

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:

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

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:

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

3. Value shares in model of producer behavior:

$$v = \frac{\partial \ln PLD}{\partial \ln P} ,$$

$$\approx \alpha_P + \beta_{PP} \ln P + \beta_{PT} \cdot T .$$

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.

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

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

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.

$$U_t = F_t(1 + \mu)^t, \quad (t = 0, 1, \dots).$$

11. Full wealth.

$$W = \sum_{t=0}^{\infty} \frac{PF_t \cdot F_t \cdot (1 + \mu)^t (1 + n)^t}{\prod_{i=0}^t (1 + \rho_i^P)}.$$

12. Transition equation for full consumption.

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

13. Shares in the value of full consumption.

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

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

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:

$$\begin{aligned} v_D &= \alpha_{PD} + B_{PD} \ln PD, \\ v_H &= \alpha_{PH} + B_{PH} \ln PH. \end{aligned}$$

17. Time path of full consumption.

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

where the real private rate of return is:

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

18. Intertemporal expenditure function:

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

where:

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

19. Equivalent variation in full wealth:

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