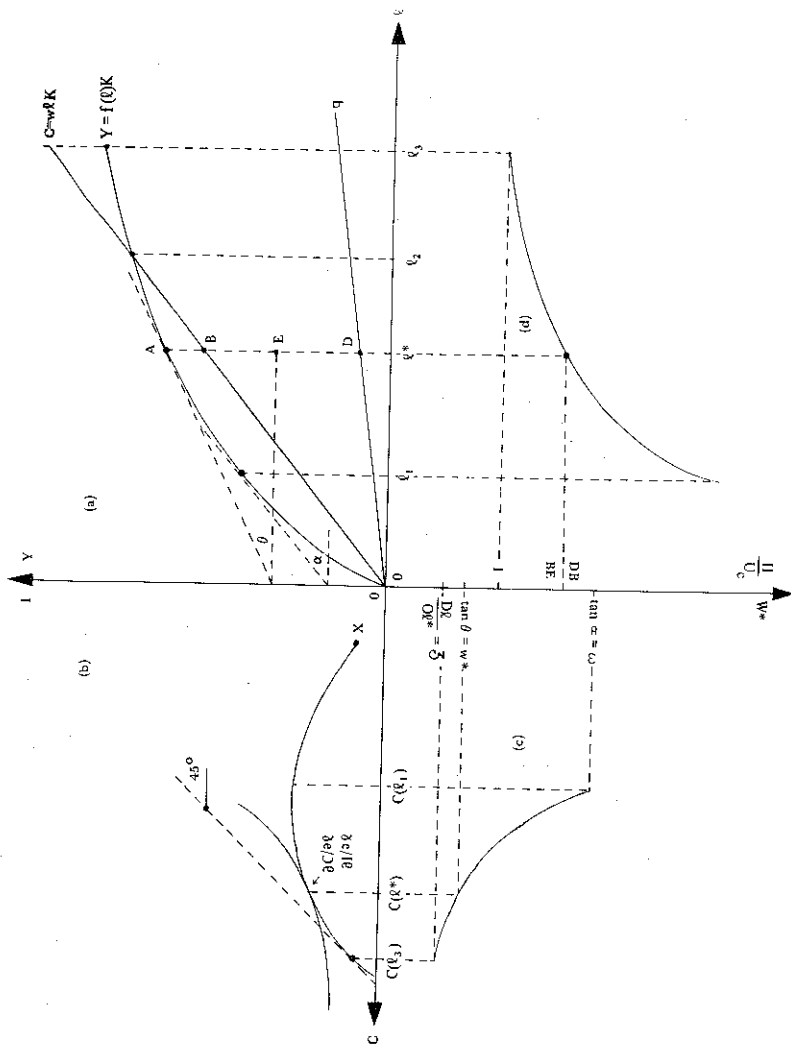
$$(14) \quad P^*(t) = \frac{\Pi(t)}{U_c(t)} = \Pi_0 \exp[-\beta t],$$

where $U_c(0) = 1$

$$\beta = (\rho - i)$$

Fig. 1

DIAGRAMMATIC REPRESENTATION OF THE
OECD METHODOLOGY



With these basic definitions in mind, one may now ask: what is the purpose of a given project, described by the expenditure of a capital sum K_0 in year zero? The answer is essentially to increase the labor-capital ratio by $d\ell$ in order to bring about an increase in output, $df(\ell) = dy$. But from (8), it can be seen that the project will increase the utility benefit of workers by $U_c(w-z)d\ell$, and investable surplus (valued at asset price) by $\Pi(dy-w d\ell)$. If the interval $(0, T)$ represents the beginning and end of the project, its social productivity (B) is:

$$(15) \int_0^T B(t) dt = \int_0^T \left\{ U_c(t) (w-z) d\ell(t) + \Pi(t) [dy(t) - w d\ell(t)] \right\} dt - \Pi_0 K_0 \geq 0.$$

Factoring out $U_c(t)$ and $\Pi(t)/U_c(t)$ from the bracketed expression and rearranging give:

$$\int_0^T \frac{\Pi(t)}{U_c(t)} [dy(t) - w d\ell(t) + \frac{(w-z) d\ell(t)}{\frac{\Pi(t)}{U_c(t)}}] U_c(t) dt - \frac{\Pi_0 K_0}{\frac{U_c(0)}{U_c(t)}} \geq 0$$

If now this expression is multiplied and divided by $\Pi(t)$, nothing is changed; but upon division by Π_0 , the unit of account changes from consumption to investment. If we do that and then use (14) and (11), the net present value of the project can be written as:

$$(16) NPV_I \int_0^T \frac{\Pi(t)}{U_c(t)} \cdot \frac{1}{\Pi(t)} \left\{ dy(t) - \left[\frac{z}{P^*(t)} + \frac{(1-1)}{P^*(t)} w \right] d\ell(t) \right\} \\ \frac{U_c(t) \Pi(t)}{\Pi_0} dt - K_0 = \int_0^T \left\{ dy(t) - \left[\frac{z}{P^*(t)} + \frac{(1-1)}{P^*(t)} w \right] d\ell(t) \right\} \exp[-\rho t] dt - K_0 \geq 0.$$

Eq. (16) is essentially the OECD criterion. *Grosso modo*, it has the following features: net output (dy) receives a shadow valuation of unity (subject to the fulfilment of certain conditions as regards trade policy, discussed in Part III). The shadow price of invest-

ment (P^*) exceeds unity between ℓ_1 and ℓ_3 . The Shadow wage rate (w^*) varies from the market wage rate (w) at ℓ_1 to the wage rate prevailing in the backward sector (z) (see fig. 1-c). And finally, current social value (the braced expression) is discounted at the marginal product of capital, since the numéraire is free foreign exchange or simply investment. These are its main theoretical characteristics, however; a fuller discussion of how it should be used in practice is postponed until Part II.

