THE ECONOMIC IMPACT OF TAX REFORM

by

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Notation:

C -- private national consumption, excluding household capital services.

I -- private national investment, including investment in consumers' durables.

K -- private national capital stock, including the stock of household capital.

L -- labor services.

Complete system of notation:

CE -- supply of consumption goods by government enterprise.

CG -- government purchases of consumption goods.

CR -- rest of the world purchases of consumption goods.

CS -- supply of consumption goods by private enterprise.

HD -- household capital services.

HL -- household capital services from long-lived assets.

HS -- household capital services from short-lived assets.

IG -- government purchases of investment goods.

IR -- rest of the world purchases of investment goods.

IS -- supply of investment goods by private enterprise.

K -- capital stock.

KD -- capital services.

LD -- private enterprise purchases of labor services.

LE -- government enterprise purchases of labor services.
LG -- general government purchases of labor services.

LH -- time endowment.

LJ -- leisure time.

LR -- rest of the world purchases of labor services.

MD -- noncorporate capital services.

ML -- noncorporate capital services from long-lived assets.

MS -- noncorporate capital services from short-lived assets.

QD -- corporate capital services.

QL -- corporate capital services from long-lived assets.

QS -- corporate capital services from short-lived assets.

To denote prices we place a P before the corresponding symbol for quantity.

1. Shares of outputs and inputs in the value of labor input:

$v_C = \frac{PCS \cdot CS}{PLD \cdot LD}, \quad v_I = \frac{PIS \cdot IS}{PLD \cdot LD}, \quad v_M = -\frac{PMD \cdot MD}{PLD \cdot LD}, \quad v_Q = -\frac{PQD \cdot QD}{PLD \cdot LD}.$

Notation:

$v = (v_C, v_I, v_M, v_Q)$ -- vector of value shares.

$\ln P = (\ln PCS, \ln PIS, \ln PMD, \ln PQD)$ -- vector of logarithms of prices of outputs and inputs.

T -- time as an index of technology.

2. Price function for model of producer behavior:

$\ln PLD = \ln P' \alpha_p + \alpha_T \cdot T + \frac{1}{2} \ln P' \beta_{PP} \ln P \cdot T$

$+ \ln P' \beta_{PT} \cdot T + \frac{1}{2} \beta_{TT} \cdot T^2.$
3. Value shares in model of producer behavior:

\[ v = \frac{\partial \ln PLD}{\partial \ln P}, \]
\[ = \alpha_P + B_{PP} \ln P + \beta_{PT} \cdot T. \]

4. Rate of technical change:

\[ - v_T = \frac{\partial \ln PLD}{\partial T}, \]
\[ = \alpha_T + \beta_{PT} \ln P + \beta_{TT} \cdot T. \]

5. Harrod-neutrality of technical change:

\[ \beta_{PT} = 0, \beta_{TT} = 0. \]

6. Shares of long- and short-lived assets in the value of noncorporate and corporate capital:

\[ v_{ML} = \frac{PML \cdot ML}{PMD \cdot MD}, v_{MS} = \frac{PMS \cdot MS}{PMD \cdot MD}, v_{QL} = \frac{PQL \cdot QL}{PQD \cdot QD}, v_{QS} = \frac{PQS \cdot QS}{PQD \cdot QD}. \]

Notation:

\[ v_M = (v_{ML}, v_{MS}) \quad \text{-- vector of value shares in noncorporate capital input.} \]
\[ v_Q = (v_{QL}, v_{QS}) \quad \text{-- vector of value shares in corporate capital input.} \]

\[ \ln PM = (\ln PML, \ln PMS) \quad \text{-- vector of logarithms of prices of capital inputs in the noncorporate sector.} \]
\[ \ln PQ = (\ln PQL, \ln PQS) \quad \text{-- vector of logarithms of prices of capital inputs in the corporate sector.} \]

7. Price functions for noncorporate and corporate capital sub-models.

\[ \ln PMD = \ln PM' \alpha_{PM} + \frac{1}{2} \ln PM'B_{PM} \ln PM, \]
\[ \ln PQD = \ln PQ' \alpha_{PQ} + \frac{1}{2} \ln PQ'B_{PQ} \ln PQ. \]
8. Value shares in noncorporate and corporate sub-models.

\[ v_M = \alpha_{PM} + B_{PM} \ln PM, \]
\[ v_Q = \alpha_{PQ} + B_{PQ} \ln PQ. \]

Notation:

\( F_t \) -- full consumption per capita with population measured in efficiency units.

