where $u_{(n)}$ is the (n —1)-vector of u, excluding element n. Barten defines a new non-singular matrix *V* by

$$V— S2+ Kfi, \qquad (42)$$

where *i* is the normalized vector of units, Le. i, =1/n, and 0 < *K* <*co.* Then (41) may be shown to be equal to

$$\ln L= (ink +inn —(n —1)1n277. —Indet V\} — 1 \sum_{e 1}^{T} ¬ury\ 114,. \qquad (43)$$

This formulation establishes that the likelihood is independent of the equation deleted (and incidentally of K since (41) does not depend on it) and also returns the original symmetry to the problem. However, in practice, the technique of dropping one equation is usually to be preferred since it reduces the dimension of the parameter vector to be estimated which tends to make computation easier.

Note two further issues associated with singularity. First, if the system to be estimated is a "subsystem" of commodities that does not exhaust the budget, the variance covariance matrix of the residuals need not, and usually will not be singular. In consequence, SURE or FIML (see below) can be carried out directly on the subsystem. However, it is still necessary to assume a non-diagonal variance—covariance matrix; overall singularity precludes *all* goods from having orthogonal errors and there is usually no good reason to implicitly confine all the off-diagonal covariances to the omitted goods. Second, there are additional complications if the residuals are assumed to be serially correlated. For example, in (32), it might be tempting to write

$$(44)$$

for serially uncorrelated errors ε_{li}. If *R* is the diagonal matrix of p_i's, (44) implies that

$$= RfIR + \qquad (45)$$

where .1: is the contemporaneous variance—covariance matrix of the E's. Since *12i* = = 0, we must have *52p* = 0, which, since *i* spans the null space of 2, implies that *p* a *i,* i.e. that all the p_i's are the same, a result first established by Berndt and Savin (1975). Note that this does *not* mean that (44) with p, = *p* for all *i* is a sensible specification for autocorrelation in singular systems. It would seem better to allow for autocorrelation at an earlier stage in the modeling, for example by letting v_u be autocorrelated in (34) and following through the consequences for the compound errors in (35). In general, this will imply vector