C. *The UNIDO Methodology in a Nutshell.*

As indicated, the UNIDO measure is also a streamlined version of the labor surplus model, but differently from the OECD criterion, it: a) uses consumption as its numéraire, and b) assumes more realistically that capitalists save only a fraction (s) of their profit income. Therefore, consumption and investment in the modern sector are:

$$(17) C = (1-s) [f(\ell) - w\ell] K + (w-z) \ell K > 0$$

$$(18) I = s [f(\ell) - w\ell] K > 0.$$

The problem and the constraints being the same, one can from the above heuristics proceed to write down the Hamiltonian as:

$$(19) H = U \left\{ (1-s) [f(\ell) - w\ell] K + (w-z) \ell K \right\} \\ + \Pi s [f(\ell) - w\ell] K.$$

The static optimality conditions, describing a particular 'Pontryagin path' of employment and savings³: $\partial H / \partial \ell = 0$, $\partial H / \partial s = 0$, show that, as before, the price of capital goes from infinity at ℓ_1 to unity at ℓ_3 :

$$(20) 1 < P_K^* = \frac{\partial C / \partial \ell}{\partial I / \partial \ell} < \frac{(1-s)F'(\ell) + sw - z}{s[w - f'(\ell)]}$$

Since profits are split between consumption and investment in the proportions $(1-s)$: s , the shadow price of a unit of profits is a

³ The 'Pontryagin path' that satisfies the optimality, intertemporal and transversality conditions maximizes (4) if the utility function has the assumed shape. For a proof of these assertions, see Marglin (1976, pp. 110-15).

weighted average of the prices of consumption (unity) and investment (P^*_K). The shadow wage rate (w^*) is expressed in terms of consumption, and so on. In fact, the whole system can be represented by Fig. 1, but the unit of measurement must be changed from free foreign exchange to aggregate-consumption.

The intertemporal commitment of a capital sum K_0 in year zero will yield social benefit, $B(t)$, the equivalent of eq. (15):

$$(21) \int_0^T [U_c(t) \{ (1-s) [dy(t) - w d\ell(t)] + (w-z) d\ell(t) \} + \Pi(t)s \{ dy(t) - w d\ell(t) \}] dt - \Pi_0 K_0 \geq 0;$$

factoring $U_c(t)$ and collecting terms give:

$$(22) \text{NPV}_c = \int_0^T \left\{ \left((1-s) + \frac{\Pi(t)}{U_c(t)} s \right) dy(t) - \left[\left((1-s) + \frac{\Pi(t)}{U_c(t)} s \right) w d\ell(t) - (w-z)d\ell(t) \right] \right\} U_c(t) dt - \frac{\Pi_0 K_0}{U_c(0)} \geq 0.$$

As indicated, the accounting price of profits, denoted P^*_y is a weighted average of the shadow price of consumption and the shadow price of capital, the weights being the marginal propensities to consume $(1-s)$ and to save (s) , respectively. Thus (22) may be written as:

$$(23) \text{NPV}_c = \int_0^T \left\{ P^*_y(t) dy(t) - [P^*_y - 1] w + z \right\} d\ell(t) \Bigg\} U_c(t) dt - \frac{\Pi_0 K_0}{U_c(0)} \geq 0$$

Also, the shadow wage rate (w^*) in (23) is the sum of the direct opportunity cost of withdrawing a worker from the 'backward sector' (z) and the indirect cost of employment in the modern sector

$(P_y^* - 1)w$; hence the expression: $z + (P_y^* - 1)w = P_y^* \cdot f(l)^4$. Eq. (23) can be rewritten, after using (13), as:

$$(24) \quad NPV_c = \int_0^T P_y^*(t) [dy(t) - f'(l) \cdot dl(t)] \\ U_c(0) \exp[-it] dt - \frac{\Pi_o K_o}{U_c(0)} \geq 0$$

Eq. (24) is essentially the criterion recommended by UNIDO for project evaluation. In this case, current social value (the bracketed expression) receives a shadow valuation greater than unity (P_y^*). Aggregate-consumption being the numéraire, the appropriate discount rate of current social value is the consumption rate of interest (i_c), assumed constant over time. The shadow wage rate exceeds the market rate (w) at first and then falls to the level of the wage rate in the backward sector (z) as $P_y^*(t)$ falls to unity at full-employment.

II. The implications of the Numeraire on Social Valuation

Fig. 1 goes a long way in depicting the similarities between the two procedures. Both account for the inadequacy of savings and investment in low capital-intensity countries, and both acknowledge the incapacity of the government to increase the saving rate via suitable fiscal and monetary policy, due mainly to the prevailing institutional constraints; therefore a shadow price of in-

4 The opportunity cost (z) is positive when the employment constraint is binding, and it is the sum of changes in C and I resulting from the transfer of a worker either from the backward sector or from elsewhere in the economy. That is:

$$i) \quad \frac{\partial (C/K)}{\partial l} + \frac{\Pi}{U_c} \frac{\partial (I/K)}{\partial l}$$

Using (17) and (18), we have:

$$ii) \quad z = (1-s) [f'(l) - w] + w + \frac{\Pi s}{U_c} [f'(l) - w]; \text{ Since } P_y^* = (1-s) + \frac{\Pi s}{U_c}$$

the shadow wage rate is:

$$iii) \quad w^* = z + (P_y^* - 1) w = P_y^* \cdot f'(l).$$

vestment greater than unity offers the government an additional control measure. Both recognize that domestic market prices for intermediate inputs and primary factors do not indicate social costs, and both specially account for the disequilibrium of the labor market. Finally, both arrive at the decision rule by reducing current social value to an index of net present value (NPV), but discounting takes place at the rate consistent with their respective numéraire.

