Estimation of Tax Functions from Microsimulation Data for OG-India
Day 2

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Tax Policy Research Unit and World Bank

Where taxes enter model: BC

The household budget constraint

$$c_{j,s,t} + b_{j,s+1,t+1} = (1+r_t)b_{j,s,t} + w_t e_{j,s} n_{j,s,t} + \zeta_{j,s}\frac{BQ_t}{\lambda_j \omega_{s,t}} + \eta_{j,s,t}\frac{TR_t}{\lambda_j \omega_{s,t}} - T_{s,t}$$

$$T_{j,s,t} \equiv \tau_{s,t}\left(x,y\right)\left(x+y\right) + \tau_{c,t}c_{j,s,t}$$

$$\text{where} \quad x \equiv \frac{w_t e_{j,s} n_{j,s,t}}{e^{g_y t}} \quad \text{and} \quad y \equiv \frac{r_t b_{j,s,t}}{e^{g_y t}}$$

$$\text{MTR on savings:} \equiv \frac{\partial T_{j,s,t}}{\partial r_t b_{j,s,t}}$$

$$\text{MTR on labor supply:} \equiv \frac{\partial T_{j,s,t}}{\partial w_t e_{j,s} n_{j,s,t}}$$

Where taxes enter model: Eulers

Two Euler Equations

$$w_t e_{j,s}\left(\frac{1-\tau^{mtrx}_{s,t}}{1-\tau_{c,t}}\right)(c_{j,s,t})^{-\sigma} =$$

$$e^{g_y(1-\sigma)}\chi^n_s\left(\frac{b}{\tilde{l}}\right)\left(\frac{n_{j,s,t}}{\tilde{l}}\right)^{\upsilon-1}\left[1-\left(\frac{n_{j,s,t}}{\tilde{l}}\right)^{\upsilon}\right]^{\frac{1-\upsilon}{\upsilon}}$$

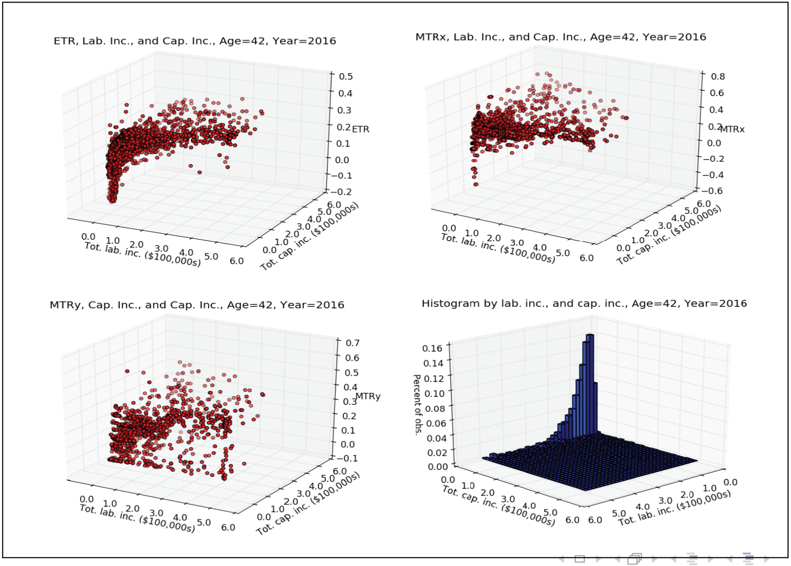
$$j,t, \quad \text{and} \quad E+1\leq s\leq E+S$$

$$(c_{j,s,t})^{-\sigma} = \chi^b_j\rho_s(b_{j,s+1,t+1})^{-\sigma}+$$

$$\beta(1-\rho_s)\left(\frac{1-\tau_{c,t}}{1-\tau_{c,t+1}}\right)\left(1+r_{t+1}\left[1-\tau^{mtry}_{s+1,t+1}\right]\right)(c_{j,s+1,t+1})^{-\sigma}$$

$$\forall j,t, \quad \text{and} \quad E+1\leq s\leq E+S-1$$

Microsim can generate ETR and MTR for each age



Need smooth function for dynamic model

Let x = labor income (*wen*) and y = capital income (*rb*)