\( n \) -- rate of population growth.

\( \mu \) -- rate of Harrod-neutral technical change.

\( \rho^p \) -- nominal private rate of return.

9. Intertemporal utility function.

\[ V = \frac{1}{1 - \sigma} \sum_{t=0}^{\infty} \left( \frac{1 + n}{1 + \gamma} \right)^t U_t^{1-\sigma}. \]

10. Atemporal utility function.

\[ U_t = F_t (1 + \mu)^t, \quad (t = 0, 1, \ldots). \]

11. Full wealth.

\[ W = \sum_{t=0}^{\infty} \frac{PF_t \cdot F_t \cdot (1 + \mu)^t (1 + n)^t}{\prod_{s=0}^{t} (1 + \rho_s^p)}. \]

12. Transition equation for full consumption.

\[ \frac{F_t}{F_{t-1}} = \left[ \frac{PF_{t-1}}{PF_t} \cdot \frac{1 + \rho_t^p}{(1 + \gamma)(1 + \mu)^\sigma} \right]^{1/\sigma}. \]

13. Shares in the value of full consumption.

\[ v_C = \frac{PC \cdot C}{PF \cdot F}, \]
\[ v_{HD} = \frac{PHD \cdot HD}{PF \cdot F}, \]
\[ v_{LJ} = \frac{PLJ \cdot LJ}{PF \cdot F}; \]
\[ v_{HL} = \frac{PHL \cdot HL}{PHD \cdot HD}, \quad v_{HS} = \frac{PHS \cdot HS}{PHD \cdot HD}. \]

Notation:

\[ v_D = (v_C, v_{HD}, v_{LJ}) \] -- vector of value shares in full consumption.

\[ v_H = (v_{HL}, v_{HS}) \] -- vector of value shares of household capital input.

\[ \ln PD = (\ln PC, \ln PHD, \ln PLJ^*) \] -- vector of logarithms of prices of consumption goods, household capital services, and leisure. (Note that the price of leisure is defined in terms of labor measured in efficiency units.)

\[ \ln PH = (\ln PHL, \ln PHS) \] -- vector of logarithms of prices of capital inputs in the household sector.

14. Price function for full consumption.

\[ \ln PF = \ln PD' \alpha_{PD} + \frac{1}{2} \ln PD'B_{PD} \ln PD. \]

15. Price function for household capital sub-model:

\[ \ln PHD = \ln PH' \alpha_{PH} + \frac{1}{2} \ln PH'B_{PH} \ln PH. \]

16. Value shares for full consumption and household capital submodel:

\[ v_D = \alpha_{PD} + B_{PD} \ln PD, \]

\[ v_H = \alpha_{PH} + B_{PH} \ln PH. \]

17. Time path of full consumption.

\[ \frac{F_t}{F_0} = \prod_{s=1}^{t} \left[ \frac{1 + r_p^s}{(1 + \gamma)(1 + \mu)^s} \right]^{\frac{1}{\sigma}}, \quad (t = 1, 2 \cdots), \]

where the real private rate of return is:

\[ r_p^t = \frac{PF_{t-1}}{PF_t} (1 + \rho_f^t) - 1, \quad (t = 1, 2 \cdots). \]
18. Intertemporal expenditure function:

\[ W = PF \cdot \left[ \frac{(1-\sigma) V}{D^\sigma} \right]^{\frac{1}{1-\sigma}}, \]

where:

\[ D = \sum_{t=0}^{\infty} \left( \frac{1+n}{1} \right)^t \prod_{n=0}^{t} \frac{1}{(1 + r_n^p)^{\sigma}}, \]

19. Equivalent variation in full wealth:

\[ \Delta W = W(PF_0, D_0, V_0) - W(PF_1, D_0, V_0). \]