From these heuristics, one may conclude, as in the two previously mentioned analyses, that $P^*_y \cdot NPV_{OECD} = NPV_{UNIDO}$. However, I will show in Section III that matters are not so simple. But first, let us take a quick look at the theoretical implications of the numéraire for the task of social valuation. Admittedly, there is nothing novel in what follows, as many of these points have been discussed in the literature (see for example: Joshi (1972), Lal (1972), Taylor (1979)). But restating the most basic ones here should shed light on some of the claims to superiority which have clouded further the selection process.

A. Social Valuation of Value Added

According to (16), every flow variable must be converted into foreign exchange, free foreign exchange in the hands of the government being the numéraire in the OECD system. By supposing that the country where the project is located is a price taker in international trade, the marginal import cost and the marginal export revenue become the appropriate measure of social value for importables and exportables, respectively. In other words, goods whose consumption and production points are independent of each other, or goods whose border prices cannot change in response to project demand and supply are termed 'fully-traded' goods; goods whose prices fall between their c.i.f. and f.o.b. values are termed 'non-traded'. The social valuation of 'fully-traded' and 'non-traded' goods consists of valuating the former at their observed 'border' prices (i.e. domestic prices net of tariffs and subsidies) and marking down the prices of the latter and primary factors by multiplying them by their specific 'conversion factors.'

The downward revision of the price of non-traded goods (or the valuation of fully-traded at world prices) leads to the free trade exchange rate (r^*_f), or the so-called Bacha-Taylor (1971) rate, in

contrast to the current exchange rate (r_f). In the absence of the specific conversion factor for a particular non-traded good, a 'standard conversion factor', scf, may be used as a shortcut; the scf is a weighted average of specific conversion factors or the reciprocal of the opportunity cost of foreign exchange.

The UNIDO procedure, in contrast, values consumers and producers goods by the principle of 'willingness to pay', with the proper adjustments for non-competitive cases. If outputs and inputs substitute for imports or increase exports, they are valued by their impact on foreign exchange availability. The foreign exchange rate used in assessing such an impact is not the free trade exchange rate, but a simple welfare measure, consistent with the principle of 'willingness to pay', hence consistent with existing trade distortions.

As the procedure of valuing social added value is of paramount importance for the selection procedure, it requires a more elaborate discussion, which is postponed until the next section. The remaining part of this section will briefly examine minor technical divergences and common limitations.

B. The Shadow Price of Investment

The shadow price of investment (P^*) is really identical in both procedures as indicated by (14), although it can be calculated in a number of different ways consistent with data availability. The important thing to notice is that (P^*) varies over time. To estimate it from (14), one would have to assume that ρ and i_c remain constant until a time T^* , when the gap between the two will be closed, presumably at end of labor-surplus. With two end conditions: $P^*(0) = \Pi_0$ at $t = 0$, and $P^*(T^*) = 1$ at $t = T^*$, β can be estimated and one can find the value of P^* at any time t . But the problem here is that it is rather unrealistic to assume that ρ and i_c suddenly become equal at T^* and not at T^*-1 or T^*-2 , in addition to the difficulty of estimating T^* itself.

The authors of the OECD criterion propose another version (1974, pp. 363-65) which combines the surplus lost by removing a worker from the backward sector, ($\Pi[w-f'(0)]$), the utility gain in industry ($U_c(w-z)$), and the utility gain in the backward sector ($U_c(\bar{z}-x)$) to the extent that the average income of the removed worker (\bar{z}) was above his marginal product (x). This approach is

equivalent to that which is implicit in (8) above, but does not do away with the data problem, in particular as regards the actual utility function. Still another approach would be to view the shadow price of investment as the present value, at the consumption rate of interest, of an infinite stream of aggregate-consumption generated by a dollar investment in year 0, plus the accumulated capital stock (which reduces to zero upon discounting). Thus in the OECD procedure:

$$(25) \quad P^*_{(0)} = \sum_{t=1}^{\infty} \frac{(w_t - z_t) \ell_t \cdot (1 + r_t)^{t-1}}{(1 + i_1) (\dots) (1 + i_t)}$$

(where r is the reinvestment rate),
and the shadow price of investment at time t is:

$$(26) \quad \frac{P^*(t)}{P^*(t+1)} = (1 + \rho_t) / (1 + i_t).$$

In the UNIDO approach, the shadow price of investment at any time τ is:

$$(27) \quad P^*_{(\tau)} = \sum_{t=\tau+1}^{T^*} \frac{(1-s_t)\rho_t \cdot \prod_{j=\tau+1}^{t-1} (1 + s_j \rho_j)}{(1+i_{\tau+1}) (\dots) (1+i_{t-\tau})} + \frac{T^*}{\prod_{j=\tau+1}^{T^*}} \frac{(1 + s_t \rho_t)}{(1+i_{\tau+1}) (\dots) (1+i_{t-\tau})} P^*(T^*).$$

As discussed above, the supposition that $\rho=i$ at some time T^* in the future makes $P^*(T^*)=1$; but year to year estimate of i , ρ , and s until T^* , which may well be over 100 years, remains an impossible task. The best that can be one is to assume that $T^* \rightarrow \infty$ and constant values for the other parameters. If this is done, (25) reduces to $(w-z)\ell/(i-r)$ and (27) reduces to $(1-s)\rho/(i-s\rho)$, but if $(1-s)\rho$ is equivalent to $(w-z)\ell$ and r is equivalent to $s\rho$, then the two approaches concur⁵.

