apparently akin to (89)

$$qi/m,(a^h) = fi(x^4/Ino(a9)), \tag{94}$$

where $m_i(ah)$*is the specific* commodity scale, and $rn_0(a^h)$ is some *general* scale. In contrast to (93), we now have the relationship

$$\frac{ding,}{da_i} \qquad \frac{airing,}{dal} \qquad e_l \cdot \frac{din\ rn_0}{dad} \tag{95}$$

so that the substitution effects embodied in (93) are no longer present. Indeed, if $x^h/m_0(a^h)$ is interpreted as a welfare indicator (which is natural in the context) (94) can only be made consistent with (88) and (89) if indifference curves are Leontief, ruling out all substitution in response to relative price change, see Muellbauer (1980) for details, and Pollak and Wales (1981) for a different interpretation.

On a single cross-section, neither the Barten model nor the Prais—Houthakker model are likely to be identifiable. That there were difficulties with the Prais—Houthakker formulation has been recognized for some time, see Forsyth (1960) and Cramer (1969) and a formal demonstration is given in Muellbauer (1980). In the Barten model, (93) may be rewritten in matrix notation as

$$F = + E)M, \tag{96}$$

and we seek to identify M from observable information on $\boldsymbol{F}$. In the most favorable case, E may be assumed to be known (and suitable assumptions may make this practical even on a cross-section, see Section 4.2 below). The problem lies in the budget constraint, $p \cdot q = x$ which implies $+ El = 0$ so that the matrix $(I + E)$ has at most rank n —1. Hence, for any given F and E, both of which *are* observable, there exist an infinite number of $\boldsymbol{M}$ matrices satisfying (96). In practice, with a specific functional form, neither F nor E may be constant over households so that the information matrix of the system could conceivably not be singular. However, such identification, based on choice of functional form and the existence of high nonlinearities, is inherently controversial. A much better solution is the use of several cross-sections between which there is price variation and, in a such a case, several quite general functional forms are fully identified. For the Prais—Houthakker model, (95) may be written as

$$F = M — ern', \tag{97}$$

where $ni = din\ re/ da$. From the budget constraint, $w'F — 0$ so that m'