COWLES COMMISSION DISCUSSION PAPERS: ECONOMICS, No. 222

May 4, 1948

Preliminary Results on Mobility of Labor Study

The investigation into mobility of labor between the agricultural and non-agricultural sectors of the economy has produced certain preliminary numerical results. Many of these results cannot be accepted, on economic grounds. They are presented here with the object of eliciting possible explanations of the results and suggestions as to improvement.

The variables employed in the structural relations were as follows: excluding those variables appearing only in definitions and identities:

$\Delta N_{1t} = N_{1t} - N_{1t-1}$ = the change in the number of individuals desiring employment in agriculture

$\Delta N_{2t} = N_{2t} - N_{2t-1}$ = the change in the number of individuals desiring employment in non-agriculture

y_1 = per capita real disposable income of agricultural workers (including proprietors)

y_2 = per capita real disposable income of non-agricultural workers (including proprietors)

U = number of individuals unemployed (all in non-agriculture)

N = total population of the United States

c = per capita real consumption of all individuals

y = per capita real disposable income of all individuals

x_1 = real agricultural output per head of total population

x_2 = real non-agricultural output per head of total population

p_1 = index of prices received by farmers, deflated by the general price level

p_2 = index of prices received by the non-agricultural sector, deflated by the general price level.

z = real per capita net investment

t = time

L_1 = number of individuals working in agriculture

L_2 = number of individuals working in non-agriculture

D_1 = agricultural depreciation in real terms

D_2 = non-agricultural depreciation in real terms

s_1 = real payments of agriculture to non-agriculture for goods used in production, per head of total population

v_1 = real value of agricultural goods consumed on the farm per agricultural worker.

p_A = index of prices paid by agriculture for consumption goods, deflated by the general price level.

Endogenous variables: ΔN_1, ΔN_2, I_1, I_2, U, x_1, x_2, y, y_1, y_2, v_1, c, s_1, p_1, p_2, p_A.

Predetermined variables: R, t, ~~money~~ real investment, money depreciation, and all lagged variables.

Time period: 1920-41, inclusive

For identities, see ~~previous paper~~ page 6

Equations:

(1) $$\Delta N_{1t} = \alpha_{10} + \alpha_{11}y_{1t} + \alpha_{12}y_{2t} + \alpha_{13}U_t - \alpha_{14}R_t + \alpha_{15}y_{1,t-1} + \alpha_{16}y_{2,t-1} + \alpha_{17}U_{t-1}$$

Mobility of labor equation

(2) $$\Delta N_{2t} = \alpha_{20} + \alpha_{21}y_{1t} + \alpha_{22}y_{2t} + \alpha_{23}U_t + \alpha_{24}R_t + \alpha_{25}y_{1,t-1} + \alpha_{26}y_{2,t-1} + \alpha_{27}U_{t-1}$$

Mobility of labor equation

(3) $$c_t = \alpha_{30} + \alpha_{31}y_t + \alpha_{32}y_{t-1}$$

Consumption function

(4) $$x_1 = \alpha_{40} + \alpha_{41}p_{1t} + \alpha_{42}p_{2t} + \alpha_{43}z_t + \alpha_{45}y_t$$

Demand for Agricultural goods

(5) $$x_2 = \alpha_{50} + \alpha_{51}p_{2t} + \alpha_{52}p_{2,t-1} + \alpha_{53}t$$

Supply of non-agricultural goods

(6) $$R_t x_{1t} = \alpha_{60} L_1^{\alpha_{61}+\alpha_{62}t} D_1^{\alpha_{63}+\alpha_{64}t}$$

Agricultural production function

(7) $$R_t x_{2t} = \alpha_{70} L_2^{\alpha_{71}+\alpha_{72}t} D_2^{\alpha_{73}+\alpha_{74}t}$$

Non-agricultural production function

(8) $$s_{1t} = \alpha_{80} + \alpha_{81}p_{1t} + \alpha_{82}p_{1,t-1}$$

Demand by agriculture for goods used in production

(9) $$v_{1t} = \alpha_{90} + \alpha_{91}p_{1t} + \alpha_{92}p_{At}$$

Demand by agriculture for home consumption

Preliminary results were obtained by the limited information method for equations (1), (2), (4), (6) and (7). We omit constant terms:

(1) $$\Delta N_{1t} = \overset{X}{-}.099y_{1t} \overset{X}{+} 1.02y_{2t} \overset{X}{-} .022U_t - 6.16R_t + .59y_{1,t-1} - 1.1y_{2,t-1} + .034U_{t-1}$$

(2) $$\Delta N_{2t} = \overset{X}{2.07}y_{1t} \overset{X}{-} 1.85y_{2t} - .013U_t + 47.03R_t - 1.71y_{1,t-1} \overset{X}{-} 4.88y_{2,t-1} - .068U_{t-1}$$

(4) $$x_{1t} = -.16p_{1t} - 1.36p_{2t} + .112z_t + .03y$$

(6) $$\log Rx_1 = \overset{X}{-}(.110 + .013t)\log L_1 \overset{X}{-} (.019 - .051t)\log D_1$$

(7) $$\log Rx_2 = (.39 + .18t)\log L_2 + (.22 - .35t)\log D_2$$

We include, for comparison, some least squares fits:

(4) $$x_{1t} = -.19p_{1t} - 2.45p_{2t} + .042z_t + .048y$$

$$S_s^2 = 2.2158$$

(6) $$\log Rx_1 = (2.24 - .0017t) \log L_1 + (.22 - .0307t) \log D_2$$

$$\delta^2/s^2 = 2.1887$$

(7) $$\log Rx_2 = (.92 + .089t) \log L_2 - (.025 + .17t) \log D_2$$

$$\delta^2/s^2 = 2.1572$$

Identities

(10) $R_t y_t = L_{1t} y_{1t} + L_{2t} y_{2t}$

(11) $o_t + z_t = y_t$

(12) $U_t = E_{2t} - L_{2t}$

(13) $N_{1t} = L_{1t}$

(14) $L_{1t} y_{1t} = R_t(x_{1t} - s_{1t}) + E_{1t}$

(15) $L_{2t} y_{2t} = P_t(x_{2t} + y_{1t} - x_{1t}) + E_{2t}$

(16) $p_{2t} = f(p_{1t}, p_{2t})$

(17) $D_{1t} = \frac{\mathcal{D}_{1t}}{p^*_t}$

(18) $D_{2t} = \frac{\mathcal{D}_{2t}}{p^*_t}$

(19) $p^*_t = G(p_{2t}, p_{2t-1}, \ldots)$

E_1 (predetermined) = agricultural imputed rent + revaluation of agricultural inventories + transfer payments to agriculture - taxes paid by agriculture - agricultural depreciation,

E_2 (predetermined) = revaluation of nonagricultural inventories + transfer payments to nonagriculture - taxes paid by agriculture - nonagricultural depreciation.

$\mathcal{D}_{1t}$ = money depreciation of agricultural sector

$\mathcal{D}_{2t}$ = money depreciation of nonagricultural sector

p^*_t = price index implicit in depreciation deflated by general price level