5 Alternatively, all the values needed for the calculation of $P^*(0)$ might figure prominently in the plan document as suggested in the *Guidelines* (Chs. 15, 17). The instantaneous intertemporal consistency requirement (see note 3 above) allows one to write from

C. The Shadow Wage Rate

Conceptually, the shadow wage rate (w^*) is the same in both procedures, differing only according to the definition of the numéraire. Assuming that the shadow price of investment $P^*(0)$ remains constant over the planning period (see note (5) above), the net social benefit of employing an extra worker in the modern sector in the OECD framework is the sum of the change in investable surplus and the change in the worker's consumption, valued in terms of investment. In other words, the social cost of labor (w^*) is its direct opportunity cost (z) plus its indirect employment cost, consisting of its net increase in consumption ($w-z$), corrected for the portion of that increase which represents a benefit $(w-z)/P^*(0)$. That is:

$$(28) \quad f'(\ell) = w^* = z + (w-z) \left(1 - \frac{1}{P^*(0)}\right) = \frac{z}{P^*(0)} + w \left(1 - \frac{1}{P^*(0)}\right).$$

In terms of Fig. 1, in the static case, $w^* = \tan \theta$ at ℓ^* (Fig. 1-a), while its trajectory in the dynamic case is depicted by Fig. 1-c. Incidentally, Eq. (28) also shows that the assertions of Sjaastad and Wisecarver (1977, pp. 541-47) as regards w^* in the OECD procedure are wrong. Both z and w are estimated according to the procedure outlined for fully-traded and non-traded goods, i.e. by finding their consumption equivalents (in both sectors), valued in terms of foreign exchange.

By assuming that capitalists in the modern sector divide their

the Hamiltonian given in (19), and suppressing t to save on algebra:

$$i) \quad \frac{\partial H}{\partial K} = - \frac{d \Pi(t)}{dt} = U_c \left\{ (1-s) [f(\ell) - w\ell] + (w-z)\ell \right\} + \Pi_s [f(\ell) - w\ell] = 0$$

Assuming constant values throughout, dividing through by U_c , and integrating from 0 to infinity, (i) reduces to:

$$ii) \quad P^*(0) = \frac{\Pi(0)}{U_c(0)} = \left\{ (1-\bar{s}) [f(\ell) - w\ell] + (w-z)\ell \right\} \div \left\{ 1 - \bar{s} [f(\ell) - w\ell] \right\};$$

here $f(\ell)$ is the output-capital ratio (or an average of), ℓ is the labor-capital ratio (or an average of) of the sector (or sectors) from which the project is likely to divert capital formation at the margin, and \bar{s} is the average marginal propensity to save out of non wage income in the private and public sectors. Thus using data available from the national plan, a $P^*(0)$ can be calculated for each planning period.

surplus between consumption and investment in view of long-term utility maximization, the controlling force of the consumption-saving decision is capital. Thus surplus changes produce equal changes in current investment. Therefore, in the UNIDO procedure, the accounting price of profits or output (P^*_y) is the shadow price of investment or capital. As indicated previously, the shadow wage rate in the UNIDO measure, w^*_u , is $P^*(0)$ times the shadow wage rate in the OECD procedure (w^*). One may then write:

$$w^*_u = P^*(0) \cdot w^* = z + [P^*(0) - 1] w;$$

but $P^*(0)$ being a weighted average in the UNIDO procedure, and using the price of capital P^*_K , defined in (20), in the above formula, we have:

$$(29) \quad w^*_u = z + [(1-s) + sP^*_k - 1] w = z + (P^*_k - 1) sw.$$

Both (28) and (29) represent the sum of direct and indirect cost of employment. The didactic advantages of the OECD criterion here are: a) w^* is defined over the whole range of employment, while w^*_u is not defined as the Galenson-Leibenstein point (this advantage is only apparent, however, since the level of chosen employment in a labor-surplus economy should never be there in the first place); and b) analysts trained in the tradition of the marginal-productivity-doctrine might be more comfortable with a shadow wage rate which lies below the institutional wage rate (w)⁶.

D. The Discount Rate

As indicated, the intertemporal commitment of capital re-

6 It should also be pointed out that both measures treat the opportunity cost of labor in a somewhat cavalier fashion. The UNIDO criterion, for example, equates z with the wage rate of landless laborers, and ignores transfer costs and the obvious fact that public projects may draw workers from various regions with differing wage rates. Given positive infrastructural costs and differences in regional wage rate, a better short-cut for w^* would be:

$$w^*_u = \alpha + \sum h_i z_i + (P^*_K - 1)sw,$$

where h_i = proportion of workers withdrawn from region i , z_i = yearly average wage of landless workers in region i , α = yearly costs of urban services provided by the government to each transferred worker, such as health services, transportation subsidies, housing etc; $i = 1, 2, \dots, n$.

quires discounting in order to provide the index of net present value. The discount rates in the two procedures are in line with the definition of their numéraire. Both treat investment and consumption as separate goods. Therefore what is called the accounting rate of interest (ρ) in the OECD measure and the social rate of discount (i_c) in UNIDO are by definition the own rate of interest of investment and consumption, respectively. The difference between the two rates stems from the capital gain term, as shown by differentiating (14) logarithmically with respect to time:

$$-\frac{d P^*(t)}{dt P^*(t)} = \beta = \rho - i_c;$$

since the capital gain term is negative (P^* falls over time) i_c is strictly less than ρ .

