

EQUITY IN COST-BENEFIT ANALYSIS

A Comment

By D. W. Pearce and J. Wise

We wish to correct the results produced by V. C. Nwaneri in his paper on the effects of "equity" weighting on the outcome of the cost-benefit analysis on the Third London Airport [1].

The purpose of an equity weighting procedure in cost-benefit is either to correct the results for different income utilities, or to adjust for differences in social circumstances which inhibit the reactions of some recipients of costs and benefits but enable the more fortunate to appropriate benefits fully or to "shift" cost burdens on to others. In general, though not always, these latter issues arise because of the income differences between classes of beneficiaries or sufferers. In this we are at one with Mr. Nwaneri, although we would disagree about the extent to which adjustments for income utilities have anything to do with value judgements concerning "equity".

As an example of Mr. Nwaneri's procedure, consider his adjustments for differences in income utilities. The approach requires that costs and benefits to beneficiaries (air travellers in this case) be scaled down, and that costs to sufferers (ground residents) be left unchanged (Nwaneri's "Method I" ([1], p. 240)). Let C_T be costs borne by air travellers, and C_R be costs to ground residents. Then, taking a selected airport site, say Cublington, Nwaneri's procedure in his Table I ([1], p. 243) is to take the social costs borne by air travellers and to scale them down in apparent accordance with the principle of method I. The income utility weight is selected from a vector of weights $Q = (0.32, 0.24, 0.17)$, suggested by us in our earlier evidence [2], corresponding to different elasticities of a marginal utility of income function ([1], p. 252). Nwaneri selects a value of $Q = 0.24$. Hence we would expect the weighted costs to beneficiaries to be $Q \cdot C_T$ and total weighted costs to be $Q \cdot C_T + C_R$. But Nwaneri's Table 1 records the following adjustments to the unweighted costs of £2,161.8 million for Cublington:

$$\text{(row 12)} \quad C_T(1-Q) = 1635.3$$

$$\text{(row 13)} \quad C_T - C_T(1-Q) = Q \cdot C_T = 526.5$$

$$\text{(row 14)} \quad Q \cdot C_T + C_R = 630.0$$

$$\text{(row 15)} \quad Q \cdot C_T + C_R + C_T = C_T(1+Q) + C_R = 2791.2.$$

It can be seen that row 14 does in fact provide the correct result. But Nwaneri selects row 15 as the equity-adjusted result, a procedure which *up-values* C_T relative to C_R , in contradiction to his own correctly stated principles of weighting.¹

The same error is made with the other weighting procedures. Stripped of the extraordinary arithmetic, and without challenging the Roskill Research Team's valuations, Foulness is ranked as the most desirable site in two of the five cases,

¹In correspondence, Mr. Nwaneri suggests that his row 15 computation is $C_T(1-Q) + C_R + C_T$ where Q is equal to unity *minus* the marginal utility of income, i.e. $Q = 0.76$. The error remains, however, since this reduces to the result given above, i.e. $1.24C_T + C_R$.

Thurleigh twice and Cublington once. This may be contrasted with Nwaneri's incorrect ranking of Thurleigh on four counts and Cublington once. Mr. Nwaneri's conclusion that the Roskill Commission Research Team's judgement against Foulness "is not altered by taking equity considerations into account" ([1], p. 246) is therefore unjustified.

REFERENCES

- [1] Nwaneri, V. C.: "Equity in Cost-Benefit Analysis. A Case Study of the Third London Airport". *Journal of Transport Economics and Policy*, September 1970.
- [2] Wise, J., C. B. Chapman, and D. W. Pearce: *Stage V. Written Evidence to the Roskill Commission on Behalf of Buckinghamshire County Council*, March 1970.

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*A Rejoinder**

By V. C. Nwaneri

The substance of the comment by Pearce and Wise is that the weighted costs to beneficiaries should be QC_T and total weighted costs $QC_T + C_R$, the latter being the correct formulation for inter-site ranking, rather than $QC_T + C_R + C_T$ which was used in my original article. I regret that I do not accept their suggestion that $QC_T + C_R$ should be used for inter-site ranking. It would be correct to adopt their formulation if equity (measured by cost vector QC_T) and the disbenefits to non-travelling residents (measured by cost vector C_R) were the only considerations in inter-site ranking. But it ignores the net benefit to the travellers themselves as measured by cost vector C_T . The central object of my article was to obtain for each of the proposed sites a cost vector (QC_T), which reflects the income distributional effects of the airport, add the new cost vector to those obtained by the Roskill research team ($C_T + C_R$), and then compare the resulting inter-site ranking with that obtained by the Commission. Therefore, I do not accept that there was an error in my original article, and see no reason to alter my conclusions regarding the ranking of the proposed airport sites. I admit the error in my correspondence with Pearce and Wise regarding my equations, which they had in fact interpreted correctly.

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*The views expressed in this note relate to work done before I joined the staff of the World Bank, and do not reflect the views of the World Bank or any member of its staff.