that, one can freely choose to approximate the direct utility function, the indirect utility function, the cost-function or the distance function provided only that the appropriate quasi-concavity, quasi-convexity, concavity and homogeneity restrictions are observed. The best known of these approximations is *the translog,* Sargan (1971), Christensen, Jorgenson and Lau (1975) and many subsequent applications. See in particular Jorgenson, Lau and Stoker (1982) for a comprehensive treatment. The *indirect translog* gives a quadratic approximation to the indirect function *4,*(r)* for normalized prices, and then uses (14) to derive the system of share equations. The forms are

$$0*(0 = a_o + Ea_k \text{in } r_k \text{ E } EP_k\!:\!J \text{ in } r_k \text{ln} \qquad (60)$$

$$\frac{a, + E \qquad r_J}{Eak \qquad {}_{kj}} \qquad (61)$$

where 13,_, = + In estimating (61), some normalization is required, e.g. that $Ea_k = 1$. The *direct translog* approximates the direct utility function as a quadratic in the vector q and it yields an equation of the same form as (61) with w, on the left-hand side but with q_i replacing $r,$ on the right. Hence, while (61) views the budget share as being determined by quantity adjustment to exogenous price to outlay ratios, the direct translog views the share as adapting by prices adjusting to exogenous' quantities. Each could be appropriate under its own assumptions, although presumably not on the same set of data. Yet another flexible functional form with close affinities to the translog is the second-order approximation to the cost function offered by the AIDS, eqs. (17), (18) and (19) above. Although the translog considerably predates the AIDS, the latter is a good deal simpler to estimate, at least if the price index In P can be adequately approximated by some fixed pre-selected index.

The AIDS and translog models yield demand functions that are first-order flexible subject to the theory, i.e. they automatically possess symmetric substitution matrices, are homogeneous, and add up. However, trivial cases apart, the AIDS cost function will not be *globally* concave nor the translog indirect utility function globally convex, though they can be so over a restricted range of r (see below). The functional forms for both systems are such that, by relaxing certain restrictions, they can be made first-order flexible without theoretical restrictions, as is the Rotterdam system. For example, in the AIDS, eq. (19), the restrictions $y_U = y_{Ji}$ and $E_i y_{i;} = 0$ can be relaxed while, in the indirect translog, eq. (61), $= /3_j$, can be relaxed and In x included as a separate variable without necessarily assuming that its coefficient equals — Efl_{if}. Now, if the theory is correct, and the flexible functional form is an adequate representation of it over the data, the restrictions should be satisfied, or at least not significantly violated. Similarly,