An operational definition of i_c ⁷ was given in (12), but for ρ , things are a bit more complex. If the investment programme consists only of public projects, ρ is obtained by trial-and-error; the initial value picked is adjusted upward when the value of acceptable projects exceeds the governments' budget, or adjusted downward when the opposite occurs.

E. Income Distribution

The inclusion of income distribution considerations in both criteria is another characteristic that helps putting them on a different footing as compared with other CBA measures. As already indicated; in both, the problem of inter-generational equity is accounted for through the premium put on investment, and through the positive consumption rate of interest. Distribution among contemporaries, on the other hand, is handled through the shadow wage rate, through specific income weights to be attached to gains and losses of projects' participants, and through government pricing policies.

⁷ From (12), the growth of aggregate-consumption (dC/Cdt) should be available in the plan document; the old short-cut method, proposed by Fisher (1927), recently resuscitated by Fellner (1967), should yield labor-surplus values for η ranging from 2 to 3 (see Lal, 1972); typical values for λ used by planners vary from 2 to 5%. For a growth rate of consumption of, say, 3%, i_c should fall between 8% and 14%.

As regards distribution among contemporaries, there is some difference in emphasis, however. In the OECD world, small increases in consumption to many people seem to be preferred to large increases to a few. The consumption of the rich is treated as a cost; reliance on low wage rate in poor regions in order to attract projects seems to be given more credence than progressive taxation, and so on. Most of these are also discussed in UNIDO, but there seems to be an explicit need to go further, i.e. to weight the net effects of projects on major groups and on regions. Given governments' desire for greater equity, the main task of project analysts according to the UNIDO measure is the determination of numerical weights to be attached to income changes accruing to different income groups; a task which should not be too difficult provided that one bears in mind the normative judgment connected with this kind of exercise.

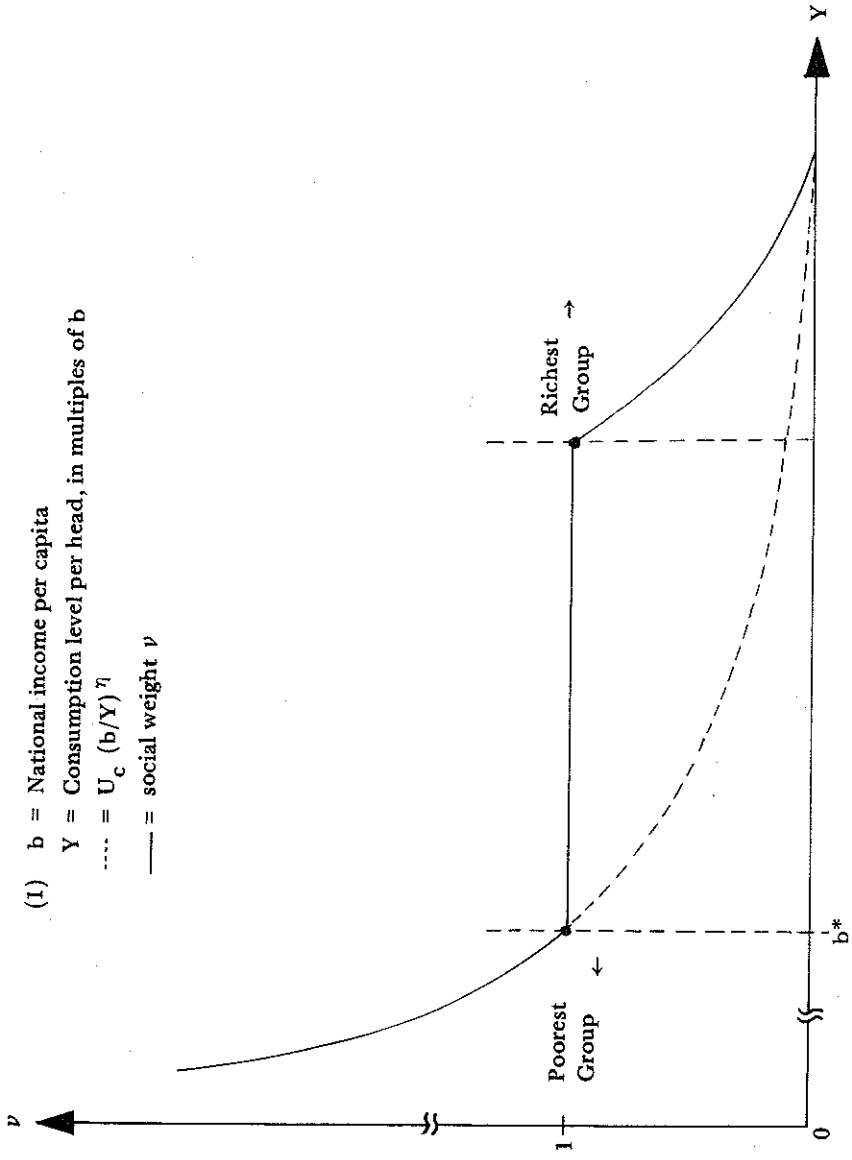
Despite the skepticism and fear susciated by the mixing of equity and efficiency aspects of projects' analysis (see Harberger, 1971; Bruce and Harris, 1982), no objective (yet operational) approach to the distributional question is available to my knowledge. Yet as late as the mid-1970s, the income share of the lowest 40% in all labor-surplus economies, taken as a group, was 12.5%; showing that the pattern of income distribution was unequal by any standard (see Ahluwalia, 1974, pp. 3-37, 209-35). Further, the evidence shows that income distribution is likely to worsen with growth, while governments seem more and more incapable of taxing according to the ability to pay in order to redistribute according to needs. But again, given the avowed concern of these same governments with mitigating inequalities, they should be receptive to the idea of quietly trading-off some potential consumption for some equity through project evaluation. Moreover, until this issue is finally resolved, there is a technical reason to do so when projects' participants do not constitute a homogeneous group, i.e. on the grounds that the marginal utility of income is not constant. One simple, straight forward and practical way of approaching this controversial issue is to focus on the poorest and richest groups, while using the concave utility function described previously as a guide (see Fig. 2).

