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.

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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:

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

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:

$$\ln PLD = \ln P'\ \alpha_p + \alpha_T \cdot T + \frac{1}{2} \ln P'\ B_{PP} \ln P$$
$$+ \ln P'\ \beta_{PT} \cdot T + \frac{1}{2}\, \beta_{TT} \cdot T^2\ .$$

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:

$v_M = (v_{ML}, v_{MS})$ -- vector of value shares in noncorporate capital input.

$v_Q = (v_{QL}, v_{QS})$ -- vector of value shares in corporate capital input.

ln PM = (ln PML, ln PMS) -- vector of logarithms of prices of capital inputs in the noncorporate sector.

ln PQ = (ln PQL, ln PQS) -- vector of logarithms of prices of capital inputs in the corporate sector.

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

$$\ln PMD = \ln PM' \alpha_{PM} + \frac{1}{2} \ln PM' B_{PM} \ln PM ,$$

$$\ln PQD = \ln PQ' \alpha_{PQ} + \frac{1}{2} \ln PQ' B_{PQ} \ln PQ .$$

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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.

μ -- rate of Harrod-neutral technical change.

ρ^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.

$$U_t = F_t(1+\mu)^t, \qquad (t = 0, 1, \cdots).$$

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.

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

13. Shares in the value of full consumption.

$$v_C = \frac{PC \cdot C}{PF \cdot F} \ , \ v_{HD} = \frac{PHD \cdot HD}{PF \cdot F} \ , \ v_{LJ} = \frac{PLJ \cdot LJ}{PF \cdot F} \ ;$$

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$$v_{HL} = \frac{PHL \cdot HL}{PHD \cdot HD}, \; v_{HS} = \frac{PHS \cdot HS}{PHD \cdot HD}.$$

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.

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

where the real private rate of return is:

$$r_t^p = \frac{PF_{t-1}}{PF_t} (1 + \rho_t^p) - 1, \qquad (t = 1, 2 \cdots).$$

18. Intertemporal expenditure function:

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

where:

$$D = \sum_{t=0}^{\infty} \left(\frac{1+n}{(1+\gamma)^{\frac{1}{\sigma}}}\right)^{t} \prod_{s=0}^{t} (1 + r_s^p)^{\frac{1-\sigma}{\sigma}},$$

19. Equivalent variation in full wealth:

$$\Delta\ W = W(PF_0,\ D_0,\ V_1) - W(PF_0,\ D_0,\ V_0).$$

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