$$\tau(x,y) = \left[\tau(x) + shift_x\right]^{\phi}\left[\tau(y) + shift_y\right]^{1-\phi} + shift$$

$$\text{where} \quad \tau(x) \equiv (max_x - min_x)\left(\frac{Ax^2 + Bx}{Ax^2 + Bx + 1}\right) + min_x$$

$$\text{and} \quad \tau(y) \equiv (max_y - min_y)\left(\frac{Cy^2 + Dy}{Cy^2 + Dy + 1}\right) + min_y$$

$$\text{where} \quad A, B, C, D, max_x, max_y, shift_x, shift_y > 0$$

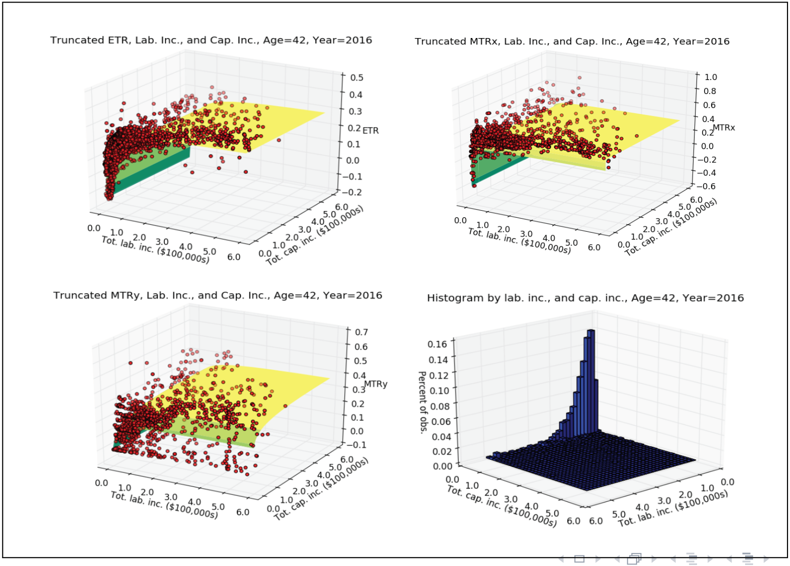
$$\text{and} \quad max_x > min_x \quad \text{and} \quad max_y > min_y$$

$$\text{and} \quad \phi \in [0,1]$$

Tax Function Parameters Description

Symbol	Description
A	Coefficient on squared labor income term x^2 in $\tau(x)$
B	Coefficient on labor income term x in $\tau(x)$
C	Coefficient on squared capital income term y^2 in $\tau(y)$
D	Coefficient on capital income term y in $\tau(y)$
max_x	Maximum tax rate on labor income x given $y = 0$
min_x	Minimum tax rate on labor income x given $y = 0$
max_y	Maximum tax rate on capital income y given $x = 0$
min_y	Minimum tax rate on capital income y given $x = 0$
$shift_x$	shifter $> \lvert min_x \rvert$ ensures that $\tau(x) + shift_x > 0$ despite potentially negative values for $\tau(x)$
$shift_y$	shifter $> \lvert min_y \rvert$ ensures that $\tau(y) + shift_y > 0$ despite potentially negative values for $\tau(y)$
$shift$	shifter (can be negative) allows for support of $\tau(x, y)$ to include negative tax rates
ϕ	Cobb-Douglas share parameter between 0 and 1

Estimated ETR, MTRx, and MTRy



A simpler tax function

Gouveia and Strauss (1994), three parameters (ψ_0, ψ_1, ψ_2)

$$T(I) = \psi_0 \left[I - \left(I^{-\psi_1} + \psi_2 \right)^{-\frac{1}{\psi_1}} \right] \quad \text{where} \quad I \equiv x + y$$

$$\tau^{ETR}(I) \equiv \frac{T(I)}{I} = \frac{\psi_0 \left[I - \left(I^{-\psi_1} + \psi_2 \right)^{-\frac{1}{\psi_1}} \right]}{I}$$

Gouveia and Strauss versus others