F. Limitations

There is, of course, a host of other related aspects which cannot

Fig. 2

SOCIAL INCOME DISTRIBUTION WEIGHTS⁽¹⁾
ON THE GAIN AND LOSS OF A PERSON WITH
ANNUAL INCOME k TIMES THE AVERAGE b^*



be handled satisfactorily by either procedure. This stems both from the inadequacy of the economic tools of analysis and the complexity involved. For example, until now, matters such as environmental impacts, the appropriateness of technology, etc. remain largely outside the purview of economists. It is best they are considered in feasibility studies, where engineers and scientists do or should have an input.

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The problem of uncertainty is ever present; a project may look good at time $t=0$ and bad at, say, $t=6$, due to adverse fluctuations in key variables or simply due to unintended effects. The best evaluators can do is to rely on good judgments and good sensitivity analyses. Projects' effects may be anything but marginal, but most labor-surplus countries are not in a position to build economy-wide intertemporal optimizing models⁸ for obvious technical and financial constraints.

Last but not least, engineers and technocrats who often have a considerable input in feasibility studies are biased toward capital-intensity and large scale. The two labor-surplus procedures discussed in this paper may somewhat counter-balance capital intensity, but remain powerless before the problem of large scale; reliance must be put on experience and rules of thumb.

Admittedly, social cost-benefit analysis is not for purists, nor can it substitute for a general equilibrium analysis (related problems notwithstanding). It will always remain a partial exercise or

8 For some first hand accounts of the shortcomings of these models, see M. Bruno, "Planning Models, Shadow Prices and Project Evaluation," in C.R. Blitzer, et al, (eds.), *Economy-Wide Models and Development Planning*, World Bank Pub., Wash. D.C., 1975; J.H. Duloy, "Sectoral, Regional and Project Analysis," in H.B. Chenery, et al, (eds), *Redistribution With Growth*, Oxf. Univ. Press, London, 1974; L. Taylor, "Multi-sectoral Models in Development Planning: A Survey," Econ. Dev. Disc. Paper No 230, Center for International Affairs, Harvard Univ., Cambridge, MA, May 1973.

an approximation. As it must have been observed, most of the 'second-best' parameters (ρ , P^* and w^*) are related. Nothing short of solving the optimal time-path of the economy will yield reliable values, and this is not an easy task, given the state of the art. The main asset of CBA is its recognized usefulness in guiding policy makers in the pursuit of their economic development goals, hence it would be silly to believe that it can be divorced from normative judgments.

III. Estimation of Value Added and Policy Implication

The choice of numéraire affects the social valuation of value added, the definition as well as the empirical estimation of the parameters in the two systems. But previous comparative analyses have focused extensively on the didactic advantages connected with the parameters, while ignoring the policy implication of the valuation of value added,⁹ although these didactic advantages do not amount to much in practical terms. As was shown in Section II, with investment as the numéraire, accounting prices remain finite at all levels of employment, and the accounting rate of return is equal to the physical marginal product of capital regardless of the specification of the utility function. Not only this is not true when the numéraire is consumption, but consumption-dependent shadow prices are not independent of the question of the distribution of aggregate-consumption. But notice, to the extent that one avoids the limiting case of $\ell = \ell_1$ (Fig. 1), assumes more realistically that capitalists do not invest all their income, and introduce distributional weights, the advantages of the numéraire vanish¹⁰. This is not so for the policy implication of the valuation of value added to which I now turn.

A. The Rationale of OECD Valuation of Value Added

Succinctly put, the rationale of valuing value added at border

⁹ See, for example, Little (1977, pp. 58-65), Lal (1974, pp. 3-23), and to some extent Marglin (1976, pp. 70-78). But Dasgupta (1972, pp. 33-51) remains a notable exception, however.

¹⁰ Here, I am abstracting from refinements. I have not, for example, asked whether or not the consumption rate of interest is the true social rate of discount; nor have I elaborated on the difference between public and private savings. Discussion of these points would elicit a long discussion of optimality, which is not necessary in a comparative analysis.

price derives from the conclusions of the static two factor-two commodity model of an open economy, which supposes that there are no transport costs and that planners face only technological and trade constraints. Abstracting from refinements, it may be said that if a country is producing two goods M and X at relative domestic price higher than world relative price, there is a Pareto potential improvement to be had if planners shift the domestic production point so as to equate domestic price ratio with world price ratio, provided of course that the country is a price taker in international trade. Production efficiency depends on world prices, consumption depends on domestic preferences, but production efficiency does permit the expansion of the consumption possibility set. On the other hand, given the correspondence between good and factor prices, the government may have to intervene along the lines of the Stolper-Samuelson theorem to make the potential Pareto improvement actual. This means that all relative shadow prices will be uniquely determined by the international terms of trade. The knowledge of a single price (or the exchange rate) leads to the determination of the absolute level of all prices, although changes in the exchange rate would have no effect on relative prices.

