The Structure of Technology, Federal Republic of Germany, 1950 - 1973: Comment

By Peter Zweifel

In this Journal, *Conrad* and *Jorgenson* (1978, CJ henceforth) develop a translog approximation to an arbitrary production function $F(C, I, K, L, t) = 0$. They present empirical separability tests showing that a distinction between outputs (C, I) and inputs and technical change (K, L, t) is compatible with German data. Unfortunately, their work contains a couple of flaws which tend to cast doubt on the validity of their interesting results.

I.

The first point concerns the separability issue itself. Any function $F(\cdot)$ can be approximated by a second-order Taylor series in the logarithms of its arguments. In order to have logarithms throughout, let us write

$$H = \ln(F+1) \cong h'a + \frac{1}{2}h'Bh,$$

$$\text{with} \quad h' = [\ln C, \ln I, \ln K, \ln L, t]$$

$$a' = \left[\frac{\partial H}{\partial \ln C}, \frac{\partial H}{\partial \ln I}, \frac{\partial H}{\partial \ln K}, \frac{\partial H}{\partial \ln L}, \frac{\partial H}{\partial t}\right]$$

$$(1) \qquad = [\alpha_C, \alpha_I, \alpha_K, \alpha_L, \alpha_t]$$

$$B = \left[\frac{\partial^2 H}{\partial \ln C^2}, \frac{\partial^2 H}{\partial \ln C\, \partial \ln I}, \ldots, \frac{\partial^2 H}{\partial t\, \partial \ln L}, \frac{\partial^2 H}{\partial t^2}\right]$$

$$= \begin{bmatrix} \beta_{CC} & \beta_{CI} & \beta_{CK} & \beta_{CL} & \beta_{Ct} \\ & \beta_{II} & \beta_{IK} & \beta_{IL} & \beta_{It} \\ & & \beta_{KK} & \beta_{KL} & \beta_{Kt} \\ & & & \beta_{LL} & \beta_{Lt} \\ & & & & \beta_{tt} \end{bmatrix}$$

Therefore, the vector h contains the increments of the arguments around the point of expansion (1, 1, 1, 1, 0); the vector a collects the first