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.
LI — 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:

\[ v_c = \frac{PCS \cdot CS}{PLD \cdot LD}, v_l = \frac{PIS \cdot IS}{PLD \cdot LD}, v_m = \frac{PMD \cdot MD}{PLD \cdot LD}, v_q = \frac{PQD \cdot QD}{PLD \cdot LD}. \]

Notation:

\( v = (v_c, v_l, v_m, v_q) \) — 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:

\[ \ln PLD = \ln P \cdot v_c + \ln P \cdot v_l - T + \frac{1}{2} \ln P \cdot \ln P + \frac{1}{2} \beta_{pt} \cdot T + \frac{1}{2} \beta_{TT} \cdot T^2. \]
3. Value shares in model of producer behavior:
\[ v = \frac{\partial \ln P_{LD}}{\partial \ln P} , \]
\[ = \alpha_P + \beta_{PP} \ln P + \beta_{PT} \cdot T . \]

4. Rate of technical change:
\[ \nu_T = \frac{\partial \ln P_{LD}}{\partial T} , \]
\[ = \alpha_T + \beta_{PT} \ln P + \beta_{PT} \cdot T . \]

5. Harrod-neutrality of technical change:
\[ \beta_{PT} = 0, \beta_{PT} = 0. \]

6. Shares of long- and short-lived assets in the value of noncorporate and corporate capital:
\[ \begin{align*}
V_{ML} &= v_{ML} \\
V_{PS} &= v_{PS} \\
V_{MS} &= v_{MS} \\
V_{MS} &= v_{MS} \\
V_{QL} &= v_{QL} \\
V_{QS} &= v_{QS} \\
V_{QL} &= v_{QL} \\
V_{QS} &= v_{QS} \\
V_{QL} &= v_{QL} \\
V_{QS} &= v_{QS} \\
V_{QL} &= v_{QL} \\
\end{align*} \]

Notation:
\[ v_M = (v_{ML}, v_{ML}) \rightarrow \text{vector of value shares in noncorporate capital input.} \]
\[ v_Q = (v_{QL}, v_{QL}) \rightarrow \text{vector of value shares in corporate capital input.} \]
In FM = (ln FM, ln FMS) \rightarrow \text{vector of logarithms of prices of capital inputs in the noncorporate sector.} \]
In PQ = (ln PQ, ln PQS) \rightarrow \text{vector of logarithms of prices of capital inputs in the corporate sector.} \]

7. Price functions for noncorporate and corporate capital sub-models.
\[ \ln P_{MD} = \ln PMF \cdot \nu_{PM} + \frac{1}{2} \ln PM \cdot R_{PM} \ln PM , \]
\[ \ln P_{QD} = \ln PQF \cdot \nu_{PQ} + \frac{1}{2} \ln PQ \cdot R_{PQ} \ln PQ , \]
8. Value shares in noncorporate and corporate sub-models.

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

**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.

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

10. Atemporal utility function.

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

11. Full wealth.

\[ W = \sum_{i=0}^{\infty} \frac{PF_t \cdot F_t \cdot (1 + \mu)^i (1 + n)^i}{(1 + \mu)^i}. \]

12. Transition equation for full consumption.

\[ \frac{F_t}{F_{t-1}} = \frac{PF_{t-1} \cdot (1 + \mu)^i (1 + n)^i}{PF_t \cdot (1 + \gamma)(1 + \mu)^i}. \]

13. Shares in the value of full consumption.

\[ v_c = \frac{PC \cdot C}{PF \cdot F}, \quad v_{HD} = \frac{PHD \cdot HD}{PF \cdot F}, \quad v_{LJ} = \frac{P LJ \cdot LJ}{PF \cdot F}. \]
\[ v_D = \frac{PHL}{PHD} \cdot \frac{HD}{HL} \cdot v_H = \frac{PHS}{PHD} \cdot \frac{HD}{HD} \]

Notation:

- \( v_D = (v_C, v_HD, v_L) \) — vector of value shares in full consumption.
- \( v_H = (v_C, v_HD) \) — vector of value shares of household capital input.

\[ \ln P_D = \ln P_C, \ln P_H, \ln P_L \] — 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.)

\[ \ln P_H = \ln P_{HL}, \ln P_{HS} \] — vector of logarithms of prices of capital inputs in the household sector.

14. Price function for full consumption.

\[ \ln P_F = \ln P_D \cdot \alpha_{PD} + \frac{1}{2} \ln P_D \cdot B_{PD} \ln P_D. \]

15. Price function for household capital sub-model:

\[ \ln P_H = \ln P_H \cdot \alpha_{PH} + \frac{1}{2} \ln P_H \cdot B_{PH} \ln P_H. \]

16. Value shares for full consumption and household capital sub-model:

\[ v_D = \alpha_{PD} + B_{PD} \ln P_D, \]
\[ v_H = \alpha_{PH} + B_{PH} \ln P_H. \]

17. Time path of full consumption:

\[ \frac{P_{t+1}}{P_t} = \prod_{t=1}^{\infty} \left( 1 + \gamma \right)^{\frac{1}{r_f}} \]

where the real private rate of return is:

\[ r_f = \frac{PF_t - 1}{PF_t (1 + r_f)} = 1. \]
18. Intertemporal expenditure function:

\[ W = PF \cdot (\frac{1 - \sigma}{\partial})^{\frac{1}{1 - \sigma}}, \]

where:

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

19. Equivalent variation in full wealth:

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