The absence of transport costs makes the two goods fully-traded, and their relevant shadow prices are border prices regardless of domestic production possibilities and the pattern of domestic demand. This continues to be true for any number of intermediate and final goods in the static case, and continues to be true in the intertemporal case as long as goods and factors are properly dated.

What happens in the model, the minute one brings in transport costs? Well, the marginal values of some goods will fall between their world prices, i.e. they will lie between their c.i.f. and f.o.b. prices, they will then become non-traded goods. The presence of non-traded goods complicates the analysis. Their shadow prices are not border prices, but depend rather on production and preference parameters. This means that their shadow prices may be sensitive to their demand, and they may have to be determined simultaneously since the production of non-traded goods requires the use of other non-traded goods. Moreover, exchange rate manipulations will have real effects on relative domestic prices of fully-traded to non-traded goods. On the assumption that the

country is a price taker, the imposition of a tariff structure will do the same. Since the latter point plays a significant role in the OECD system, it would be useful to say more about it at this point.

Suppose that in the after trade situation, instead of taxing and subsidizing gains and losses to factors, the government responds to internal pressure by levying an average tariff of $t\%$ on importables and/or an negative tax of $t\%$ on exportables. According to the model, this action will result in a misallocation of resources. First, the relative domestic prices of fully-traded to non-traded goods change. As non-traded goods become relatively cheaper, productive resources will move to the production of fully-traded, thus creating an excess demand for non-traded and a surplus in the balance-of-payments. To restore internal and external balances, the relative prices of non-traded must rise for a given exchange rate, or the exchange rate must fall for a given relative prices of non-traded. The supposition in the OECD system is that the exchange rate is kept fixed, so the adjustment takes the form of a rise in the relative prices of non-traded by the average tariff-cum-subsidy rate of $t\%$.

Project evaluation in this situation is a simulation of the undistorted situation. Fully-traded goods are valued at border prices (i.e. domestic price net of tariffs and subsidies) and the shadow prices of non-traded goods are obtained through their specific conversion factors. The problem here is the need for specific conversion factors for each non-traded good and for primary factors. Recognizing the difficulty herein, the measure recommends instead the decomposition of non-tradables into their constituent inputs, which should fall into three categories: fully-traded, labor, and a handfull of irreducible non-tradables. Fully-traded inputs are again valued at border prices, labor's marginal product is converted to consumption equivalents, so that it can be valued in foreign exchange, and non tradables are valued at their marginal costs of production (assuming no excess capacity). As regards the valuation of non-tradables, if production information is hard to come by, as a short-cut, the standard conversion factor may be used to get their shadow price. Ultimately, everything is converted into uncommitted foreign exchange in the hands of the government (see Little and Mirrlees, 1974, ch. 5).

B. UNIDO's Social Valuation

As alluded to in Section II, the UNIDO measure distinguishes between supply augmenting and alternative supply substituting net outputs, between final consumer goods, producer goods, and foreign exchange. It does the same for inputs. And in each case, it provides a step-by-step estimation procedure based on the principle of willingness to pay. Since it does so in considerable details, including the rules of adjustment for non-competitive situations, there is no need repeating it here. The reader can check this out in the *Guidelines*. The only thing that warrants a brief comment here is the valuation of foreign exchange, which has been called in question in some quarters.

The shadow rate of foreign exchange in UNIDO is a utility-based parameter, which like the free trade rate, is a weighted average of import tariffs (less subsidies) added to the official rate of exchange.¹¹ But the aim of UNIDO's exchange rate is to calculate the utility value of the availability of an extra unit of foreign exchange, so as to get a measure of welfare.¹² Its calculation does not depart from the principle of willingness to pay; it is valid for fixed or free-floating exchange rate systems; it is consistent with any kind

11 To demonstrate this, assume, following Taylor (1979) that there are three goods: a non-traded (Q_n), an exportable (Q_x) and an importable (Q_m). If \tilde{U}^w = world price, t = tariff rate on M , r = official rate, B = budget, F = exogenous flow of foreign exchange, X = quantity exported, M = quantity imported, then $U'_n = 1$, $U'_x = r\tilde{U}^w$, $U'_m = r(1+t)\tilde{U}^w$, and the balance of payments equation is:

$$i) \tilde{U}'_x X + F = \tilde{U}'_m M.$$

The Lagrangian social utility function:

$$ii) L = V[Q_n, (Q_x - X), (Q_m - M)] + \lambda(B - Q_n - U'_x X - U'_m M).$$

From the first-order conditions $V'_n = \lambda$, $V'_x = \lambda U'_x$, $V'_m = \lambda U'_m$. Combining total differentiation and cost minimization, we have:

$$iii) dZ = dV/\lambda = U'_m dM - U'_x dX = r(1+t)\tilde{U}^w dM - r\tilde{U}^w dX.$$

Substituting for $\tilde{U}^w dX$ from i) and denoting the UNIDO rate $r^* = dV/\lambda dF$, we have:

$$iv) dV/\lambda dF = r^* = r \left(1 + \frac{dM}{dF} t \tilde{U}^w_m \right)$$

If $d\tau/r = \eta_m dM/M$, and $dM/dF = -\eta_m M / (\epsilon_x - \eta_m) \tilde{U}^w_m$, substitution into iv) gives:

$$v) r^* = \left[\epsilon_x - \eta_m (1+t) \right] / (\epsilon_x - \eta_m), \text{ where } \epsilon_x, \eta_m = \text{elasticities of supply and demand for foreign exchange.}$$

12 Little (1977, p. 61) has pointed out that the multiplicity of specific conversion factors in OECD implies a multiplicity of exchange rates, and seems to be offering this as a proof of better economics. But notice, in terms of applicability, this does not go very far. It would take a good two years of labor to compile a complete set of specific factors; that's a big investment according to a methodology that barks at the use of constant parameters. Would it not be simpler to adjust domestic prices to reflect true opportunity costs?

of distortions, such as tariffs, subsidies, rationing or licensing.¹³ Therefore, it is quite consistent with the non optimal situations prevailing in labor-surplus countries.

C. Policy Implications

As the reader may have already noticed, the OECD criterion may lead to the wrong answer for a number of reasons. First, not all labor-surplus countries are price takers in international trade, and trading conditions are far from being perfect, hence the terms of trade are rather variable. If, for example, the country is not a price taker, shadow prices for relevant goods cannot be inferred from the marginal rate of transformation through international trade unless the tariff is the optimum tariff. Moreover, tariffs imposed by price takers are, of course, sub-optimal but they exist; export and import quotas are widespread, and most governments face some of budgetary constraints. Furthermore, governments respond to changes in international situations and to pressure from local groups, so their trading policy cannot be assumed to be on the verge of becoming optimal, nor can it be assumed that the existing distortions will remain unchanged over time. And to the extent that the above departures from optimality persist, border prices of outputs are not their relevant shadow prices (Dasgupta and Stiglitz, 1974, pp. 1-33).

Second, because of poor transport systems, excess capacity (built in anticipation of market expansion), and the lack of trading opportunities (due to protection in industrial countries or to in-

¹³ The assumption behind its derivation is that the availability of an extra unit of foreign exchange can be used to increase imports and to relieve the pressure to export. But it is recommended that exports be deleted on the grounds that, in most cases, exports are not responsive to the availability of foreign exchange. It is also recommended that capital goods be removed from imports on the assumption that capital formation depends more on growth rather than on the availability of foreign exchange. As regards capital formation, however, if the allocation of foreign exchange does not reflect the usual conflict between local interest groups, capital goods should be included in imports. With U_i^w as the domestic price of import i , U_i^v as the c.i.f. price of import i , and $\Delta M_i / \Delta M$ as the share of import i in total marginal import bill over the plan

$$r^* = \sum_i \frac{\Delta M_i}{M} \frac{U_i^v}{U_i^w}$$

complete information), most goods manufactured in labor-surplus countries are in fact non tradables. Hence, the OECD assumption that project demand affects mainly trade is not realistic. In fact, it is more realistic to suppose that the marginal costs of production of non-traded goods vary with output, and their shadow prices then depend on domestic demand.

Thirdly, it must be borne in mind (and this is discussed in some detail in Srinivasan (1975)) that due to: numerous leads and lags in transaction recordings, different accounting practices of trading partners, under and overinvoicing by multinational firms attempting to overcome capital flow restrictions, etc., *true* border prices may not even be known.

The question that logically comes to mind at this point is: given these shortcomings, why does the OECD criterion cling to its numéraire? It cannot be for 'a psychological reason' as stated by Professor Little (1977, p. 63). The sole explanation, in my view, is the belief that international market solutions are the *best* guide to applied welfare. *If one holds such a neo-classical belief, one cannot accept domestic market prices for home goods.* In other words, the OECD measure, in line with the dictates of the neo-classical paradigm, sanctifies international market solutions. Accordingly a country would lose welfare if it does not respect international prices, regardless how they are determined, since they represent opportunity costs. The gist of this line of thought and its counter argument are succinctly summarized by a perceptive theorist as follows:

A country can choose to accept this [international trade] theory and its implications... but it can also reject it... In the past, large countries like the United States and the Soviet Union, which had enough natural resources to generate exports to pay for essential imports, carried off an autarchic industrialization strategy quite successfully. In their cases, and given their strategy, a reasonable procedure in project evaluation would have been to accept internal prices for inputs produced at home, even if they did exceed their import costs. That way, a fully integrated industrial structure could be built up, even if it was temporarily inefficient in part (Taylor, 1979, p. 210.)

These words are far from being in support of protection; they simply imply that a country should be aware of the various

development strategies open to it.

Concluding Comments

The purpose of this paper was to extend the conclusions of previous comparative analyses of the two main labor-surplus project appraisal methods, namely OECD and UNIDO. The main conclusions that can be drawn from this extension are: a) contrary to the finding of Lal, for example, the OECD procedure is not the general framework for project appraisal in labor-surplus economies, and b) preference for OECD over UNIDO cannot be based on technical grounds.

The first conclusion stems from the fact that the estimation of social value added in OECD depends on optimal situations that do not obtain in the real world. Also the difficult task of solving the time-path of the labor-surplus economy makes it quasi-impossible to derive consistent parameters and to deliver the kind of precision implicit in its discourse. The second conclusion follows from the first. That is a preference for OECD, despite its shortcomings, can only be based on the belief of the sanctity of international prices. The view that market prices are marginal and decentralizable would logically lead to the acceptance of internal prices of non-tradables, and therefore, to the selection of UNIDO as the appropriate method in the context of national planning.

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